CLACKAMAS COUNTY

DAN JOHNSON
DIRECTOR

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
DEVELOPMENT SERVICES BUILDING
150 BEAVERCREEK ROAD OREGON CITY, OR 97045

March 20, 2025 BCC Agenda Date/Item: _____

Board of County Commissioners
Clackamas County

Approval of a Public Improvement Contract with Westech Construction for the Stafford Road Pattulo Way to Rosemont Road construction project. Contract Value is $10,066,942.17 for 4 years. Funding is through Community Road Funds, HB2017 Safety Funds and System Development Charges. No County General Funds are involved.

Previous Board Action/Review	03/20/2025: Approval to Accept Two Permanent and Temporary Easements from Metro for the Stafford Road Improvements Project. 06/20/2024: Approval of Contract Amendment #5 with Consor North America, Inc. for the Stafford Road (Pattulo Wy to Rosemont Rd) Improvements Project. 08/10/2023: Approval of Contract Amendment #4 with Consor North America, Inc. for the Stafford Road (Pattulo Wy to Rosemont Rd) Improvements Project. 03/30/23: Approval of a Resolution of Necessity and purpose for Acquisition of Right of Way, Easements, and Fee Property and Authorizing Good Faith Negotiations and Condemnation actions for the Stafford Road (Pattulo Wy to Rosemont Rd) Improvements Project. 11/12/20: Approval of Contract with Murraysmith, Inc. (now known as Consor North America, Inc.) for the Stafford Road (Pattulo Wy to Rosemont Rd) Improvements Project.		
Performance Clackamas	The project will build a strong infrastructure and ensure safe, healthy and secure communities.		
Counsel Review	Amanda Keller, 3/11/25	**Procurement Review**	Yes
Contact Person	Jonathan Hangartner	**Contact Phone**	503-742-4649

EXECUTIVE SUMMARY: SW Stafford Road has long been identified as a priority improvement project in the Clackamas County transportation system plan (TSP). This project will improve Stafford Rd between Pattulo Way and Rosemont Rd by realigning intersections at Johnson Road

For Filing Use Only

and Childs Road and widening Stafford Road to add bike lanes. The project will also add a southbound left-turn lane at Johnson Road and a roundabout at Childs Road.

The total construction contract cost is $10,066,942.17. The construction will be substantially completed by June 30, 2027. A 2-year plant establishment period will extend through December 31, 2029.

PROCUREMENT PROCESS: This project was advertised in accordance with ORS and LCRB Rules on January 2, 2025, Invitation to Bid 2024-122. Bids were publicly opened on February 12, 2025. The County received nine (9) bids in response to the Invitation to Bid from Kerr Contractors, Willamette Valley Excavating, Westech Construction, Canby Excavating, Pacific Excavation, Interlaken Inc., Goodfellow Bros., K&E Excavation, and Moore Excavation. The apparent lowest bid was from Westech Construction, Inc. for a total value of $10,066,942.17. A review of the bids received led to a recommendation for contract award to the apparent low bidder, Westech Construction, Inc.

RECOMMENDATION: Staff recommends that the Board of County Commissioners approve this Public Improvement Contract #1200 with Westech Construction, Inc. for Construction of the Stafford Road: Pattulo Way to Rosemont Road Construction Project.

Respectfully submitted,

Dan Johnson

Dan Johnson, Director
Department of Transportation & Development

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT
Contract #1200

This Public Improvement Contract (the "Contract"), is made by and between the Clackamas County, a political subdivision of the State of Oregon ("Owner"), and **Westech Construction, Inc.** ("Contractor"), both collectively referred to as the "Parties". This Contract shall become effective on the date this Contract has been signed by all the Parties and shall expire upon completion the completion of all obligations under the terms of this Contract unless terminated earlier by the Parties.

All capitalized terms in this Contract shall have the meanings identified in the Specifications (defined below) unless otherwise defined in this Contract.

Project Name: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road Construction

1. Contract Price, Contract Documents and Work.
The Contractor hereby agrees to perform all the work described in, and reasonably inferred from, the Contract Documents, as further defined below ("Work"). In consideration of the Contractor performing the Work in accordance with the terms of the Contract, the Owner agrees to pay the Contractor an amount not to exceed **Ten Million Sixty-Six Thousand Nine Hundred Forty-Two Dollars and Seventeen Cents ($10,066,942.17)** (the "Contract Price"). Payment will be made in accordance with the terms and conditions provided in the Contract Documents. The Contract Price is the amount contemplated by the Base Bid, as indicated in the accepted Bid.

The following documents are incorporated by reference in this Contract and made a part hereof ("Contract Documents"):

- Notice of Contract Opportunity
- Supplemental Instructions to Bidders
- Bid Form
- Prevailing Wage Rates
- Plans, Specifications and Drawings
- Instructions to Bidders
- Bid Bond
- Performance Bond and Payment Bond
- Payroll and Certified Statement Form
- Addenda 1-3

The Plans, Specifications and Drawings expressly incorporated by reference into this Contract includes, but is not limited to, the Special Provisions for Highway Construction (the "Specifications"), together with the provisions of the Oregon Standard Specifications for Construction (2021) referenced therein.

The Contractor shall comply with the prohibitions set forth in ORS 652.220, compliance of which is a material element of this Contract and failure to comply is a material breach that entitles County to exercise any rights and remedies available under this Contract including, but not limited to, termination for default.

2. Representatives.
Contractor has named Joshua Meng as its Authorized Representative to act on its behalf. Owner designates, or shall designate, its Authorized Representative as indicted below (check one):

☒ Unless otherwise specified in the Contract Documents, the Owner designates Jonathan Hangartner as its Authorized Representative in the administration of this Contract. The above-named individual shall be the initial point of contact for matters related to Contract performance, payment, authorization, and to carry out the responsibilities of the Owner.

☐ Name of Owner's Authorized Representative shall be submitted by Owner in a separate writing.

3. Key Persons.
The Contractor's personnel identified below shall be considered Key Persons and shall not be replaced during the project without the written permission of Owner, which shall not be unreasonably withheld. If the Contractor intends to substitute personnel, a request must be given to Owner at least 30 days prior to the intended time of substitution. When replacements have been approved by Owner, the Contractor shall provide a transition period of at least 10 working days during which the original and replacement personnel shall be working on the project concurrently. Once a replacement for any of these staff members is authorized, further replacement shall not occur without the written permission of Owner. The Contractor's project staff shall consist of the following personnel:

Project Executive: Joshua Meng shall be the Contractor's project executive, and will provide oversight and guidance throughout the project term.

Project Manager: Wyatt Houghtby shall be the Contractor's project manager and will participate in all meetings throughout the project term.

Job Superintendent: Dennis Meng shall be the Contractor's on-site job superintendent throughout the project term.

Project Engineer: Michael Pingle shall be the Contractor's project engineer, providing assistance to the project manager, and subcontractor and supplier coordination throughout the project term.

4. Contract Dates.
The Contractor agrees to complete the Work in accordance with the following key dates:

COMMENCEMENT DATE: Upon Issuance of Notice to Proceed ("NTP")
SUBSTANTIAL COMPLETION DATE: September 30, 2025 (stages 1 and 2)
SUBSTANTIAL COMPLETION DATE: December 31, 2026 (all Work, except for permanent striping, seeding establishment and plant establishment)
SUBSTANTIAL COMPLETION DATE: June 30, 2027 (all Work, except for seeding establishment and plant establishment)
FINAL COMPLETION DATE: December 31, 2029

5. Insurance Certificates and Required Performance and Payment Bonds.

5.1 In accordance with Section 00170.70 of the Specifications, Contractor shall furnish proof of the required insurance naming Clackamas County as an additional insured. Insurance certificates may be returned with the signed Contract or may be emailed to the Owner's Contract Analyst.

5.2 Primary Coverage: Insurance carried by Contractor under the Contract shall be the primary coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

5.2.1 Workers' Compensation: All employers, including Contractor, that employ subject workers who work under the Contract in the State of Oregon shall comply with ORS 656.017 and provide the required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. This shall include Employer's Liability Insurance with coverage limits of not less than the minimum amount required by statute for each accident. Contractors who perform the Work without the assistance or labor of any employee need not obtain such coverage if the Contractor certifies so in writing. Contractor shall ensure that each of its Subcontractors complies with these

requirements. The Contractor shall require proof of such Workers' Compensation coverage by receiving and keeping on file a certificate of insurance from each Subcontractor or anyone else directly employed by either the Contractor or its Subcontractors.

5.3 Builder's Risk Insurance: During the term of the Contract, for new construction the Contractor shall obtain and keep in effect Builder's Risk insurance on an all risk forms, including earthquake and flood, for an amount equal to the full amount of the Contract, plus any changes in values due to modifications, Change Orders and loss of materials added. Such Builder's Risk shall include, in addition to earthquake and flood, theft, vandalism, mischief, collapse, transit, debris removal, and architect's fees "soft costs" associated with delay of Project due to insured peril. Any deductible shall not exceed $50,000 for each loss, except the earthquake and flood deductible which shall not exceed 2 percent of each loss or $50,000, whichever is greater. The deductible shall be paid by Contractor. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear.

5.4 Builder's Risk Installation Floater: For Work other than new construction, Contractor shall obtain and keep in effect during the term of the Contract, a Builder's Risk Installation Floater for coverage of the Contractor's labor, materials and equipment to be used for completion of the Work performed under the Contract. The minimum amount of coverage to be carried shall be equal to the full amount of the Contract. The policy will include as loss payees Owner, the Contractor and its Subcontractors as their interests may appear. Owner may waive this requirement at its sole and absolute discretion.

5.4.1 Such insurance shall be maintained until Owner has occupied the facility.

5.4.2 A loss insured under the Builder's Risk insurance shall be adjusted by the Owner and made payable to the Owner as loss payee. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner. The Owner shall have power to adjust and settle a loss with insurers.

5.5 "Tail" Coverage: If any of the required liability insurance is arranged on a "claims made" basis, "tail" coverage will be required at the completion of the Contract for a duration of 36 months or the maximum time period available in the marketplace if less than 36 months. Contractor shall furnish certification of "tail" coverage as described or continuous "claims made" liability coverage for 36 months following Final Completion. Continuous "claims made" coverage will be acceptable in lieu of "tail" coverage, provided its retroactive date is on or before the effective date of the Contract. Owner's receipt of the policy endorsement evidencing such coverage shall be a condition precedent to Owner's obligation to make final payment and to Owner's final acceptance of Work or services and related warranty (if any).

5.6 Notice of Cancellation or Change: If the Contractor receives a non-renewal or cancellation notice from an insurance carrier affording coverage required herein, or receives notice that coverage no longer complies with the insurance requirements herein, Contractor agrees to notify Owner by fax within five (5) business days with a copy of the non-renewal or cancellation notice, or written specifics as to which coverage is no longer in compliance. When notified by Owner, the Contractor agrees to stop Work pursuant to the Contract at Contractor's expense, unless all required insurance remain in effect. Any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, shall not affect the coverages provided to the Owner and its institutions, divisions, officers, and employees. Owner shall have the right, but not the obligation, of prohibiting Contractor from entering the Project Site until a new certificate(s) of insurance is provided

to Owner evidencing the replacement coverage. The Contractor agrees that Owner reserves the right to withhold payment to Contractor until evidence of reinstated or replacement coverage is provided to Owner.

5.7 Before execution of the Contract, the Contractor shall file with the Construction Contractors Board, and maintain in full force and effect, the separate public works bond required by Oregon Revised Statutes, Chapter 279C.830 and 279C.836, unless otherwise exempt under those provisions. The Contractor shall also include in every subcontract a provision requiring the Subcontractor to have a public works bond filed with the Construction Contractors Board before starting Work, unless otherwise exempt, and shall verify that the Subcontractor has filed a public works bond before permitting any Subcontractor to start Work.

5.8 When the Contract Price is $50,000 or more, the Contractor shall furnish and maintain in effect at all times during the Contract Period a performance bond in a sum equal to the Contract Price and a separate payment bond also in a sum equal to the Contract Price. Contractor shall furnish such bonds even if the Contract Price is less than the above thresholds if otherwise required by the Contract Documents.

5.9 Bond forms furnished by the Owner and notarized by Contractor's surety company authorized to do business in Oregon are the only acceptable forms of performance and payment security, unless otherwise specified in the Contract Documents.

6. Responsibility for Damages/Indemnity.

6.1 Contractor shall be responsible for all damage to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by, or result from, the carrying out of the Work to be done under the Contract, or from any act, omission or neglect of the Contractor, its Subcontractors, employees, guests, visitors, invitees and agents.

6.2 To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel approved by Owner) and hold harmless the Owner and its elected officials, officers, directors, agents, and employees (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses, demands and actions of any nature whatsoever which arise out of, result from or are related to: (a) any damage, injury, loss, expense, inconvenience or delay described in this Section 6.1; (b) any accident or occurrence which happens or is alleged to have happened in or about the Project Site or any place where the Work is being performed, or in the vicinity of either, at any time prior to the time the Work is fully completed in all respects; (c) any failure of the Contractor to observe or perform any duty or obligation under the Contract Documents which is to be observed or performed by the Contractor, or any breach of any agreement, representation or warranty of the Contractor contained in the Contract Documents or in any subcontract; (d) the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or any one of them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder (except to the extent otherwise void under ORS 30.140); and (e) any lien filed upon the Project or bond claim in connection with the Work. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 6.2.

6.3 In claims against any person or entity indemnified under Section 6.2 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 6.2 shall not be limited on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

7. Tax Compliance.
The Contractor shall comply with all federal, state and local laws, regulation, executive orders and ordinances applicable to this Contract. Contractor represents and warrants that it has complied, and will continue to comply throughout the duration of this Contract and any extensions, with all tax laws of this state or any political subdivision of this state, including but not limited to ORS 305.620 and ORS chapters 316, 317, and 318. Any violation of this section shall constitute a material breach of this Contract and shall entitle Owner to terminate this Contract, to pursue and recover any and all damages that arise from the breach and the termination of this Contract, and to pursue any or all of the remedies available under this Contract or applicable law.

8. Confidential Information.
Contractor acknowledges that it and its employees or agents may, in the course of performing their responsibilities under this Contract, be exposed to or acquire information that is confidential to Owner. Any and all information of any form obtained by Contractor or its employees or agents in the performance of this Contract shall be deemed confidential information of Owner ("Confidential Information"). Contractor agrees to hold Confidential Information in strict confidence, using at least the same degree of care that Contractor uses in maintaining the confidentiality of its own confidential information, and not to copy, reproduce, sell, assign, license, market, transfer or otherwise dispose of, give, or disclose Confidential Information to third parties or use Confidential Information for any purpose unless specifically authorized in writing under this Contract.

9. Counterparts.
This Contract may be executed in several counterparts, all of which when taken together shall constitute an agreement binding on all Parties, notwithstanding that all Parties are not signatories to the same counterpart. Each copy of the Contract so executed shall constitute an original.

10. Integration.
All provisions of state law required to be part of this Contract, whether listed in the Specifications, Contract Documents or otherwise, are hereby integrated and adopted herein. Contractor acknowledges the obligations thereunder and that failure to comply with such terms is a material breach of this Contract.

The Contract Documents constitute the entire agreement between the parties. There are no other understandings, agreements or representations, oral or written, not specified herein regarding this Contract. Contractor, by the signature below of its authorized representative, hereby acknowledges that it has read this Contract, understands it, and agrees to be bound by its terms and conditions.

11. Liquidated Damages
The Contractor acknowledges that the Owner will sustain damages as a result of the Contractor's failure to substantially complete the Project in accordance with the Contract Documents. These damages may include, but are not limited to delays in completion, use of the Project, and costs associated with Contract administration and use of temporary facilities. The liquidated damages amount is not a penalty, but a reasonable estimate of the loss the Owner will suffer. Liquidated damages are set forth in the Contract Documents and may include the following:

11.1 $2,000 per Calendar day past the Substantial Completion date, as set forth in section 00180.85 (b).

11.2 $500 per 15 minutes, or for a portion of 15 minutes, per lane, for any lane closure beyond the limits listed in 00220.40(e), as set forth in 00180.85(c).

11.3 $2,000 per day for any road closure beyond the limit listed in 00220.40(b)

12. Compliance with Applicable Law. Contractor shall comply with all federal, state, county, and local laws, ordinances, and regulations applicable to the Work to be done under this Contract including, but not limited to, compliance with the prohibitions set forth in ORS 652.220, compliance of which is a material element of this Contract and failure to comply is a material breach that entitles County to exercise any rights and remedies available under this Contract including, but not limited to, termination for default.

13. Responsibility for Taxes. Contractor is solely responsible for payment of any federal, state, or local taxes required as a result of the Contract or the Work including, but not limited, to payment of the corporate activity tax imposed under enrolled HB 3427 (2019 Oregon regular legislative session). Contractor may not include its federal, state, or local tax obligations as part of the cost to perform the Work.

14. No Attorney Fees. In the event any arbitration, action or proceeding, including any bankruptcy proceeding, is instituted to enforce any term of this Contract, each party shall be responsible for its own attorneys' fees and expenses.

In witness whereof, Owner executes this Contract and the Contractor does execute the same as of the day and year first above written.

Contractor DATA:
Westech Construction, Inc.
2204 NE 194th Ave
Portland, Oregon 97230

Contractor CCB # 99833 Expiration Date: 6/13/2026
Oregon Business Registry # 391288-89 Entity Type: DBC State of Formation: Oregon

Payment information will be reported to the IRS under the name and taxpayer ID# provided by the Contractor. Information must be provided prior to contract approval. Information not matching IRS records could subject Contractor to 28 percent backup withholding.

Westech Construction, Inc.

3/3/2025
Authorized Signature Date

Joshua Meng / Vice President
Name / Title Printed

Clackamas County

Chair Date

Recording Secretary

APPROVED AS TO FORM

3/11/2025
County Counsel Date

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY

Table of Contents

CLACKAMAS COUNTY
NOTICE OF PUBLIC IMPROVEMENT CONTRACT OPPORTUNITY

INVITATION TO BID #2024-122
Stafford Road: Pattulo Way to Rosemont Road Construction
January 2, 2025

Clackamas County ("County") through its Board of County Commissioners is accepting sealed bids for the **Stafford Road: Pattulo Way to Rosemont Road** Project until **February 5, 2025, 2:00 PM,** Pacific Time, ("Bid Closing") at the following location:

Bidding Documents can be downloaded from the state of Oregon procurement website ("OregonBuys") at the following address: https://oregonbuys.gov/bso/view/login/login.xhtml, Document No.S-C01010-00012425.
Prospective Bidders will need to sign in to download the information and that information will be accumulated for a Plan Holder's List. Prospective Bidders are responsible for obtaining any Addenda from Website listed above.

Submitting Proposals: Bid Locker
Proposals will only be accepted electronically thru a secure online bid submission service, **Bid Locker**.
Email submissions to Clackamas County email addresses will no longer be accepted.

A. Completed proposal documents must arrive electronically via Bid Locker located at https://bidlocker.us/a/clackamascounty/BidLocker.
B. Bid Locker will electronically document the date and time of all submissions. Completed documents must arrive by the deadline indicated in Section 1 or as modified by Addendum. LATE PROPOSALS WILL NOT BE ACCEPTED.
C. Proposers must register and create a profile for their business with Bid Locker in order to submit for this project. It is free to register for Bid Locker.
D. Proposers with further questions concerning Bid Locker may review the Vendor's Guide located at https://www.clackamas.us/how-to-bid-on-county-projects .

Engineers Estimate: $13,940,000.000 - $14,700,000.00

Contact Information
Procurement Process and Technical Questions: Tralee Whitley at TWhitley@clackamas.us

Bids will be opened and publicly read aloud at the above Delivery address after the Bid Closing. Bid results will also be posted to the OregonBuys listing shortly after the opening.

To be eligible for award under this Invitation to Bid, bidders (prime contractors) must submit a prequalification application (either ODOT or County) to the County at least two business days prior to the Bid Closing. County will reject bids from bidders who are not prequalified for the class of work indicated prior to the Bid Closing. **Bidders must be prequalified in Earthwork and Drainage (EART)**

State Prevailing Wage
Prevailing Wage Rates requirements apply to this Project because the maximum compensation for all Owner-contracted Work is more than $50,000. Contractor and all subcontractors shall comply with the provisions of ORS 279C.800 through 279C.870, relative to Prevailing Wage Rates. The Bureau of Labor and Industries (BOLI) wage rates and requirements set forth in the following BOLI booklet (and any

listed amendments to that booklet), which are incorporated herein by reference, apply to the Work authorized under this Agreement:

PREVAILING WAGE RATES for Public Works Contracts in Oregon, July 5, 2024 and amended on October 5, 2024, which can be downloaded at the following web address: http://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx The Work will take place in Clackamas County, Oregon.

Clackamas County encourages bids from Minority, Women, and Emerging Small Businesses.

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

INSTRUCTIONS TO BIDDERS

Clackamas County Local Contract Review Board Rules ("LCRB Rules") govern this procurement process. LCRB Rules may be found at: http://www.clackamas.us/code/documents/appendixc.pdf. The Instructions to Bidders is applicable to the procurement process for Clackamas County, or any component unit thereof identified on the Notice of Public Improvement Contract Opportunity, herein after referred to as the "Owner."

Article 1. Scope of Work

The work contemplated under this contract with the Owner, includes all labor, materials, transportation, equipment and services necessary for, and reasonably incidental to, the completion of all construction work in connection with the project described in the Project Manual which includes, but is not necessarily limited to, the Notice of Public Improvement Contract Opportunity, Instructions to Bidders, Supplemental Instructions to Bidders, Bid Form, Bid Bond, Public Improvement Contract Form, Performance Bond, Payment Bond, and Plans, Specifications and Drawings.

Article 2. Examination of Site and Conditions

Before making a Bid, the Bidder shall examine the site of the work and ascertain all the physical conditions in relation thereto. The Bidder shall also make a careful examination of the Project Manual including the plans, specifications, and drawings and other contract documents, and shall be fully informed as to the quality and quantity of materials and the sources of supply of the materials. Failure to take these steps will not release the successful Bidder from entering into the contract nor excuse the Bidder from performing the work in strict accordance with the terms of the contract at the price established by the Bid.

The Owner will not be responsible for any loss or for any unanticipated costs, which may be suffered by the successful Bidder, as a result of such Bidder's failure to be fully informed in advance with regard to all conditions pertaining to the work and the character of the work required, including site conditions. No statement made by an elected official, officer, agent, or employee of the Owner in relation to the physical or other conditions pertaining to the site of the work will be binding on the Owner, unless covered by the Project Manual or an Addendum.

Article 3. Interpretation of Project Manual and Approval of Materials Equal to Those Provided in the Specifications

If any Bidder contemplating submitting a Bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or forms of contract documents, or detects discrepancies or omissions, such Bidder may submit to the Architect (read "Engineer" throughout in lieu of Architect as appropriate) a written request for an interpretation thereof at least ten (10) calendar days prior to the date set for the Bid Closing.

When a prospective Bidder seeks approval of a particular manufacturer's material, process or item of equal value, utility or merit other than that designated by the Architect in the Project Manual, the Bidder may submit to the Architect a written request for approval of such substitute at least ten (10) calendar days prior to the date set for the Bid Closing. The prospective Bidder submitting the request will be responsible for its prompt delivery.

Requests of approval for a substitution from that specified shall be accompanied by samples, records of performance, certified copies of tests by impartial and recognized laboratories, and such other information as the Architect may request.

To establish a basis of quality, certain processes, types of machinery and equipment or kinds of materials may be specified in the Project Manual either by description of process or by designating a

manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Whenever a process is designated or a manufacturer's name, brand or item designation is given, or whenever a process or material covered by patent is designated or described, it shall be understood that the words "or approved equal" follow such name, designation or description, whether in fact they do so or not.

Any interpretation of the Project Manual or approval of manufacturer's material will be made only by an Addendum duly issued. All Addenda will be posted to the OregonBuys listing and will become a part of the Project Manual. The Owner will not be responsible for any other explanation or interpretation of the Project Manual nor for any other approval of a particular manufacturer's process or item for any Bidder.

When the Architect approves a substitution by Addendum, it is with the understanding that the Contractor guarantees the substituted article or material to be equal or better than the one specified.

Article 4. Security to Be Furnished by Each Bidder

Each Bid must be accompanied by either 1) a cashier's check or a certified check drawn on a bank authorized to do business in the State of Oregon, or 2) a Bid bond described hereinafter, executed in favor of the Owner, for an amount equal to ten percent (10%) of the total amount Bid as a guarantee that, if awarded the contract, the Bidder will execute the contract and provide a performance bond and payment bond as required. The successful Bidder's check or Bid bond will be retained until the Bidder has entered into a contract satisfactory to Owner and furnished a one hundred percent (100%) performance bond and one hundred percent (100%) payment bond. The Owner reserves the right to hold the Bid security as described in Article 10 hereof. Should the successful Bidder fail to execute and deliver the contract as provided for in Article 12 hereof, including a satisfactory performance bond and payment bond within twenty (20) calendar days after the Bid has been accepted by the Owner, then the contract award made to such Bidder may be considered canceled and the Bid security may be forfeited as liquidated damages at the option of the Owner. The date of the acceptance of the Bid and the award of the contract as contemplated by the Project Manual shall mean the date of acceptance specified in the Notice of Intent to Award.

Article 5.Execution of Bid Bond

Should the Bidder elect to utilize a Bid bond as described in Article 4 in order to satisfy the Bid security requirements, such form must be completed in the following manner:

A. Bid bonds must be executed on the County forms, which will be provided to all prospective Bidders by the Owner.

B. The Bid bond shall be executed on behalf of a bonding company licensed to do business in the State of Oregon.

C. In the case of a sole individual, the bond need only be executed as principal by the sole individual. In the case of a partnership, the bond must be executed by at least one of the partners. In the case of a corporation, the bond must be executed by stating the official name of the corporation under which is placed the signature of an officer authorized to sign on behalf of the corporation followed by such person's official capacity, such as president, etc. The corporation seal should then be affixed to the bond.

D. The name of the surety must be stated in the execution over the signature of its duly authorized attorney-in-fact and accompanied by the seal of the surety corporation.

Article 6. Execution of the Bid Form

Each Bid shall be made in accordance with: (i) the sample Bid Form accompanying these instructions; (ii) the appropriate signatures for a sole individual, partnership, corporation or limited liability corporation shall be added as noted in Article 5C above; (iii) numbers pertaining to base Bids shall be stated both in writing and in figures; and (iv) the Bidder's address shall be typed or printed.

The Bid Form relates to Bids on a specific Project

Manual. Only the amounts and information asked for on the Bid Form furnished will be considered as the Bid. Each Bidder shall Bid upon the work exactly as specified and provided in the Bid Form. The Bidder shall include in the Bid a sum to cover the cost of all items contemplated by the Contract. The Bidder shall Bid upon all alternates that may be indicated on the Bid Form. When Bidding on an alternate for which there is no charge, the Bidder shall write the words "No Charge" in the space provided on the Bid Form. If one or more alternates are shown on the Bid Form, the Bidder shall indicate whether each is "add" or "deduct."

Article 7. Prohibition of Alterations to Bid

Bids that are incomplete, or contain ambiguities or have differing conditions required by the Bidder, including requested changes or exceptions to the Public Improvement Contract form or other portions of the Project Manual, may be rejected in Owner's sole and absolute discretion.

Article 8. Submission of Bid

Each Bid shall be sealed in an envelope, properly addressed to the Owner, showing on the outside of the envelope the name of the Bidder and the name of the project. Bids will be received at the time and place stated in the Notice of Public Improvement Contract Opportunity.

Article 9. Bid Closing and Opening of Bids

All Bids must be received by the Owner at the place and time set for the Bid Closing. Any Bids received after the scheduled Bid Closing time for receipt of Bids will be rejected.

At the time of opening and reading of Bids, each Bid received will be publicly opened and read aloud, irrespective of any irregularities or informalities in such Bids.

Generally, Bid results will be posted to the Oregonbuys Website within a couple hours of the opening.

Article 10. Acceptance or Rejection of Bids by Owner

Unless all Bids are rejected, the Owner will award a contract based on the lowest responsive Bid from a responsible Bidder. If that Bidder does not execute the contract, it will be awarded to the next lowest responsible Bidder or Bidders in succession.

The Owner reserves the right to reject all Bids and to waive minor informalities. The procedures for contract awards shall be in compliance with the provisions of the LCRB Rules in effect at that time.

The Owner reserves the right to hold the Bid and Bid security of the three lowest Bidders for a period of thirty (30) calendar days from and after the time of Bid opening pending award of the contract. Following award of the contract the Bid security of the three lowest Bidders may be held twenty (20) calendar days pending execution of the contract. All other Bids will be rejected and Bid security will be returned.

In determining the lowest Bidder, the Owner reserves the right to take into consideration any or all authorized base Bids as well as alternates or combinations indicated in the Bid Form.

If no Bid has been accepted within thirty (30) calendar days after the opening of the Bids, each of the three lowest Bidders may withdraw the Bid submitted and request the return of the Bid security.

Article 11. Withdrawal of Bid

At any time prior to the Bid Closing, a Bidder may withdraw its Bid. This will not preclude the submission of another Bid by such Bidder prior to the time set for the Bid Closing.

After the time set for the Bid Closing, no Bidder will be permitted to withdraw its Bid within the time frames specified in Article 10 for award and execution, except as provided for in that Article.

Article 12. Execution of Contract, Performance Bond and Payment Bond

The Owner will provide the successful Bidder with contract forms within seven (7) calendar days after

the completion of the award protest period. The Bidder is required to execute the contract forms as provided, including a performance bond and a payment bond from a surety company licensed to do surety business in the State of Oregon, within seven (7) calendar days after receipt of the contract forms. The contract forms shall be delivered to the Owner in the number called for and to the location as instructed by the Owner.

Article 13. Recyclable Products

Contractors will use recyclable products to the maximum extent economically feasible in the performance of the Contract.

Article 14. Clarification or Protest of the Solicitation Document or Specifications

Any request for clarification or protest of the solicitation document or specifications must be submitted in the manner provided for in the applicable section of the LCRB Rules to the Procurement Representative referenced in the Notice of Public Improvement Contract Opportunity.

A protest of the Solicitation Document must be received within seven (7) business days of the issuance of the Bid or within three (3) business days of issuance of an addendum.

Requests for clarification may be submitted no less than five (5) business days prior to the Bid Closing Date.

Article 15. Protest of Intent to Award

Owner will name the apparent successful Bidder in a "Notice of Intent to Award" letter. Identification of the apparent successful Bidder is procedural only and creates no right in the named Bidder to the award of the contract. Competing Bidders will be notified by publication of the Notice of Intent to Award on the OregonBuys Website of the selection of the apparent successful Bidder(s) and Bidders shall be given seven (7) calendar days from the date on the "Notice of Intent to Award" letter to review the file at the Procurement Division office and file a written protest of award, pursuant to C-049-0450. Any award protest must be in writing and must be delivered by email, hand delivery, or mail to the Procurement Division Director at: Procurement Division, 2051 Kaen Road, Oregon City, OR 97045.

Article 16. Disclosure of First-Tier Subcontractors

Within two (2) working hours after the Bid Closing, all Bidders shall submit to the County a disclosure form identifying any first-tier subcontractors (those entities that would be contracting directly with the prime contractor) that will be furnishing labor and materials on the contract, if awarded, whose subcontract value would be equal to or greater than: (a) Five percent (5%) of the total contract price, but at least $15,000; or (b) $350,000, regardless of the percentage of the total contract price.

Disclosures may be submitted with the Bid or may be hand delivered to the Bid Closing address or emailed to the Contract Information Analyst listed on the Notice of Contract Opportunity.

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

Project Name: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road Construction

The following modify the Clackamas County "Instructions to Bidders" for this Project. Where a portion of the Instructions to Bidders has been modified by these Supplemental Instructions to Bidders, the unaltered portions shall remain in effect.

1. To be eligible for award under this Invitation to Bid, bidders (prime contractors) must submit a prequalification application (either ODOT or County) to the County at least two business days prior to the Bid Closing. County will reject bids from bidders who are not prequalified for the class of work indicated prior to the Bid Closing. **Bidders must be prequalified in Earthwork and Drainage (EART)**

1. **Electronic Submissions: The County is requiring all bids for this project be electronically submitted. Complete Bids (including all attachments) will only be accepted electronically thru a secure online bid submission service, Bid Locker. Email submissions to Clackamas County email addresses will no longer be accepted. https://bidlocker.us/a/clackamascounty/BidLocker.**

   Bids will be publicly read aloud via the computer application, Zoom. Bidders will be allowed to video conference or listen by phone to the bid results. The projects Zoom meeting can be accessed via the information below:

   ZOOM LINKS.
   Join Zoom Meeting
   https://clackamascounty.zoom.us/j/88906000913

   Meeting ID: 889 0600 0913

   One tap mobile
   +16699006833,,88906000913# US (San Jose) 17193594580,,88906000913# US

   Dial by your location
   • +1 669 900 6833 US (San Jose)
   • +1 719 359 4580 US
   • +1 253 205 0468 US
   • +1 253 215 8782 US (Tacoma)
   • +1 346 248 7799 US (Houston)

• +1 408 638 0968 US (San Jose)
• +1 669 444 9171 US
• +1 564 217 2000 US
• +1 646 876 9923 US (New York)
• +1 646 931 3860 US
• +1 689 278 1000 US
• +1 301 715 8592 US (Washington DC)
• +1 305 224 1968 US
• +1 309 205 3325 US
• +1 312 626 6799 US (Chicago)
• +1 360 209 5623 US
• +1 386 347 5053 US
• +1 507 473 4847 US

Meeting ID: 889 0600 0913

Find your local number: https://clackamascounty.zoom.us/u/kdizYAQvKU

**The Apparent Low bid results will be posted to the projects OregonBuys listing as soon as possible following the bid opening.

2. **Good Faith Effort:** Clackamas County encourages participation in contracts by Historically Underrepresented Businesses. "Historically Underrepresented Businesses" are State of Oregon-certified and self-identified minority, women and emerging small business as well as firms that are certified federally or by another state or entity with substantially similar requirements as the State of Oregon.

   Bidders must perform Good Faith Effort (defined below) and submit **Form 1 and Form 2** for the Bidders Bid to be considered responsive. **Form 1 and Form 2** must be submitted within **two (2) hours** after the Closing Date and Time. Form 1 and Form 2 may be submitted to either the Contact Information Analyst listed on Notice of Contract Opportunity or via the https://bidlocker.us/a/clackamascounty/BidLocker listing.
   "Good Faith Effort" is a requirement of a prime contractor to reach out to at least three Historically Underrepresented Business Subcontractors for each division of work that will be subcontracted out and to complete the required forms. If fewer than three Historically Underrepresented Business Subcontractors are reasonably available for a particular division of work, the Bidder must specifically note the reason for there being fewer than three contacts. The outreach should be performed with sufficient time to give the subcontractors at least 5 calendar days to respond to the opportunity. Form 3, which documents the actual amount of subcontractors on the project, must be submitted with the project final pay application. Compliance with the Good Faith Effort and submission of Forms 1, 2 and 3 is a contractual requirement for final payment.

   The sufficiency of the documentation or the performance of Good Faith Effort shall be in the sole and absolute determination of Clackamas County. Only those Bidders that Clackamas County has determined have not sufficiently performed

Good Faith Effort shall have protest rights of the determination for such Bidder. No Bidder shall have protest rights of the sufficiency of any other Bidder completing Good Faith Effort.

CLACKAMAS COUNTY
GOOD FAITH EFFORT
SUBCONTRACTOR AND SELF-PERFORMED WORK LIST
(FORM 1)

Prime Contractor Name: [redacted] **Total Contract Amount:**

Project Name: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road

PRIME SELF-PERFORMING: Identify below **ALL** GFE Divisions of Work (DOW) to be self-performed. Good Faith Efforts are otherwise required.	
DOW BIDDER WILL SELF-PERFORM	***(GFE not required)***
[redacted]	

PRIME CONTRACTOR SHALL DISCLOSE AND LIST ALL SUBCONTRACTORS, including those Minority-owned, Woman-owned, and Emerging Small Businesses ("M/W/ESB") that you intend to use on the project. Delivery via bid locker https://bidlocker.us/a/clackamascounty/BidLocker within 2 hours of the BID/Quote Closing Date/Time.

LIST ALL SUBCONTRACTORS BELOW Use **correct legal name** of Subcontractor (No Assumed Business Names)	**Division of Work** (Painting, electrical, landscaping, etc.) List **ALL** DOW performed by Subcontractors	**DOLLAR AMOUNT OF SUBCONTRACT**	If Certified or self-reporting MBE/WBE/ESB Subcontractor Check box		
			MBE	WBE	ESB
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☑	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☑	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☐	☐

GFE SUBCONTRACTOR AND SELF-PERFORMED WORK LIST (FORM 1) cont'd

Prime Contractor Name: **Total Contract Amount:**

Project Name: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road

LIST ALL SUBCONTRACTORS BELOW Use **correct legal name** of Subcontractor (No Assumed Business Names)	**Division of Work** (Painting, electrical, landscaping, etc.) List **ALL** DOW performed by Subcontractors	**DOLLAR AMOUNT OF SUBCONTRACT**	If Certified or self-reporting MBE/WBE/ESB Subcontractor Check box		
			MBE	WBE	ESB
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☑
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☑	☐	☐

GFE SUBCONTRACTOR AND SELF-PERFORMED WORK LIST (FORM 1) cont'd

Prime Contractor Name: **Total Contract Amount:**

Project Name: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road

LIST ALL SUBCONTRACTORS BELOW Use **correct legal name** of Subcontractor (No Assumed Business Names)	**Division of Work** (Painting, electrical, landscaping, etc.) List **ALL** DOW performed by Subcontractors	**DOLLAR AMOUNT OF SUBCONTRACT**	If Certified or self-reporting MBE/WBE/ESB Subcontractor Check box		
			MBE	WBE	ESB
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**	[redacted]	[redacted]	☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐
Name **Address** **City/St/Zip** **Phone#** **OCCB#**			☐	☐	☐

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID BOND

Project Name: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road Construction

We, Westech Construction, Inc., as "Principal,"
(Name of Principal)

and United Fire & Casualty Company, an Iowa Corporation,
(Name of Surety)

authorized to transact Surety business in Oregon, as "Surety," hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns to pay unto Clackamas County ("Obligee") the sum of ($ 10%)

Ten Percent of Total Amount Bid dollars.

WHEREAS, the condition of the obligation of this bond is that Principal has submitted its proposal or bid to an agency of the Obligee in response to Obligee's procurement document (No.2024-122) for the project identified above which proposal or bid is made a part of this bond by reference, and Principal is required to furnish bid security in an amount equal to ten (10%) percent of the total amount of the bid pursuant to the procurement document.

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, we have caused this instrument to be executed and sealed by our duly authorized legal representatives this 10th day of January, 2025.

Principal: Westech Construction, Inc.

By: James C Woodward
Signature

PRESIDENT / SEC TREAS.
Official Capacity

Attest:
Corporation Secretary

Surety: United Fire & Casualty Company

By: Attorney-In-Fact

Sarah Harren
Name

PO Box 73909
Address

Cedar Rapids, IA 52407-3909
City State Zip

(319) 399-5700
Phone

(866) 726-9738
Fax

UNITED FIRE & CASUALTY COMPANY CORPORATE SEAL CEDAR RAPIDS IOWA

UNITED FIRE & CASUALTY COMPANY, CEDAR RAPIDS, IA
UNITED FIRE & INDEMNITY COMPANY, WEBSTER, TX
FINANCIAL PACIFIC INSURANCE COMPANY, LOS ANGELES, CA
CERTIFIED COPY OF POWER OF ATTORNEY
(original on file at Home Office of Company – See Certification)

Inquiries: Surety Department
118 Second Ave SE
Cedar Rapids, IA 52401

KNOW ALL PERSONS BY THESE PRESENTS, That United Fire & Casualty Company, a corporation duly organized and existing under the laws of the State of Iowa; United Fire & Indemnity Company, a corporation duly organized and existing under the laws of the State of Texas; and Financial Pacific Insurance Company, a corporation duly organized and existing under the laws of the State of California (herein collectively called the Companies), and having their corporate headquarters in Cedar Rapids, State of Iowa, does make, constitute and appoint

KARL CHOLTUS, STEFAN ENGELHARDT, SARAH HARREN, MICHAEL MERTZ, JAIMIE KANGAS, NICK DEAN, CHERYL KLEINER, NICOLE SAJI, AMY M BURNS EACH INDIVIDUALLY

their true and lawful Attorney(s)-in-Fact with power and authority hereby conferred to sign, seal and execute in its behalf all lawful bonds, undertakings and other obligatory instruments of similar nature provided that no single obligation shall exceed $50,000,000.00 and to bind the Companies thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Companies and all of the acts of said Attorney, pursuant to the authority hereby given and hereby ratified and confirmed.

The Authority hereby granted is continuous and shall remain in full force and effect until revoked by United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

This Power of Attorney is made and executed pursuant to and by authority of the following bylaw duly adopted by the Boards of Directors of United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

"Article VI – Surety Bonds and Undertakings"

Section 2, Appointment of Attorney-in-Fact. "The President or any Vice President, or any other officer of the Companies may, from time to time, appoint by written certificates attorneys-in-fact to act in behalf of the Companies in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. The signature of any officer authorized hereby, and the Corporate seal, may be affixed by facsimile to any power of attorney or special power of attorney or certification of either authorized hereby; such signature and seal, when so used, being adopted by the Companies as the original signature of such officer and the original seal of the Companies, to be valid and binding upon the Companies with the same force and effect as though manually affixed. Such attorneys-in-fact, subject to the limitations set of forth in their respective certificates of authority shall have full power to bind the Companies by their signature and execution of any such instruments and to attach the seal the Companies thereto. The President or any Vice President, the Board of Directors or any other officer of the Companies may at any time revoke all power and authority previously given to any attorney-in-fact.

IN WITNESS WHEREOF, the COMPANIES have each caused these presents to be signed by its vice president and its corporate seal to be hereto affixed this 1st day of April, 2024

UNITED FIRE & CASUALTY COMPANY
UNITED FIRE & INDEMNITY COMPANY
FINANCIAL PACIFIC INSURANCE COMPANY

By: Kyanna M Saylor
Vice President

State of Iowa, County of Linn, ss:

On 1st day of April, 2024, before me personally came Kyanna M. Saylor to me known, who being by me duly sworn, did depose and say; that she resides in Cedar Rapids, State of Iowa; that she is a Vice President of United Fire & Casualty Company, a Vice President of United Fire & Indemnity Company, and a Vice President of Financial Pacific Insurance Company the corporations described in and which executed the above instrument; that she knows the seal of said corporations; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporations and that she signed her name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporations.

Patti Waddell
Iowa Notarial Seal
Commission number 713274
My Commission Expires 10/26/2025

Patti Waddell
Notary Public
My commission expires: 10/26/2025

I, Mary A. Bertsch, Assistant Secretary of United Fire & Casualty Company and Assistant Secretary of United Fire & Indemnity Company, and Assistant Secretary of Financial Pacific Insurance Company, do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Section of the bylaws and resolutions of said Corporations as set forth in said Power of Attorney, with the ORIGINALS ON FILE IN THE HOME OFFICE OF SAID CORPORATIONS, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

In testimony whereof I have hereunto subscribed my name and affixed the corporate seal of the said Corporations this 10th day of January, 2025.

By: Mary A Bertsch
Assistant Secretary,
UF&C & UF&I & FPIC

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID FORM

PROJECT: # 2024-122 Stafford Road: Pattulo Way to Rosemont Road Construction
BID CLOSING: February 5, 2025, 2:00 PM, Pacific Time
BID OPENING: February 5, 2025, 2:05 PM, Pacific Time

FROM: _____
Bidder's Name (must be full legal name, not ABN/DBA)

TO: https://bidlocker.us/a/clackamascounty/BidLocker

1. Bidder is (*check one of the following and insert information requested*):

____a. An individual; or

____b. A partnership registered under the laws of the State of _____; or

_____c. A corporation organized under the laws of the State of _____; or

____d. A limited liability corporation organized under the laws of the State of _____;

and authorized to do business in the State of Oregon hereby proposes to furnish all material and labor and perform all work hereinafter indicated for the above project in strict accordance with the Contract Documents for the Basic Bid as follows:

_____ Dollars ($_____)

and the Undersigned agrees to be bound by the following documents:

- Notice of Public Improvement Contract Opportunity
- Instructions to Bidders
- Supplemental Instructions to Bidders
- Bid Bond
- Bid Form
- Public Improvement Contract Form
- Performance Bond and Payment Bond
- Prevailing Wage Rates
- Payroll and Certified Statement Form
- Plans, Specifications and Drawings

- ADDENDA numbered _____ through_____, inclusive *(fill in blanks)*

2. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items of work relating to the following Alternate(s) as designated in the Specifications: **N/A**

3. The Undersigned proposes to add to or deduct from the Base Bid indicated above the items or work relating to the following Unit Price(s) as designated in the Specifications, for which any adjustments in the Contract amount will be made in accordance with the project specifications: **Provide the attached Bid Schedules with Bid.**

4. The work shall be completed within the time stipulated and specified in 00180.50(h) of the Special Provisions for **Highway Construction Department of Transportation and Development, Stafford**

Road: Pattulo Way to Rosemont Road Construction

5. Accompanying herewith is Bid Security which is equal to ten percent (10%) of the total amount of the Basic Bid, plus the total sum of Alternatives (if any).

6. The Undersigned agrees, if awarded the Contract, to execute and deliver to Clackamas County, within twenty (20) calendar days after receiving the Contract forms, a Contract Form, and a satisfactory Performance Bond and Payment Bond each in an amount equal to one hundred percent (100%) of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be:

[redacted]

(name of surety company - not insurance agency)

The Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the Contract.

7. The Undersigned further agrees that the Bid Security accompanying the Bid is left in escrow with Clackamas County; that the amount thereof is the measure of liquidated damages which the Owner will sustain by the failure of the Undersigned to execute and deliver the above-named Contract Form, Performance Bond and Payment Bond, each as published, and that if the Undersigned defaults in either executing the Contract Form or providing the Performance Bond and Payment Bond within twenty (20) calendar days after receiving the Contract forms, then the Bid Security shall become the property of the Owner at the Owner's option; but if the Bid is not accepted within thirty (30) calendar days of the time set for the opening of the Bids, or if the Undersigned executes and timely delivers said Contract Form, Performance Bond and Payment Bond, the Bid Security shall be returned.

8. The Undersigned certifies that: (i) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (ii) the contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned or its surety on any Bond furnished with the Bid and will not be communicated to such person prior to the official opening of the Bid.

9. The undersigned ☒ **HAS,** ☐ **HAS NOT** (*check one*) paid unemployment or income taxes in Oregon within the past 12 months and ☒ **DOES,** ☐ **DOES NOT** (*check one*) a business address in Oregon. The undersigned acknowledges that, if the selected bidder, that the undersigned will have to pay all applicable taxes and register to do business in the State of Oregon before executing the Contract Form.

10. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

11. Contractor's CCB registration number is [redacted]. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will make the bid unresponsive and it will be rejected, unless contrary to federal law.

12. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the contract.

13. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of

the State of Oregon, its Worker's Compensation Insurance provider is _____, Policy No. _____, and that Contractor shall submit Certificates of Insurance as required.

14. Contractor's Key Individuals for this project (supply information as applicable):

Project Executive:	_____,	Cell Phone:	_____,
Project Manager:	_____,	Cell Phone:	_____,
Job Superintendent:	_____,	Cell Phone:	_____,
Project Engineer:	_____,	Cell Phone:	_____.

15. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

16. The Undersigned certifies that it has a drug testing program in accordance with ORS 279C.505.

REMINDER: Bidder must submit the below First-Tier Subcontractor Disclosure Form.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM _____

ADDRESS _____

_____

TELEPHONE NO _____

EMAIL _____

SIGNATURE 1) _____
Sole Individual

or 2) _____
Partner

or 3) _____
Authorized Officer or Employee of Corporation

* * * * * ***END OF BID*** * * * * *

BID SCHEDULE

Stafford Road: Pattulo Way to Rosemont Road

11/7/2024

ITEM NO.	SPEC SECTION	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE
1	00100	TRAINING	HR	2,000	$20.00	$40,000.00
2	00196	EXTRA WORK AS AUTHORIZED	LS	1	$250,000.00	$250,000.00
3	00180	WORKPLACE HARASSMENT PREVENTION PLAN	LS	1	$1,000.00	$1,000.00
		TEMPORARY FEATURES AND APPURTENANCES				
4	00210	MOBILIZATION	LS	1	$969,000.00	$969,000.00
5	00221	TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC	LS	1	$345,000.00	$345,000.00
6	00222	TEMPORARY SIGNS	SF	4,000	$29.28	$117,120.00
7	00222	PORTABLE CHANGEABLE MESSAGE SIGNS	EA	7	$3,500.00	$24,500.00
8	00222	DETOUR ROUTE COUNTERMEASURES, SIGNS	EA	10	$325.00	$3,250.00
9	00222	DETOUR ROUTE COUNTERMEASURES, SPEED FEEDBACK	EA	10	$1,100.00	$11,000.00
10	00222	DETOUR ROUTE COUNTERMEASURES, PCMS	EA	10	$3,500.00	$35,000.00
11	00224	TEMPORARY BARRICADES, TYPE III	EA	30	$96.63	$2,898.90
12	00224	TEMPORARY PLASTIC DRUMS	EA	400	$6.90	$2,760.00
13	00225	TEMPORARY FLEXIBLE PAVEMENT MARKERS	EA	5,000	$2.00	$10,000.00
14	00225	TEMPORARY STRIPING	FT	30,190	$0.22	$6,641.80
15	00225	TEMPORARY PAVEMENT BARS	SF	100	$8.68	$868.00
16	00240	TEMPORARY DRAINAGE FACILITIES	LS	1	$7,000.00	$7,000.00
17	00245	TEMPORARY WATER MANAGEMENT FACILITY	LS	1	$71,000.00	$71,000.00
18	00280	EROSION CONTROL	LS	1	$100,000.00	$100,000.00
19	00280	PLASTIC SHEETING	SY	200	$7.39	$1,478.00
20	00280	SLOPE MATTING - TYPE C	SQYD	11,160	$7.59	$84,704.40
21	00280	AGGREGATE CHECK DAM - TYPE 1	EA	16	$400.00	$6,400.00
22	00280	CHANNEL MATTING - TYPE E	SQYD	300	$10.85	$3,255.00
23	00280	TEMPORARY SLOPE DRAIN	LF	143	$58.40	$8,351.20
24	00280	COMPOST FILTER SOCK CHECK DAM - TYPE 6	EA	174	$100.00	$17,400.00
25	00280	CONSTRUCTION ENTRANCE, TYPE 2	EA	2	$11,500.00	$23,000.00
26	00280	TIRE WASH - TYPE 1	EA	1	$6,715.00	$6,715.00
27	00280	CONCRETE TRUCK WASH OUT	EA	1	$7,850.00	$7,850.00
28	00280	SEDIMENT FENCE	LF	2,350	$4.69	$11,021.50
29	00280	INLET PROTECTION TYPE 3	EA	35	$108.00	$3,780.00
30	00280	COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9	LF	6,613	$5.40	$35,710.20
31	00280	STRAW BALE	EA	20	$26.00	$520.00
32	00280	TEMPORARY ENERGY DISSIPATOR	EA	6	$800.00	$4,800.00
33	00280	ORANGE CONSTRUCTION FENCE	LF	1,560	$3.75	$5,850.00
34	00290	POLLUTION CONTROL PLAN	LS	1	$550.00	$550.00
35	00290	WORK CONTAINMENT PLAN	LS	1	$2,200.00	$2,200.00
36	00290	TURBIDITY MONITORING	LS	1	$7,250.00	$7,250.00
		ROADWORK				
37	00305	CONSTRUCTION SURVEY WORK	LS	1	$84,000.00	$84,000.00
38	00310	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$63,000.00	$63,000.00
39	00320	CLEARING AND GRUBBING	LS	1	$275,000.00	$275,000.00
40	00330	GENERAL EXCAVATION	CY	23,300	$47.26	$1,101,158.00
41	00330	ROCK EXCAVATION	CY	1,000	$85.00	$85,000.00
42	00330	BOULDER EXCAVATION	CY	400	$88.00	$35,200.00
43	00331	18" SUBGRADE STABILIZATION	SQYD	1,260	$13.50	$17,010.00
44	00350	SUBGRADE GEOTEXTILE	SQYD	13,400	$1.16	$15,544.00
45	00350	RIPRAP GEOTEXTILE, TYPE 1	SQYD	23	$9.72	$223.56
46	00390	LOOSE RIPRAP, CLASS 100	TON	100	$167.00	$16,700.00
		DRAINAGE & SEWERS				
47	00405	ROCK EXCAVATION	CUYD	100	$186.00	$18,600.00
48	00405	BOULDER EXCAVATION	CUYD	40	$170.00	$6,800.00
49	00415	MAINLINE VIDEO INSPECTION	LF	3,592	$11.00	$39,512.00
50	00430	4 INCH DRAIN PIPE	LF	138	$18.32	$2,528.16
51	00430	6 INCH DRAIN PIPE	LF	80	$9.27	$741.60
52	00430	8 INCH DRAIN PIPE	LF	75	$16.23	$1,217.25
53	00430	SUBSURFACE DRAIN OUTLETS	EA	1	$1,500.00	$1,500.00
54	00445	12 INCH STORM SEWER PIPE, 5 FT DEPTH	LF	687	$99.00	$68,013.00
55	00445	12 INCH STORM SEWER PIPE, 10 FT DEPTH	LF	699	$154.00	$107,646.00
56	00445	12 INCH STORM SEWER PIPE, 20 FT DEPTH	LF	189	$310.00	$58,590.00
57	00445	15 INCH STORM SEWER PIPE, 5 FT DEPTH	LF	17	$245.00	$4,165.00
58	00445	18 INCH STORM SEWER PIPE, 5 FT DEPTH	LF	131	$128.00	$16,768.00
59	00445	24 INCH STORM SEWER PIPE, 5 FT DEPTH	LF	41	$343.00	$14,063.00
60	00445	12 INCH DUCTILE IRON PIPE, 5 FT DEPTH	LF	1,828	$148.00	$270,544.00
61	00450	156 INCH X 81 INCH STRUCTURAL PLATE ARCH	LF	173	$785.00	$135,805.00
62	00450	STRUCTURAL PLATE CONCRETE FOOTINGS	CY	135	$600.00	$81,000.00
63	00470	CONCRETE MANHOLES, SHALLOW	EA	1	$5,600.00	$5,600.00
64	00470	CONCRETE STORM SEWER MANHOLES	EA	5	$6,300.00	$31,500.00
65	00470	CONCRETE MANHOLES, OVERFLOW GRATE	EA	1	$13,000.00	$13,000.00
66	00470	CONCRETE MANHOLES, WATER QUALITY	EA	3	$16,950.00	$50,850.00
67	00470	CONCRETE MANHOLES, FLOW CONTROL	EA	2	$20,000.00	$40,000.00
68	00470	CONCRETE MANHOLES, WITH INLET	EA	7	$6,280.00	$43,960.00
69	00470	CONCRETE INLETS, TYPE B WITH BEEHIVE GRATE	EA	2	$4,750.00	$9,500.00
70	00470	CONCRETE INLETS, TYPE G-2	EA	6	$2,970.00	$17,820.00
ITEM NO.	SPEC SECTION	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE

71	00470	CONCRETE INLETS, TYPE CG-2	EA	11	$2,655.00	$29,205.00
72	00470	CONCRETE INLETS, TYPE D	EA	6	$2,425.00	$14,550.00
73	00480	DRAINAGE CURBS	LF	600	$9.40	$5,640.00
74	00490	ADJUSTING BOXES	EA	12	$300.00	$3,600.00
75	00490	MINOR ADJUSTMENT OF MANHOLES	EA	5	$2,500.00	$12,500.00
76	00490	CONNECTION TO EXISTING STRUCTURES	EA	5	$2,200.00	$11,000.00
77	00490	ABANDON EXISTING STRUCTURES, 12 INCH CULVERT PIPE	LF	413	$56.00	$23,128.00
78	00490	ABANDON EXISTING STRUCTURES, 36 INCH CULVERT PIPE	LF	79	$260.00	$20,540.00
79	00495	TRENCH RESURFACING	SY	671	$111.00	$74,481.00
		BRIDGES				
80	00510	STRUCTURE EXCAVATION	LS	1	$139,000.00	$139,000.00
81	00510	GRANULAR STRUCTURE BACKFILL	LS	1	$98,000.00	$98,000.00
82	00530	REINFORCEMENT, GRADE 60	LB	592	$100.00	$59,200.00
83	00596A	RETAINING WALL, MSE	LS	1	$720,000.00	$720,000.00
84	00596C	RETAINING WALL, CAST-IN-PLACE CONCRETE SEMI-GRAVITY CANTILEVER	LS	1	$182,000.00	$182,000.00
		BASES				
85	00620	COLD PLANE PAVEMENT REMOVAL, 0 - 4 INCHES DEEP	SQYD	5,356	$3.60	$19,281.60
86	00620	COLD PLANE PAVEMENT REMOVAL, 2 INCHES DEEP	SQYD	5,356	$3.15	$16,871.40
87	00620	COLD PLANE PAVEMENT REMOVAL, 4 INCHES DEEP	SQYD	4,316	$4.50	$19,422.00
88	00641	3/4 INCH - 0 AGGREGATE BASE	TON	11,039	$42.00	$463,638.00
		WEARING SURFACES				
89	00745	LEVEL 2, 1/2 INCH ACP MIXTURE	TON	489	$138.00	$67,482.00
90	00745	LEVEL 3, 1/2 INCH ACP MIXTURE	TON	10,440	$108.00	$1,127,520.00
91	00745	LEVEL 3, 1/2 INCH ACP MIXTURE IN LEVELING	TON	272	$164.00	$44,608.00
92	00749	EXTRA FOR ASPHALT APPROACHES	EA	19	$890.00	$16,910.00
93	00759	CONCRETE CURBS, CURB & GUTTER	LF	1,350	$45.00	$60,750.00
94	00759	CONCRETE CURBS, TYPE C VERTICAL CURB	LF	1,425	$37.00	$52,725.00
95	00759	CONCRETE CURBS, MOUNTABLE CURB	LF	1,487	$37.00	$55,019.00
96	00759	CONCRETE ISLANDS	SQFT	5,685	$11.00	$62,535.00
97	00759	CONCRETE DRIVEWAYS, REINFORCED	SQFT	430	$32.00	$13,760.00
98	00759	CONCRETE WALKS	SQFT	13,200	$14.00	$184,800.00
99	00759	CONCRETE STAIRS	CY	3	$5,200.00	$15,600.00
100	00759	CONCRETE TRUCK APRON	SF	3,318	$15.50	$51,429.00
101	00759	EXTRA FOR NEW CURB RAMPS	EA	14	$1,150.00	$16,100.00
102	00759	TRUNCATED DOMES ON NEW SURFACES	SF	290	$48.00	$13,920.00
103	00759	DETECTABLE GUIDE STRIPS, BLUE	SF	245	$50.00	$12,250.00
		PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES				
104	00810	GUARDRAIL, TYPE 2A	LF	2,200	$32.00	$70,400.00
105	00810	GUARDRAIL ANCHORS, TYPE 1	EA	3	$2,000.00	$6,000.00
106	00810	GUARDRAIL END PIECES, TYPE C	EA	3	$190.00	$570.00
107	00810	GUARDRAIL TERMINALS, NON-FLARED, TEST LEVEL 2	EA	3	$3,400.00	$10,200.00
108	00810	EXTRA FOR HAND DUG GUARDRAIL POST HOLES	EA	20	$119.00	$2,380.00
109	00840	DELINEATORS, TYPE 2	EA	1	$54.00	$54.00
110	00855	BI-DIRECTIONAL YELLOW TYPE 1AR MARKERS, RECESSED	EA	145	$23.00	$3,335.00
111	00855	MONO-DIRECTIONAL WHITE TYPE 1AR MARKERS, RECESSED	EA	10	$23.00	$230.00
112	00865	THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED	LF	30,190	$1.40	$42,266.00
113	00867	PAVEMENT LEGEND, TYPE AB: ARROWS	EA	9	$350.00	$3,150.00
114	00867	PAVEMENT LEGEND, TYPE B-HS: BICYCLE LANE STENCIL	EA	5	$350.00	$1,750.00
115	00867	PAVEMENT LEGEND, TYPE B-HS: YIELD-LINE TRIANGLE	EA	26	$65.00	$1,690.00
116	00867	PAVEMENT BAR, TYPE B-HS	SF	451	$19.50	$8,794.50
		PERMANENT TRAFFIC CONTROL AND ILLUMINATION SYSTEMS				
117	00902	CROSSWALK CLOSURE SUPPORTS	EA	1	$1,400.00	$1,400.00
118	00905	REMOVE EXISTING SIGNS	LS	1	$1,500.00	$1,500.00
119	00905	REMOVE AND REINSTALL EXISTING SIGNS	LS	1	$6,500.00	$6,500.00
120	00920	SIGN SUPPORT FOOTINGS	LS	1	$15,000.00	$15,000.00
121	00930	PERFORATED STEEL SQUARE TUBE ANCHOR BASE SIGN SUPPORTS	LS	1	$18,000.00	$18,000.00
122	00940	SIGNS, STANDARD SHEETING, EXTRUDED ALUMINUM	SF	495	$27.00	$13,365.00
123	00970	POLE FOUNDATIONS	LS	1	$6,500.00	$6,500.00
124	00970	REFURBISHING & REINSTALLING EXISTING ILLUMINATION SYSTEMS	LS	1	$9,200.00	$9,200.00
125	00970	SWITCHING, CONDUIT, AND WIRING	LS	1	$84,000.00	$84,000.00
126	00987	TELECOMMUNICATIONS, MATERIAL	LS	1	$8,000.00	$8,000.00
127	00987	TELECOMMUNICATIONS, INSTALLATION	LS	1	$5,000.00	$5,000.00
128	00987	TELECOMMUNICATIONS, SPLICING AND TESTING	LS	1	$3,000.00	$3,000.00
129	00990	RRFB SYSTEM INSTALLATION	LS	1	$65,000.00	$65,000.00
		RIGHT-OF-WAY DEVELOPMENT AND CONTROL				
130	01011	BIORETENTION POND, CHILDS	LS	1	$120,000.00	$120,000.00
131	01011	BIORETENTION POND, JOHNSON	LS	1	$90,000.00	$90,000.00
132	01012	WATER QUALITY SWALE, STAFFORD	LS	1	$105,000.00	$105,000.00
133	01012	WATER QUALITY SWALE, ROSEMONT	LS	1	$1,200.00	$1,200.00
134	01030	WEED CONTROL	ACRE	5.60	$2,500.00	$14,000.00
135	01030	SEEDING MOBILIZATION	EA	3	$325.00	$975.00
136	01030	TEMPORARY SEEDING	ACRE	5.60	$9,760.00	$54,656.00
137	01030	WATER QUALITY SEEDING	ACRE	0.58	$10,000.00	$5,800.00
138	01030	NATIVE RIPARIAN SEEDING	ACRE	0.26	$10,000.00	$2,600.00
139	01030	NATIVE UPLANDS SEEDING	ACRE	1.26	$10,000.00	$12,600.00
140	01030	PERMANENT SEEDING	ACRE	3.50	$9,700.00	$33,950.00
ITEM NO.	SPEC SECTION	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE
141	01030	MULCHING	ACRE	5.26	$4,300.00	$22,618.00
142	01040	TOPSOIL	CY	205	$48.00	$9,840.00
143	01040	SOIL TESTING	EA	10	$135.00	$1,350.00
144	01040	SOIL CONDITIONER	CY	10	$65.00	$650.00
145	01040	CONIFER TREES, 6 FT HEIGHT	EA	227	$185.00	$41,995.00
146	01040	DECIDUOUS TREES, 1 INCH CALIPER	EA	352	$162.00	$57,024.00
147	01040	SHRUBS, #1 CONTAINER	EA	5,247	$7.60	$39,877.20
148	01040	SHRUBS, #5 CONTAINER	EA	1,494	$21.50	$32,121.00

149	01040	GROUNDCOVERS, #SP4 CONTAINER	EA	6,046	$2.15	$12,998.90
150	01040	WOOD CHIP MULCH	CY	200	$54.00	$10,800.00
151	01050	TYPE CL-6R CHAIN LINK FENCE, BLACK VINYL	LF	1,500	$55.00	$82,500.00
152	01050	12 FOOT SINGLE GATES	EA	2	$2,700.00	$5,400.00
153	01065	MONUMENT BOXES	EA	26	$1,050.00	$27,300.00
154	01069	METAL HANDRAIL, TWO RAILS	LF	440	$120.00	$52,800.00
155	01070	SINGLE MAILBOX SUPPORTS	EA	5	$540.00	$2,700.00
156	01070	MULTIPLE MAILBOX SUPPORTS	EA	4	$1,100.00	$4,400.00
157	01070	MAILBOX CONCRETE COLLARS	EA	9	$105.00	$945.00
158	01070	REMOVE AND REINSTALL MAILBOX SUPPORTS	EA	9	$460.00	$4,140.00
159	01070	STANDARD MAILBOX, SIZE 1.5	EA	16	$95.00	$1,520.00
160	01091	STREAMBED ENHANCEMENT	LS	1	$160,000.00	$160,000.00

PROPOSED COST BID SCHEDULE
(Numerically)

PROPOSED COST BID SCHEDULE
(Written in Words)

COMPANY NAME

AUTHORIZED SIG

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM
PROJECT: #2024-122

BID OPENING: February 5, 2025, 2:00 PM, Pacific Time

Failure to submit this Form by the disclosure deadline will result in a nonresponsive bid.

INSTRUCTIONS:
This First-Tier Subcontractor Disclosure Form ("Form") must be submitted and received at the location specified in the Notice of Public Improvement Contract Opportunity on the advertised Bid Closing, and within two working hours after the advertised Bid Closing Time.

A. Completed proposal documents must arrive electronically via Bid Locker located at https://bidlocker.us/a/clackamascounty/BidLocker.
B. Bid Locker will electronically document the date and time of all submissions. Completed documents must arrive by the deadline indicated in Section 1 or as modified by Addendum. LATE PROPOSALS WILL NOT BE ACCEPTED.
C. Proposers must register and create a profile for their business with Bid Locker in order to submit for this project. It is free to register for Bid Locker.
D. Proposers with further questions concerning Bid Locker may review the Vendor's Guide located at https://www.clackamas.us/how-to-bid-on-county-projects .

Subcontractor lists may be submitted with the bid in the same envelope or email at the Bid Closing date and time. Subcontractor lists **MUST** be submitted within **two (2) hours** of the Bid Closing date and time.

List below the name of each subcontractor that will be furnishing labor, or labor and materials, for which disclosure is required, the category of work that the subcontractor will be performing, and the dollar value of the subcontract. Enter **"NONE"** if the value of the project bid is less than $100,000 or there are no subcontractors that need to be disclosed. ATTACH ADDITIONAL SHEETS IF NECESSARY.

	SUBCONTRACTOR NAME	DOLLAR VALUE	CATEGORY OF WORK
1.	ANDERSEN CONSTRUCTION COMPANY	$816,388.05	CONCRETE
2.	ANDRES LANDSCAPE	$654,382.50	LANDSCAPE
3.	TAYLOR TANSPORT	$681,930.00	TRUCKING
4.	EAGLE ELSNER	$1,198,687.00	PAVING
5.			
6.			

The above listed first-tier subcontractor(s) are providing labor, or labor and material, with a Dollar Value equal to or greater than:

a) 5% of the total Contract Price, but at least $15,000. If the Dollar Value is less than $15,000 do not list the subcontractor above; or
b) $350,000 regardless of the percentage of the total Contract Price.

Firm Name: WESTECH CONSTRUCTION, INC.

Bidder Signature: _____ Phone # 503-777-7000

Bond No. 55230139

BOND FOR RELEASE OF RETENTION

KNOW ALL MEN BY THESE PRESENTS:

That Westech Construction, Inc., as Principal, and United Fire & Casualty Company, as Surety, are held and firmly bound unto Clackamas County, as Obligee, in the sum of Five Hundred Three Thousand Three Hundred Forty-Seven and 11/100 Dollars ($ 503,347.11), for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, The Principal has entered into a written contract dated _____ with the Obligee for ("Contract") and #2024-122 Stafford Road: Pattulo Way to Rosemont Road Construction Contract #1200, and

WHEREAS, said Contract provided for retention by the Obligee of certain portions of progress payments made by the Obligee to the Principal, as more fully set forth therein; and

WHEREAS, the Principal has requested the Obligee to release the amount so retained prior to the time set forth by the aforementioned Contract for such release of retention; and

WHEREAS, the Obligee is willing to comply with such request, provided the Principal shall furnish a bond in the amount and tenor of this instrument.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Principal shall indemnify and hold harmless the Obligee from all loss costs and expense that the Obligee may sustain by reason of release of said retention to the Principal earlier than otherwise required under the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

PROVIDED HOWEVER, that the Surety's aggregate obligation hereunder shall not exceed the lesser of the penal sum of the bond or the amount of retention released to Principal by reason of Obligee's acceptance of this Bond.

It is further provided that no action shall be instituted against this Bond unless commenced and duly served within six (6) months after the acceptance of the Project. No right of action under this Bond shall accrue, to or for the use of, any person or entity other than the Obligee named herein, or the heirs, executors, administrators, successors and assigns of the Obligee.

Signed, sealed and dated March 4, 2025

Westech Construction, Inc.
(Principal) *(Seal)*

PRESIDENT
(Title)

John E. May Vice President
(Witness)

United Fire & Casualty Company
(Surety)

Sarah Harren
Sarah Harren *Attorney-in-Fact*

UNITED FIRE & CASUALTY COMPANY CORPORATE SEAL CEDAR RAPIDS IOWA

UNITED FIRE & CASUALTY COMPANY, CEDAR RAPIDS, IA
UNITED FIRE & INDEMNITY COMPANY, WEBSTER, TX
FINANCIAL PACIFIC INSURANCE COMPANY, LOS ANGELES, CA
CERTIFIED COPY OF POWER OF ATTORNEY
(original on file at Home Office of Company – See Certification)

Inquiries: Surety Department
118 Second Ave SE
Cedar Rapids, IA 52401

KNOW ALL PERSONS BY THESE PRESENTS, That United Fire & Casualty Company, a corporation duly organized and existing under the laws of the State of Iowa; United Fire & Indemnity Company, a corporation duly organized and existing under the laws of the State of Texas; and Financial Pacific Insurance Company, a corporation duly organized and existing under the laws of the State of California (herein collectively called the Companies), and having their corporate headquarters in Cedar Rapids, State of Iowa, does make, constitute and appoint

KARL CHOLTUS, STEFAN ENGELHARDT, SARAH HARREN, MICHAEL MERTZ, JAIMIE KANGAS, NICK DEAN, CHERYL KLEINER, NICOLE SAJI, AMY M BURNS EACH INDIVIDUALLY

their true and lawful Attorney(s)-in-Fact with power and authority hereby conferred to sign, seal and execute in its behalf all lawful bonds, undertakings and other obligatory instruments of similar nature provided that no single obligation shall exceed $50,000,000.00 and to bind the Companies thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Companies and all of the acts of said Attorney, pursuant to the authority hereby given and hereby ratified and confirmed.

The Authority hereby granted is continuous and shall remain in full force and effect until revoked by United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

This Power of Attorney is made and executed pursuant to and by authority of the following bylaw duly adopted by the Boards of Directors of United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

"Article VI – Surety Bonds and Undertakings"

Section 2, Appointment of Attorney-in-Fact. "The President or any Vice President, or any other officer of the Companies may, from time to time, appoint by written certificates attorneys-in-fact to act in behalf of the Companies in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. The signature of any officer authorized hereby, and the Corporate seal, may be affixed by facsimile to any power of attorney or special power of attorney or certification of either authorized hereby; such signature and seal, when so used, being adopted by the Companies as the original signature of such officer and the original seal of the Companies, to be valid and binding upon the Companies with the same force and effect as though manually affixed. Such attorneys-in-fact, subject to the limitations set of forth in their respective certificates of authority shall have full power to bind the Companies by their signature and execution of any such instruments and to attach the seal the Companies thereto. The President or any Vice President, the Board of Directors or any other officer of the Companies may at any time revoke all power and authority previously given to any attorney-in-fact.

IN WITNESS WHEREOF, the COMPANIES have each caused these presents to be signed by its vice president and its corporate seal to be hereto affixed this 1st day of April, 2024

UNITED FIRE & CASUALTY COMPANY
UNITED FIRE & INDEMNITY COMPANY
FINANCIAL PACIFIC INSURANCE COMPANY

By: Kyanna M Saylor
Vice President

State of Iowa, County of Linn, ss:

On 1st day of April, 2024, before me personally came Kyanna M. Saylor to me known, who being by me duly sworn, did depose and say; that she resides in Cedar Rapids, State of Iowa; that she is a Vice President of United Fire & Casualty Company, a Vice President of United Fire & Indemnity Company, and a Vice President of Financial Pacific Insurance Company the corporations described in and which executed the above instrument; that she knows the seal of said corporations; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporations and that she signed her name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporations.

Patti Waddell
Iowa Notarial Seal
Commission number 713274
My Commission Expires 10/26/2025

Patti Waddell
Notary Public
My commission expires: 10/26/2025

I, Mary A. Bertsch, Assistant Secretary of United Fire & Casualty Company and Assistant Secretary of United Fire & Indemnity Company, and Assistant Secretary of Financial Pacific Insurance Company, do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Section of the bylaws and resolutions of said Corporations as set forth in said Power of Attorney, with the ORIGINALS ON FILE IN THE HOME OFFICE OF SAID CORPORATIONS, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

In testimony whereof I have hereunto subscribed my name and affixed the corporate seal of the said Corporations this 4th day of March, 2025.

By: Mary A Bertsch
Assistant Secretary,
UF&C & UF&I & FPIC

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

PERFORMANCE BOND

Bond No.: 54260770
Solicitation: #2024-122
Project Name: Stafford Road: Pattulo Way to Rosemont Road Construction

United Fire & Casualty Company (Surety #1)
_____(Surety #2)*
** If using multiple sureties*

Bond Amount No. 1:	$ 10,066,942.17
Bond Amount No. 2:*	$ _____
Total Penal Sum of Bond:	$ 10,066,942.17

We, Westech Construction, Inc. as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Clackamas County, the sum of (Total Penal Sum of Bond) $10,066,942.17 (Ten Million Sixty-Six Thousand Nine Hundred Forty-Two and 17/100 Dollars)(Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with Clackamas County, along with the plans, specifications, terms and conditions of which are contained in the above-referenced Solicitation; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Performance Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and all authorized modifications of the Contract which increase the amount of the work, the amount of the Contract, or constitute an authorized extension of the time for performance, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things undertaken by Contractor to be performed under the Contract, upon the terms set forth therein, and within the time prescribed therein, or as extended as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless Clackamas County and its elected officials, officers, employees and agents, against any direct or indirect damages or claim of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Principal or its subcontractors, and shall in

all respects perform said contract according to law, then this obligation is to be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall Clackamas County, be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this 4th day of March, 2025.

PRINCIPAL: Westech Construction, Inc.

By: Chris Woodward
Signature

President
Official Capacity

Attest: Chris Woodward
Corporation Secretary

SURETY: United Fire & Casualty Company
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

Sarah Harren, Attorney-in-Fact
Name

Sarah Harren
Signature

PO Box 73909
Address

Cedar Rapids	IA	52407-3909
City	State	Zip
(319) 399-5700	(866) 726-9738	
Phone	Fax	

UNITED FIRE & CASUALTY COMPANY
CORPORATE SEAL
CEDAR RAPIDS IOWA

UNITED FIRE & CASUALTY COMPANY, CEDAR RAPIDS, IA
UNITED FIRE & INDEMNITY COMPANY, WEBSTER, TX
FINANCIAL PACIFIC INSURANCE COMPANY, LOS ANGELES, CA
CERTIFIED COPY OF POWER OF ATTORNEY
(original on file at Home Office of Company – See Certification)

Inquiries: Surety Department
118 Second Ave SE
Cedar Rapids, IA 52401

KNOW ALL PERSONS BY THESE PRESENTS, That United Fire & Casualty Company, a corporation duly organized and existing under the laws of the State of Iowa; United Fire & Indemnity Company, a corporation duly organized and existing under the laws of the State of Texas; and Financial Pacific Insurance Company, a corporation duly organized and existing under the laws of the State of California (herein collectively called the Companies), and having their corporate headquarters in Cedar Rapids, State of Iowa, does make, constitute and appoint

KARL CHOLTUS, STEFAN ENGELHARDT, SARAH HARREN, MICHAEL MERTZ, JAIMIE KANGAS, NICK DEAN, CHERYL KLEINER, NICOLE SAJI, AMY M BURNS EACH INDIVIDUALLY

their true and lawful Attorney(s)-in-Fact with power and authority hereby conferred to sign, seal and execute in its behalf all lawful bonds, undertakings and other obligatory instruments of similar nature provided that no single obligation shall exceed $50,000,000.00 and to bind the Companies thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Companies and all of the acts of said Attorney, pursuant to the authority hereby given and hereby ratified and confirmed.

The Authority hereby granted is continuous and shall remain in full force and effect until revoked by United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

This Power of Attorney is made and executed pursuant to and by authority of the following bylaw duly adopted by the Boards of Directors of United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

"Article VI – Surety Bonds and Undertakings"

Section 2, Appointment of Attorney-in-Fact. "The President or any Vice President, or any other officer of the Companies may, from time to time, appoint by written certificates attorneys-in-fact to act in behalf of the Companies in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. The signature of any officer authorized hereby, and the Corporate seal, may be affixed by facsimile to any power of attorney or special power of attorney or certification of either authorized hereby; such signature and seal, when so used, being adopted by the Companies as the original signature of such officer and the original seal of the Companies, to be valid and binding upon the Companies with the same force and effect as though manually affixed. Such attorneys-in-fact, subject to the limitations set of forth in their respective certificates of authority shall have full power to bind the Companies by their signature and execution of any such instruments and to attach the seal the Companies thereto. The President or any Vice President, the Board of Directors or any other officer of the Companies may at any time revoke all power and authority previously given to any attorney-in-fact.

IN WITNESS WHEREOF, the COMPANIES have each caused these presents to be signed by its vice president and its corporate seal to be hereto affixed this 1st day of April, 2024

UNITED FIRE & CASUALTY COMPANY
UNITED FIRE & INDEMNITY COMPANY
FINANCIAL PACIFIC INSURANCE COMPANY

By: Kyanna M Saylor
Vice President

State of Iowa, County of Linn, ss:

On 1st day of April, 2024, before me personally came Kyanna M. Saylor to me known, who being by me duly sworn, did depose and say; that she resides in Cedar Rapids, State of Iowa; that she is a Vice President of United Fire & Casualty Company, a Vice President of United Fire & Indemnity Company, and a Vice President of Financial Pacific Insurance Company the corporations described in and which executed the above instrument; that she knows the seal of said corporations; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporations and that she signed her name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporations.

Patti Waddell
Iowa Notarial Seal
Commission number 713274
My Commission Expires 10/26/2025

Patti Waddell
Notary Public
My commission expires: 10/26/2025

I, Mary A. Bertsch, Assistant Secretary of United Fire & Casualty Company and Assistant Secretary of United Fire & Indemnity Company, and Assistant Secretary of Financial Pacific Insurance Company, do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Section of the bylaws and resolutions of said Corporations as set forth in said Power of Attorney, with the ORIGINALS ON FILE IN THE HOME OFFICE OF SAID CORPORATIONS, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

In testimony whereof I have hereunto subscribed my name and affixed the corporate seal of the said Corporations this 4th day of March, 2025.

By: Mary A Bertsch
Assistant Secretary,
UF&C & UF&I & FPIC

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

PAYMENT BOND

Bond No.: 54260770
Solicitation: #2024-122
Project Name: Stafford Road: Pattulo Way to Rosemont Road Construction

United Fire & Casualty Company (Surety #1)	Bond Amount No. 1:	$ 10,066,942.17
_____ (Surety #2)*	Bond Amount No. 2:*	$ _____
* *If using multiple sureties*	Total Penal Sum of Bond:	$ 10,066,942.17

We, Westech Construction, Inc., as Principal, and the above identified Surety(ies), authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind ourselves, our respective heirs, executors, administrators, successors and assigns firmly by these presents to pay unto Clackamas County, the sum of (Total Penal Sum of Bond) $10,066,942.17 (Ten Million Sixty-Six Thousand Nine Hundred Forty-Two and 17/100 Dollars) (Provided, that we the Sureties bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety); and

WHEREAS, the Principal has entered into a contract with Clackamas County, along with the plans, specifications, terms and conditions of which are contained in above-referenced Solicitation; and

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard specifications, special provisions, schedule of performance, and schedule of contract prices, are made a part of this Payment Bond by reference, whether or not attached to the contract (all hereafter called "Contract"); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms, conditions, requirements, plans and specifications, and schedule of contract prices which are set forth in the Contract and any attachments, and all authorized modifications of the Contract which increase the amount of the work, or the cost of the Contract, or constitute authorized extensions of time for performance of the Contract, notice of any such modifications hereby being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall faithfully and truly observe and comply with the terms, conditions and provisions of the Contract, in all respects, and shall well and truly and fully do and perform all matters and things by it undertaken to be performed under said Contract and any duly authorized modifications that are made, upon the terms set forth therein, and within the time prescribed therein, or as extended therein as provided in the Contract, with or without notice to the Sureties, and shall defend, indemnify, and save harmless Clackamas County and its elected officials, officers, employees and agents, against any claim for direct or indirect damages of every kind and description that shall be suffered or claimed to be suffered in connection with or arising out of the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay all persons supplying labor, materials or both to the Principal or its subcontractors for prosecution of the work provided in the Contract; and shall promptly pay all contributions due the State Industrial Accident Fund and the State Unemployment Compensation Fund from the Principal or its subcontractors in connection with the performance of the Contract; and shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167, and

shall permit no lien nor claim to be filed or prosecuted against Clackamas County on account of any labor or materials furnished; and shall do all things required of the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect for so long as any term of the Contract remains in effect.

Nonpayment of the bond premium will not invalidate this bond nor shall Clackamas County be obligated for the payment of any premiums.

This bond is given and received under authority of Oregon Revised Statutes Chapter 279C and the Clackamas County Local Contractor Review Board Rules, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES:

Dated this 4th day of March, 2025.

PRINCIPAL: Westech Construction, Inc.

By: Chris Woodward
Signature

President
Official Capacity

Attest: Chris Woodward
Corporation Secretary

SURETY: United Fire & Casualty Company
[Add signatures for each if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each bond]

Sarah Harren, Attorney-in-Fact
Name

Sarah Harren
Signature

PO Box 73909
Address

Cedar Rapids	IA	52407-3909
City	State	Zip
(319) 399-5700	(866) 726-9738	
Phone	Fax	

UNITED FIRE & CASUALTY COMPANY
CORPORATE SEAL
CEDAR RAPIDS IOWA

UNITED FIRE & CASUALTY COMPANY, CEDAR RAPIDS, IA
UNITED FIRE & INDEMNITY COMPANY, WEBSTER, TX
FINANCIAL PACIFIC INSURANCE COMPANY, LOS ANGELES, CA
CERTIFIED COPY OF POWER OF ATTORNEY
(original on file at Home Office of Company – See Certification)

Inquiries: Surety Department
118 Second Ave SE
Cedar Rapids, IA 52401

KNOW ALL PERSONS BY THESE PRESENTS, That United Fire & Casualty Company, a corporation duly organized and existing under the laws of the State of Iowa; United Fire & Indemnity Company, a corporation duly organized and existing under the laws of the State of Texas; and Financial Pacific Insurance Company, a corporation duly organized and existing under the laws of the State of California (herein collectively called the Companies), and having their corporate headquarters in Cedar Rapids, State of Iowa, does make, constitute and appoint

KARL CHOLTUS, STEFAN ENGELHARDT, SARAH HARREN, MICHAEL MERTZ, JAIMIE KANGAS, NICK DEAN, CHERYL KLEINER, NICOLE SAJI, AMY M BURNS EACH INDIVIDUALLY

their true and lawful Attorney(s)-in-Fact with power and authority hereby conferred to sign, seal and execute in its behalf all lawful bonds, undertakings and other obligatory instruments of similar nature provided that no single obligation shall exceed $50,000,000.00 and to bind the Companies thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Companies and all of the acts of said Attorney, pursuant to the authority hereby given and hereby ratified and confirmed.

The Authority hereby granted is continuous and shall remain in full force and effect until revoked by United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

This Power of Attorney is made and executed pursuant to and by authority of the following bylaw duly adopted by the Boards of Directors of United Fire & Casualty Company, United Fire & Indemnity Company, and Financial Pacific Insurance Company.

"Article VI – Surety Bonds and Undertakings"

Section 2, Appointment of Attorney-in-Fact. "The President or any Vice President, or any other officer of the Companies may, from time to time, appoint by written certificates attorneys-in-fact to act in behalf of the Companies in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. The signature of any officer authorized hereby, and the Corporate seal, may be affixed by facsimile to any power of attorney or special power of attorney or certification of either authorized hereby; such signature and seal, when so used, being adopted by the Companies as the original signature of such officer and the original seal of the Companies, to be valid and binding upon the Companies with the same force and effect as though manually affixed. Such attorneys-in-fact, subject to the limitations set of forth in their respective certificates of authority shall have full power to bind the Companies by their signature and execution of any such instruments and to attach the seal the Companies thereto. The President or any Vice President, the Board of Directors or any other officer of the Companies may at any time revoke all power and authority previously given to any attorney-in-fact.

IN WITNESS WHEREOF, the COMPANIES have each caused these presents to be signed by its vice president and its corporate seal to be hereto affixed this 1st day of April, 2024

UNITED FIRE & CASUALTY COMPANY
UNITED FIRE & INDEMNITY COMPANY
FINANCIAL PACIFIC INSURANCE COMPANY

By: Kyanna M Saylor
Vice President

State of Iowa, County of Linn, ss:

On 1st day of April, 2024, before me personally came Kyanna M. Saylor to me known, who being by me duly sworn, did depose and say; that she resides in Cedar Rapids, State of Iowa; that she is a Vice President of United Fire & Casualty Company, a Vice President of United Fire & Indemnity Company, and a Vice President of Financial Pacific Insurance Company the corporations described in and which executed the above instrument; that she knows the seal of said corporations; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporations and that she signed her name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporations.

Patti Waddell
Iowa Notarial Seal
Commission number 713274
My Commission Expires 10/26/2025

Patti Waddell
Notary Public
My commission expires: 10/26/2025

I, Mary A. Bertsch, Assistant Secretary of United Fire & Casualty Company and Assistant Secretary of United Fire & Indemnity Company, and Assistant Secretary of Financial Pacific Insurance Company, do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Section of the bylaws and resolutions of said Corporations as set forth in said Power of Attorney, with the ORIGINALS ON FILE IN THE HOME OFFICE OF SAID CORPORATIONS, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

In testimony whereof I have hereunto subscribed my name and affixed the corporate seal of the said Corporations this 4th day of March, 2025.

By: Mary A Bertsch
Assistant Secretary,
UF&C & UF&I & FPIC

CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT
PROJECT INFORMATION, PLANS, SPECIFICATIONS AND DRAWINGS

PROJECT: BID #2024-122 Stafford Road: Pattulo Way to Rosemont Road Construction

Project Background:

The Work to be done under this Contract consists of road widening for bike lanes, roadway reconstruction, asphalt pavement grind and inlay, installation of new roundabout, installation of retaining walls, installation of a new storm system and culvert, guardrail, signing and striping, illumination and RRFB, plantings, and stream restoration with the following elements:

1. Mobilization, erosion control, temporary traffic control, and construction survey
2. Storm pipe, catch basins, manholes, and culvert installation
3. Curbs, curb ramps, and other work as required for new roundabout
4. Retaining walls and guardrail
5. Perform additional and incidental Work, as called for by the Specifications and Plans.

Engineers Estimate: Ranges $13,940,000 to $14,700,000

Key Dates:
All Basic Bid Work may begin as soon as the Notice to Proceed ("NTP") is issued
Substantial Completion: September 30, 2025 (Section 00180.50(h)(1)) (stages 1 and 2)
Substantial Completion: December 31, 2026 (Section 00180.50(h)(2)) (all work, except for permanent striping, seeding establishment and plant establishment)
Substantial Completion: June 30, 2027 (Section 00180.50(h)(3)) (all work, except for seeding establishment and plant establishment)
Final Completion: December 31, 2029

Time is of the essence for this Project. Note the Liquidated Damages requirements as described in the project Specifications.

The Scope further includes the following Plans, Specifications, Drawings, Reports and Apprenticeship Training Policy:

SPECIAL PROVISIONS FOR HIGHWAY CONSTRUCTION- DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT, CLACKAMAS COUNTY, OREGON, dated OCTOBER 2024-Stafford Road: Pattulo Way to Rosemont Road Construction (149 Pages)

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD, Drawing Set, (267 pages)

STAFFORD ROAD (PATTULO WAY TO ROSEMONT ROAD) IMPROVEMENTS GER (May 2024) (377 pages)

REIMBUSABLE ON-THE-JOB AND APPRENTICESHIP TRAINING (6 Pages

SPECIAL PROVISIONS
FOR HIGHWAY CONSTRUCTION

DEPARTMENT OF TRANSPORTATION
AND DEVELOPMENT
CLACKAMAS COUNTY, OREGON

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD
CONSTRUCTION

EARTHWORK AND DRAINAGE, BRIDGES AND STRUCTURES, AGGREGATE BASES, ASPHALT CONCRETE PAVING AND OILING, SIGNING AND STRIPING, LANDSCAPING

OCTOBER 2024

TABLE OF CONTENTS FOR SPECIAL PROVISIONS

Specifications for Proposed
Stafford Road: Pattulo Way to Rosemont Road
Construction

PROFESSIONAL OF RECORD CERTIFICATION(s):

<table>
<tr>
<td> 

William R Adams III 2024.10.31 17:35:10-07'00'
RENEWS 12–31–25</td>
<td rowspan="2">I certify that the Special Provision Sections listed below were prepared by me or under my supervision.

Sections: 00210, 00220, 00221, 00222, 00223, 00224, 00225, 00305, 00310, 00320, 00330, 00331, 00440, 00620, 00641, 00730, 00745, 00749, 00759, 00810, 01050, 01065, 01069, 01070, 02001, 02030, 02050, 02510, 02690 and 02830.</td>
</tr>
<tr>
<td>Date Signed: 10/31/2024</td>
</tr>
</table>

Specifications for Proposed
Stafford Road: Pattulo Way to Rosemont Road
Construction

PROFESSIONAL OF RECORD CERTIFICATION(s):

<table>
<tr>
<td> 
</td>
<td rowspan="2">I certify that the Special Provision Sections listed below were prepared by me or under my supervision.

Sections: 00240, 00245, 00280, 00290, 00350, 00390, 00405, 00415, 00430, 00445, 00450, 00470, 00480, 00490, 00495, 01011, 01012, 01091, 02320, 02415 and 03020.</td>
</tr>
<tr>
<td>Date Signed: 10/31/2024</td>
</tr>
</table>

Specifications for Proposed
Stafford Road: Pattulo Way to Rosemont Road
Construction

PROFESSIONAL OF RECORD CERTIFICATION(s):

	I certify that the Special Provision Sections listed below were prepared by me or under my supervision. Sections: 00510, 00530, 00596A and 00596C.
Date Signed: 10/31/2024	

Specifications for Proposed
Stafford Road: Pattulo Way to Rosemont Road
Construction

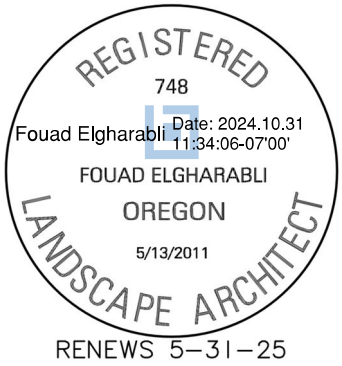
PROFESSIONAL OF RECORD CERTIFICATION(s):

<table>
<tr>
<td> 
</td>
<td rowspan="2">I certify that the Special Provision Sections listed below were prepared by me or under my supervision.

Sections: 00840, 00850, 00855, 00865, 00867, 00902, 00905, 00920, 00930, 00940, 00960, 00962, 00970, 00987, 00990, 02560, 02910 and 02926.</td>
</tr>
<tr>
<td>Date Signed: October 29, 2024</td>
</tr>
</table>

Specifications for Proposed
Stafford Road: Pattulo Way to Rosemont Road
Construction

PROFESSIONAL OF RECORD CERTIFICATION(s):

<table>
<tr>
<td> 
</td>
<td rowspan="2">I certify that the Special Provision Sections listed below were prepared by me or under my supervision.

Sections: 01030 and 01040.</td>
</tr>
<tr>
<td>Date Signed: 10/31/2024</td>
</tr>
</table>

APPLICABLE SPECIFICATIONS

The Specification that is applicable to the Work on this Project is the 2021 edition of the "Oregon Standard Specifications for Construction".

All number references in these Special Provisions shall be understood to refer to the Sections and subsections of the Standard Specifications and Supplemental Specifications bearing like numbers and to Sections and subsections contained in these Special Provisions in their entirety.

Clackamas County Special Provisions (2021 version October 27, 2021)

Section 00110 – Organization, Conventions, Abbreviations and Definitions

Comply with Section 00110 of the Standard Specifications supplemented and/or modified as follows:

00110.05(d) References to Laws, Acts, Regulations, Rules, Ordinances, Statutes, Orders, and Permits

Add the following to the first bullet (Statutes and Rules):

- Clackamas County's Local Contract Review Board (LCRB) Rules are accessible online on the County's website https://dochub.clackamas.us/documents/drupal/ef976bc9-14f4-495b-9bd8-c69ee7334685

00110.10 Abbreviations

Add the following:

CCDA - Clackamas County Development Agency
DTD - Clackamas County Department of Transportation and Development
LCRB - Local Contract Review Board
ODFW - Oregon Department of Fish and Wildlife
UNS - Utility Notification System
WES - Water Environment Services of Clackamas County

00110.20 Definitions

Add or modify definitions as follows:

Agreement Form – The written agreement between the Owner and Contractor covering the work to be performed under the contract.

Amendment – A contract modification for Additional Work, Changed Work, Extra Work, Field Directives, or other changes. An Amendment changes the contract value, scope, and/or time. Amendments require formal approval by the Board of County Commissioners, pursuant to LCRB Rule Division C-049-160, prior to approval of such work.

Approved Equal - Materials or services proposed by the contractor and approved by the County as equal substitutes for those materials or services specified.

Award – Same as "Notice to Intent to Award".

BCC – The Clackamas County Board of County Commissioners

Bid - A written offer by a bidder on forms furnished by the County to do work stated in the bid documents at the prices quoted. "Bid" is synonymous with "proposal" in these bid documents.

Bid Closing - The date and time for Bid Closing is the same as the date and time for Bid Opening.

Bid Documents - The following documents together comprise the Bid Documents:

- Invitation to Bid, Instructions to Bidders, Bid Form, Bid Proposal, Schedule of Prices, Bid
- Bond, Performance Bond
- Certificate of Insurance, Prevailing Wage Rates
- The "Oregon Standard Specifications for Construction" by ODOT and APWA, 2021 edition.
- Plans and drawings
- Other bid documents included or referenced in the bid documents
- Addenda, if any
- The Agreement Form and Special Provisions

Bonds - The bond or surety bond is a written document given by the surety and principal to the obligee to guarantee a specific obligation.

Change Order - A price agreement for Extra Work, Changed Work, field directives, or other changes. A Change Order does not change the contract value, scope, or time until it is incorporated into an Amendment. Change Orders will be agreed upon, in writing, by the County Project Manager and the Contractor's designated representative.

Contract - The written contract agreement, including amendments, signed by the Contractor and Clackamas County, which describes the work to be done, the contract amount, and defines the relationships and obligations of the Contractor and the County.

Contract Documents - The Invitation to Bid, the Instructions to Bidders, the accepted Bid Proposal and Schedule of Prices, the Subcontractor List, the Bid Bond, the Performance and Payment Bond, the Certificate of Insurance, the Prevailing Wage Rates, the Standard Specifications and Special Provisions, Amendments, the Plans and Drawings, the Agreement, as well as all documents incorporated by reference therein, and any and all addenda prepared by or at the direction of and adopted by the County and further identified by the signature of the parties and all modifications thereof incorporated in the documents before their execution.

County - The term "County" shall mean Clackamas County, including the Board of County Commissioners, employees and agents of the County authorized to administer the conditions of these contract documents.

Department – A subdivision of the Agency.

Engineer - The County's Project Manager either acting directly or through an authorized representative(s). When referring to approval of extra work or other Contract modifications, “Engineer” also refers to the County’s legal authority according to the LCRB rules.

Invitation to Bid - The public announcement (Notice to Contractors) inviting bids for work to be performed or materials to be furnished.

Legal Holiday - As defined in ORS 279C.540.

Lump Sum - A method of payment providing for one all-inclusive cost for the work or for a particular portion of the work.

Notice of Intent to Award - A written notice from the County notifying bidders that the County intends to award to the responsible bidder submitting lowest responsive bid.

ODOT Procurement Office – Clackamas County Purchasing Department.

Owner – Synonymous with Agency.

Plan Holder’s List – A list of contractor’s names, contact names, phone and fax numbers that the County’s Purchasing Department creates during bidding of the Project.

Project Manager – The Owner’s representative who directly supervises the engineering and administration of the contract.

Shop Drawings – Synonymous with Working Drawings.

Solicitation Document – Synonymous with Bid Documents.

Standard Drawings – The Agency-prepared detailed drawings for Work or methods of construction that normally do not change from project to project. The Standard Drawings include the ODOT Standard Drawings.

Standard Specifications - "Oregon Standard Specifications for Construction", current edition, published by the Oregon Department of Transportation and as amended by **the Agency.**

State - Where the term “State” or “State of Oregon” or “ODOT” appears in the contract documents it shall mean “Clackamas County”, “State of Oregon”, or “ODOT” as applicable because of context.

Work Day - Any and every calendar day from January 1 to December 31 of every year, excluding Saturdays, Sundays and Legal Holidays.

END OF SECTION

Section 00120 – Bidding Requirements and Procedures

Comply with Section 00120 of the Standard Specifications supplemented and/or modified as follows:

00120.00 Prequalification of Bidders - Delete and replace with the following:

See Instructions to Bidders.

00120.01 General Bidding Requirements – Delete and replace with the following:

See Instructions to Bidders.

00120.05 Request for Plans, Special Provisions, and Bid Booklets – Delete and replace with the following:

See Notice of Public Improvement Contract and Instructions to Bidders.

Copies of the 2021 Oregon Standard Specifications for Construction and Supplements might be found on the Oregon Department of Transportation website at:
http://www.oregon.gov/ODOT/Business/Pages/Standard_Specifications.aspx

00120.15 Examination of Work Site and Solicitation Documents; Consideration of Conditions to be Encountered – Delete the third paragraph.

00120.25 Subsurface Investigations - Replace the first two sentences of the first paragraph with the following:

The Agency or its consultant has conducted subsurface or geologic investigations of the Project Site, and the results of these investigations are included in the Bid Documents and available at the Engineer's office.

00120.30 Changes to Plans, Specifications, or Quantities before Opening of Bids - Delete and replace with the following:

See Instructions to Bidders.

00120.40 Preparation of Bids – Delete and replace this section with the following:

See Instructions to Bidders.

00120.45 Submittal of Bids - Delete and replace with:

See Instructions to Bidders.

00120.50 Submitting Bids for More than One Contract – Delete this subsection.

00120.60 Revision or Withdrawal of Bids - Delete and replace with the following:

See Instructions to Bidders.

00120.70 Rejection of Nonresponsive Bids – Delete and replace with the following:

See Instructions to Bidders.

00120.95 Opportunity for Cooperative Arrangement – Delete this section**.**

END OF SECTION

Section 00130 – Award and Execution of Contract

Comply with Section 00130 of the Standard Specifications supplemented and/or modified as follows:

00130.00 Consideration of Bids - Delete third paragraph.

00130.10 Award of Contract - Delete and replace with the following:

See Instructions to Bidders.

00130.15 Right to Protest Award – Delete and replace with the following:

See Instructions to Bidders.

00130.30 Contract Booklet – Add the following:

Other documents are part of the contract documents by reference. These include, but are not limited to:

The "Oregon Standard Specifications for Construction", 2021 Edition, as published by the Oregon Department of Transportation (ODOT).

“Oregon Standard Drawings” latest edition, as published by ODOT.

Clackamas County Service District No. 1 "Surface Water Standard Specifications", latest edition.

00130.40 Contract Submittals - Delete and replace with the following:

See Instructions to Bidders.

00130.70 Release of Bid Guaranties – Delete and replace with the following:

See Instructions to Bidders.

END OF SECTION

Section 00140 – Scope of Work

Comply with Section 00140 of the Standard Specifications supplemented and/or modified as follows:

00140.30 Agency-Required Changes in the Work – Replace the last paragraph with the following:

Upon receipt of an Engineer's written order modifying the Work, the Contractor shall perform the Work as modified via Change Order, which may be subject to approval as an Amendment.

If an Amendment incorporating changes to the Work increases the Contract amount, the Contractor shall notify its Surety of the increase and shall provide the Agency with a copy of any resulting modification to bond documents. The Contractor's performance of Work pursuant to Amendments shall neither invalidate the Contract nor release the Surety. Payment for changes in the Work shall be made in accordance with 00195.20. Contract Time adjustments shall be made in accordance with 00180.80.

00140.31 "As-Built" Records - Add the following section:

Maintain a current and accurate record of the work completed during the course of this contract. This may be in the form of "as-built" drawings kept by accurately marking a designated set of the contract plans with the specified information as the Work proceeds. Accurate, complete and current "as-built" drawings are a specified requirement for full partial payment of the work completed. At project completion and as a condition of final payment, the Contractor shall deliver to the Project Manager a complete and legible set of "as-built" drawings.

The "as-built" drawings must show the information listed below. Where the term "locate" or "location" is used, it shall mean record of position with respect to both the construction vertical datum and either construction horizontal datum or a nearby permanent improvement.

1) Record location of underground services and utilities as installed.

2) Record location of existing underground utilities and services that are to remain and that are encountered during the course of the work.

3) Record changes in dimension, location, grade or detail to that shown on the plans.

4) Record changes made by change order.

5) Record details not in the original plans.

6) Provide fully completed shop drawings reflecting all revisions.

END OF SECTION

Section 00150 – Control of Work

Comply with Section 00150 of the Standard Specifications modified as follows:

00150.00 Authority of the Engineer – Delete and replace the first sentence with the following:

Except as indicated elsewhere in the Contract (e.g. Amendment approval by the BCC), the Engineer has full authority over the Work and its suspension.

00150.05 Cooperative Arrangements – Delete this section**.**

00150.10 Coordination of Contract Documents

(a) Order of Precedence – Delete this section and replace with the following:

The Engineer will resolve any discrepancies between these documents in the following order of precedence:

- Approved Amendments;
- Approved Change Orders
- Bid Schedule with Schedule of Prices;
- Permits from governmental agencies
- Special Provisions;
- Agency-prepared drawings specifically applicable to the Project and bearing the Project title;
- Reviewed and accepted, stamped Working Drawings;
- Agreement Form;
- Standard Drawings;
- Approved Unstamped Working Drawings;
- Standard Specifications;
- All other Contract Documents not listed above.

Notes on a drawing shall take precedence over drawing details.

Dimensions shown on the drawings, or that can be computed, shall take precedence over scaled dimensions.

00150.15(b) Agency Responsibilities - Replace this subsection, except for the subsection number and title, with the following:

The Engineer will perform the Agency responsibilities described in the ODOT Construction Surveying Manual for Contractors, Chapter 1.5 (see Section 00305) and the following:

00150.15(c) Contractor Responsibilities - Replace this subsection, except for the subsection number and title, with the following:

The Contractor shall perform the Contactor responsibilities described in the ODOT Construction Surveying Manual for Contractors, Chapter 1.6 (see Section 00305) and the following:

- Perform earthwork slope staking including intersections and matchlines and set stakes defining limits for clearing which approximate right-of-way and easements.
- Inform the Engineer of any property corners monuments and/or survey markers that are not shown on the plans and are found during construction activities prior to disturbing the monuments. Allow the Agency 2 Work days for referencing all found markers before they are removed. Monuments that are noted on the plans to be protected and are disturbed by the Contractor's activities shall be replaced by the Contractor's surveyor at the Contractor's expense.

00150.50 Cooperation with Utilities - Add the following to the end of Paragraph (a):

There may be other utility servers who are not specifically listed in these Special Provisions or on the Plans that may be adjusting or inspecting their facilities within the project limits.

00150.50(c) Contractor Responsibilities – Add the following to the bulleted list:

- Hold a utility scheduling meeting and monthly utility coordination meetings (see also 00180.42);
- Maintain and re-establish utility location marks according to OAR 952-001-0090(2)(a). Coordinate re-establishment of the location marks with the associated Utility;
- Determine the exact location before excavating within the reasonable accuracy zone according to OAR 952-001-0090(2)(c);
- Backfill any exposed utilities as recommended and approved by the Utility representative. Obtain utility locate warning tape from the Utility and replace damaged or removed warning tape. Utility locate warning tape may not be present at all existing utilities;
- Stake, place warning tape, and maintain no work limits around critical Utility facilities as shown or directed by the Engineer and the Utility; and
- In addition to the notification required in OAR 952-001-0090(5), notify the Engineer and the Utility as soon as the Contractor discovers any previously unknown Utility conflicts or issues. Contrary to the OAR, stop excavating until directed by the Engineer and allow the Utility a minimum of two weeks to relocate or resolve the previously unknown utility issues.

The existing underground utilities shown on the Plans have been determined by as-built records and field surveys, but are not guaranteed to be complete or accurate. The Contractor shall be responsible for contacting the individual utility companies to mark locations, and arranging with them for any relocation work that should be required.

The Contractor shall make excavations and borings ahead of the work where necessary to determine the exact location of underground pipes or other features, which might interfere

with construction. The Contractor shall support and protect pipes or other services where they cross the trench and shall be responsible for all damages incidental in interruptions of service that may be caused by Contractor operations. Where a new utility line crosses an existing pipeline or other conduit, the trench backfill shall be well compacted in a manner that provides for the required backfill and compaction standards while protecting the utility in question.

Add the following subsection:

00150.50(f) Utility Information (No Anticipated Relocations) - Within the Project limits, there are no anticipated relocations with the Utilities listed in Table 00150-1. The Contractor shall contact those Utilities having buried facilities and request that they locate and mark them for their protection prior to construction.

Table 00150-1

Utility	Contact Person's Name, Address, Email, and Phone Number
City of Lake Oswego – Water	Stefan Broadus 380 A Avenue, Lake Oswego, OR 97034 SBroadus@ci.oswego.or.us 503-635-0267
Mossy Brae Water District	Ron Kinder RKinder@hevanet.com
Shadow Wood Water Service	Mel Olson 503-312-9206 info@hilandwater.com

The Contractor shall notify, in writing, the Utilities listed above, with a copy to the Engineer, at least 14 Calendar Days before beginning Work on the Project.

Add the following subsection:

00150.50(g) Utility Information (Anticipated Relocations):

The organizations listed in Table 00150-2 may be adjusting Utilities within the limits of the Project during the period of the Contract with relocation work estimated to be completed by the following dates and times:

Table 00150-2

Subsection	Utility	Contact Person's Name, Address, Email, and Phone Number	Estimated Completion Date
00150.50(g)(1)	NW Natural	Ryan Winfree Ryan.Winfree@nwnatural.com	May 1, 2025

00150.50(g)(2)	Portland General Electric	Andy Brewer 3700 SE 17th Avenue, Portland, OR 97202 Andy.Brewer@pgn.com 503-915-9441	May 31, 2026
00150.50(g)(3)	Clackamas Broadband Exchange	Duke Dexter 121 Library Court, Oregon City, OR 97045 DDexter@clackamas.us 503-722-6663	May 31, 2026
00150.50(g)(4)	Comcast	Matthew Bravo 11308 SW 68th Parkway, Tigard, OR 97223 Matthew_Bravo@comcast.com 971-801-5787	May 31, 2026
0150.50(g)(5)	Ziply	Scott Binney 4155 SW Cedar Hills Blvd, Beaverton, OR 97005 Scott.Binney@ziply.com 971-416-6552	July 14, 2025, for Underground Facilities. May 31, 2026, for Aerial Facilities
0150.50(g)(6)	Lumen Local Network	Jonathan Myrick 8021 SW Capitol Hill Road, Portland, OR 97219 Jonathan.Myrick@lumen.com	May 31, 2026
0150.50(g)(7)	Lumen National Network	Jonathan Myrick 8021 SW Capitol Hill Road, Portland, OR 97219 Jonathan.Myrick@lumen.com	May 1, 2025
0150.50(g)(8)	Zayo	Lawrence Lucas Lawrence.Lucas@cobbfendley.com 713-485-8011	May 1, 2025

The Contractor shall contact the Engineer to view the approved utility relocation Plans.

The Contractor shall notify, in writing, the Utilities listed above, with a copy to the Engineer, at least 14 Calendar Days before beginning Work on the Project.

(1) NW Natural - "Gas Utility":

The Contractor shall notify the Gas Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the gas pipeline.

The Gas Utility operates a high-pressure gas pipeline within the Project limits and may require an on-site safety watcher, at no cost to the Contractor. The high-pressure gas pipeline is parallel to Stafford Road, approximately along the east side fog line for the entire limits of the project.

When operating Equipment directly above the high-pressure gas pipeline, the Contractor shall keep Equipment on the paved surfaces only.

In the immediate area of the high-pressure gas lines, when moving any Equipment, excavating, driving piles, pounding guardrail posts, boring, or other road construction activities, the Contractor shall increase the tolerance zone from 24 inches, as defined in

OAR 952-001-010, to 10 feet. Exceptions require written approval from the Gas Utility. The Contractor shall provide the Engineer a copy of the written approval of the exception before beginning Work.

In the event of an emergency, and in addition to the calls required by the Utilities notification system, the Contractor shall call:

- Northwest Natural Gas 1-800-882-3377

(2) Portland General Electric - "Power Supplier":

Contractor shall notify Power Supplier in writing, with a copy to the Engineer, at least 21 Calendar Days before the Contractor requires tree and vegetation clearance within 10-ft of active lines. Power Supplier shall provide electrically qualified forestry crews to clear trees and vegetation within a 10-ft minimum clearance of active lines. The Power Supplier will not completely remove trees, but only portions of trees and vegetation required within a 10-ft distance of live wires.

The Contractor shall notify the Power Supplier(s) in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the power line(s).

The Contractor shall notify the Power Supplier in writing, with a copy to the Engineer, 14 Calendar Days before the Contractor's estimated completion of excavation and grading as required in Section 00220.40(b). After the Contractor has completed this Work or 14 Calendar Days after the Power Supplier receives the notification, whichever occurs later, the Contractor shall then allow the Power Supplier seven months to schedule and complete the relocation and adjustment work.

Energized power lines overhang portions of the Work with a minimum vertical clearance of 18 feet. The Contractor shall maintain at least 10 feet of safety clearance. Exceptions require written approval from the Power Supplier(s) and may require an on-site safety watcher, at no cost to the Contractor. The Contractor shall provide the Engineer a copy of the written approval of exception before beginning work.

(3) Clackamas Broadband Exchange - "Telecommunication Utility":

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the Telecommunication Utility facilities.

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, 14 Calendar Days before the Contractor's estimated completion of excavation and grading activities as required in Section 00220.40(b). After the Contractor has completed this Work or 14 Calendar Days after the Telecommunication Utility receives the notification, whichever occurs later, the Contractor shall then allow the Telecommunication Utility seven months to schedule and complete the relocation and adjustment work.

(4) Comcast - "Telecommunication Utility":

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the Telecommunication Utility facilities.

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, 14 Calendar Days before the Contractor's estimated completion of excavation and grading as required in Section 00220.40(b). After the Contractor has completed this Work or 14 Calendar Days after the Telecommunication Utility receives the notification, whichever occurs later, the Contractor shall then allow the Telecommunication Utility seven months to schedule and complete the relocation and adjustment work.

(5) Ziply - "Telecommunication Utility":

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the Telecommunication Utility facilities.

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, 14 Calendar Days before the Contractor's estimated completion of excavation and grading as required in Section 00220.40(b). After the Contractor has completed this Work or 14 Calendar Days after the Telecommunication Utility receives the notification, whichever occurs later, the Contractor shall then allow the Telecommunication Utility seven months to schedule and complete the relocation and adjustment work.

(6) Lumen Local Network - "Telecommunication Utility":

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the Telecommunication Utility facilities.

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, 14 Calendar Days before the Contractor's estimated completion of excavation and grading as required in Section 00220.40(b). After the Contractor has completed this Work or 14 Calendar Days after the Telecommunication Utility receives the notification, whichever occurs later, the Contractor shall then allow the Telecommunication Utility seven months to schedule and complete the relocation and adjustment work.

(7) Lumen National Network - "Telecommunication Utility":

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the Telecommunication Utility facilities.

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 21 Calendar Days before paving operations which require the adjustment of manhole frames to finished grade.

(8) Zayo - "Telecommunication Utility":

The Contractor shall notify the Telecommunication Utility in writing, with a copy to the Engineer, at least 14 Calendar Days before beginning Work within 10 feet of the Telecommunication Utility facilities.

00150.55 Cooperation with Other Contractors - Add the following:

The following contractors will be working on or near the project site:

Contract Name	**(From - To)**
1) Henkels and McCoy West (PGE Tonquin: Rosemont-Wilsonville)	Oct. 2025 thru May 2026 (concurrent with Stage 3)
2) Kiewit (I-205 Improvements: Abernethy Bridge)	May 2025 thru Dec. 2026

Add the following subsection:

00150.60 (d) In-water Work – The Contractor shall comply with the restrictions, duties and obligations with respect to protection of environmental resources of the State as required by 00290.34.

00150.70 Detrimental Operations – Add the following:

Portions of this project might be constructed in close proximity to existing private improvements. All private improvements disturbed by the Contractor's operations shall be repaired or replaced to equal or better condition at the Contractor's expense. The Engineer may withhold from future payments to the Contractor, an amount equal to the costs reasonably estimated by the Engineer to repair or replace, as the case may be, those private improvements disturbed by the Contractor's operations. Engineer shall release the retained amount once Engineer has determined that the Contractor has completed the repair consistent with the requirements of this provision. In addition, prior to construction, the Contractor shall provide to the Engineer videotape showing private property, if any, which may be disturbed during construction.

END OF SECTION

Section 00160 – Source of Materials

Comply with Section 00160 of the Standard Specifications supplemented and/or modified as follows:

00160.20(a) Buy America – Delete this section and replace with the following: Federal highway funds are NOT involved on this Project.

00160.30 Agency-Furnished Material – Add the following: "The Agency will furnish the listed items at the Project Site:"

- Project Information Signs for use under Section 00220
- Furnished materials do not include the sign supports, footings and/or the required hardware/bolts to mount the signs.

END OF SECTION

Section 00165 – Quality of Materials

Comply with Section 00165 of the Standard Specifications modified as follows:

00165.04 Costs of Testing – Replace this section with the following sentence: All testing required to be performed by the Contractor will be at the Contractor's expense.

00165.10(a) Field-Tested Materials – Add the following sentence: The County follows the MFTP on its projects:

00165.10(b) Nonfield-Tested Materials - Add the following sentence:

The County follows the NTMAG on its projects.

END OF SECTION

Section 00170 – Legal Relations and Responsibilities

Comply with Section 00170 of the Standard Specifications supplemented and/or modified as follows:

00170.02 Permits, Licenses, and Taxes – Add the following:

This project is to be constructed in Clackamas County road right of way and streets. There are no separate road opening permits required from Clackamas County to perform the work required under this contract.

00170.03 Furnishing Right-of-Way and Permits – Add the following bullet items:

- The Contactor shall provide access between Stafford Rd and 1600 SW Sunset Dr. A one-time, 24-hour period will be allowed in which access is not provided between Stafford Rd and 1600 SW Sunset Dr. A 48-hour notice shall be provided to the homeowner prior to this one-time, 24-hour period.
- The Contractor shall not store materials or equipment within project TCE's unless specifically approved by the Project Manager.

00170.61(a) Workers' Compensation - In the paragraph, replace "00170.70(d)" with "the Agreement".

Add the following subsection:

00170.67 Fees - The fee required by ORS 279C.825(1) will be paid by the Agency to the Commissioner of the Oregon Bureau of Labor and Industries under the administrative rules of the Commissioner.

00170.70(a) Insurance Coverages - Add the following to the end of this subsection:

The following insurance coverages and dollar amounts are required pursuant to this subsection:

Insurance Coverages	Combined Single Limit per Occurrence	Annual Aggregate Limit
Commercial General Liability	$3,000,000	$5,000,000
Commercial Automobile Liability	$1,000,000	(aggregate limit not required)
Pollution Liability	$1,000,000	$2,000,000
Commercial Automobile Liability with Pollution Coverage	$2,000,000	(aggregate limit not required)

Add the following:

The Contractor shall require that all subcontractors of any tier provide insurance coverage (including additional insured provisions) and limits identical to the insurance required of the Contractor under this contract, unless this requirement is expressly modified or waived by the Agency in writing.

00170.70(c) Additional Insured - Add the following paragraph and bullets to the end of this subsection:

- Clackamas County and its officers, agents, and employees
- Clackamas County Board of Commissioners
- Consor North America, Inc. and its officers, agents, and employees

00170.72 Indemnity/Hold Harmless – Delete and replace with the following:

Clackamas County Public Improvement Contract.
Extend indemnity and hold harmless to the Agency and the following:

- Clackamas County and its officers, agents, and employees
- Clackamas County Board of Commissioners
- Consor North America, Inc. and its officers, agents, and employees

00170.85(b-1) Contractor Warranty for Specific Items – This subsection does not apply:

END OF SECTION

Section 00180 – Prosecution and Progress

Comply with Section 00180 of the Standard Specifications supplemented and/or modified as follows:

00180.06 Assignment of Funds Due Under the Contract - Delete first bulleted item.

00180.21 Subcontracting - Add the following to subsection (a):

All contracts with subcontractors or suppliers shall have provisions making the contract assignable to the County, at the option of the County, if the Contractor terminates, goes out of business, declares bankruptcy, or otherwise is unable to perform provided that the County gives the subcontractor notice of assignment within fourteen (14) days of learning of the inability of the Contractor to perform.

The Engineer may revoke consent to subcontract. If the Engineer revokes consent to subcontract, the subcontractor shall be immediately removed from the Project Site.

00180.40 Limitation of Operations - Add the following to subsection (a):

The Contractor must provide, at a minimum, a 48-hour notice to the Clackamas County Project Manager in order to perform any work on Saturdays.

Add the following subsection:

00180.40(c) Specific Limitations - Limitations of operations specified in these Special Provisions include, but are not limited to, the following:

Limitations	Subsection
Cooperation with Utilities	00150.50
Cooperation with Other Contractors	00150.55
Contract Completion Time	00180.50(h)
Right-of-Way and Access Delays	00180.65
Traffic Lane Restrictions	00220.40(e)
In-water Work Restrictions	00290.34(a)
Noise Control	00290.32
Maintenance Under Traffic	00620.43
Opening Sections to Traffic	00745.51

Be aware of and subject to schedule limitations in the Standard Specifications that are not listed in this Subsection.

00180.41 Project Work Schedules – Add the following:

A Type “B” schedule as detailed in the Supplemental Specifications is required on this Contract. In addition, a three-week look ahead schedule shall be prepared by the Contractor on a weekly basis and submitted to the Engineer. It shall include all construction activities planned for the following three-week period. The three-week look ahead schedule can be hand-written and shall be in a format agreed upon by the Contractor and the Engineer.

00180.42 Preconstruction Conference - Add the following:

Following the Preconstruction Conference, before beginning On-Site Work, Contractor shall prepare for and attend a traffic control meeting per Section 00221.

Before beginning On-Site Work and before meeting with the Engineer for the preconstruction conference, hold a group utilities scheduling meeting with representatives from the utility companies involved with this project. Incorporate the utilities time needs into the Contractor's schedule submitted prior to the preconstruction conference.

Submit the following during the preconstruction conference unless otherwise directed:

- The names, addresses, and telephone numbers of two or more persons employed by the Contractor who can be reached day or night to handle emergency matters.
- Subcontractor's list including contact list for each subcontractor with phone numbers and addresses and work to be performed.
- List of personnel authorized to sign change orders and receive progress payment warrants.
- Video recording of private properties affected by construction per 00150.70.

A representative of each subcontractor shall be required to attend the pre-construction conference.

The Contractor shall submit a written Utility Coordination Report to the Engineer not later than seven Calendar Days after the Utility scheduling meeting. The Utility Coordination Report shall:

- Identify each specific Utility;
- Identify Utility contact names and numbers;
- Identify dates for Utility scheduling for the entire Project;
- Contain documents showing that the Contractor has accomplished Utility locates; and
- Contain documents showing that Utility locates, along with applicable construction activities, have been reviewed and discussed on-site with Utility representatives.

The Contractor shall hold monthly Utility coordination meetings with Utilities and the Engineer to coordinate Project activities with Utilities and on-going Utility relocation work. The Contractor shall hold monthly Utility coordination meetings in the office or in the field, as appropriate. The Utility coordination meetings shall include, but not be limited to:

- Detailed discussions of existing and abandoned Utilities,
- Detailed discussions of de-energizing and re-energizing service lines,
- Detailed discussions of critical locations for potholing of Utilities,
- Detailed discussions of Project activities, and
- Detailed discussions of on-going Utility relocations in upcoming Project activity areas.

During the monthly Utility coordination meetings, the Utilities will provide Utility drawings and discuss the scope, extent, locations, and significance of all Utility facilities before the

Contractor begins work in a new activity area. The Contractor shall incorporate this information into the Project schedules and furnish the Utilities copies of the updated Project schedules.

The Contractor shall plan and schedule all Utility adjustment operations well in advance of On-Site Work. When the Contractor becomes aware of Utility conflicts not previously identified, the Contractor shall notify the applicable Utilities in writing the same Calendar Day. The Contractor shall allow Utilities at least 2 weeks (14 Calendar Days) to relocate (adjust) the Utility conflicts not previously identified.

00180.43 Commencement and Performance of Work - Add the following bullet item:

- Conduct the work at all times in a manner and sequence that will insure minimal interference with traffic. The Contractor shall not begin work that will interfere with work already started. If it is in the County's best interest to do so, the County may require the Contractor to finish a portion or unit of the project on which work is in progress or to finish a construction operation before work is started on an additional portion or unit of the project.

00180.44 Critical Time Periods - Note the following critical time periods where only certain types of work can be performed throughout the project, and completion times for work items:

- All work below Ordinary High Water Elevation:
  July 15, 2025 – September 30, 2025
  July 15, 2026 – September 30, 2026

- Road closures:
  1). Johnson Rd – at Stafford Rd:
  May 1, 2025 – July 14, 2025
  October 1, 2026 – October 31, 2026

  2.) Childs Rd – at Stafford Rd:
  July 15, 2025 – September 30, 2026

  3.) Stafford Rd – North of Pattulo Wy to south of Childs Rd:
  May 1, 2025 – July 14, 2025
  October 1, 2026 – October 31, 2026

  4.) Stafford Rd – North of Johnson Rd to south of Rosemont Rd:
  July 15, 2025 – September 30, 2025
  June 1, 2026 – September 30, 2026

Add the following subsection:

00180.50(h) Contract Time - There are four Contract Times on this Project as follows:

(1) Complete all Stage 1 and 2 Work according to 00220.40(b) under the Contract (to sufficiently allow franchise utility relocations to occur) not later than September 30, 2025.

(2) Complete all Work to be done under the Contract, except for seeding, plant establishment, and permanent striping, not later than December 31, 2026.

(3) Complete all Work to be done under the Contract, except for seeding and plant establishment, not later than June 30, 2027.

00180.65 Right-of-Way and Access Delays - Add the following paragraph:

It is anticipated that the ending date of an anticipated delay for the following properties will be as shown:

- File 11 not later than May 1, 2025.
- File 12 not later than May 1, 2025.
- File 14 not later than May 1, 2025.
- File 15 not later than May 1, 2025.
- File 16 not later than May 1, 2025.

00180.70 Suspension of Work - Add the following to the first bullet item:

If the Inspector has reason to believe that any safety provisions are not being adhered to, the Inspector will immediately notify the Contractor's site foreman and/or the appropriate person and the County Project Manager. The purpose of this discussion is to determine the validity of the alleged violation. This will also allow the Contractor a reasonable amount of time to correct or improve any of the provisions for the safety on this project. If the County Project Manager finds the problem still unresolved or uncorrected, they will notify the Contractor's Project Manager and the County's Risk Management Safety Analyst. If the County's Risk Management Safety Analyst finds that the job site contains any unresolved safety issues they will take appropriate action up to and including suspension of the Contractor's operations on all or part of the Work.

00180.85(b) Liquidated Damages - Add the following paragraph:

The liquidated damages for failure to complete the Work on time required by 00180.50(h) will be $2,000 per Calendar Day *.

* Calendar Day amounts are applicable when the Contract time is expressed on the Calendar Day or fixed date basis.

Add the following subsection:

00180.85(c) Lane Closures and Road Closures - Lane closures and road closures beyond the limits specified will inconvenience the traveling public and will be a cost to the Agency.

(1) Lane Closures - It is impractical to determine the actual damages the Agency will sustain in the event traffic lanes are closed beyond the limits listed in 00220.40(e). Therefore, the Contractor shall pay to the Agency, not as a penalty, but as liquidated damages, $500 per 15 minutes, or for a portion of 15 minutes, per lane, for any lane closure beyond the limits listed in 00220.40(e). In addition to the liquidated damages, all added cost for traffic control measures, including flagging, required to maintain the lane

closures beyond the allowed time limits, will be at no additional cost to the Agency. The required traffic control measures will be as determined by the Engineer.

The Engineer will determine when it is safe to reopen lanes to traffic. Assessment of liquidated damages will stop when all lanes have been safely reopened. Any liquidated damages assessed under these provisions will be in addition to those listed in 00180.85(b).

(2) Road Closures - It is impractical to determine the actual damages the Agency will sustain in the event roads are closed beyond the specified dates. Therefore, the Contractor shall pay to the Agency, not as a penalty, but as liquidated damages, $2,000 per day for any road closure beyond the limit listed in 00220.40(b). In addition to the liquidated damages, any added cost for traffic control measures required to maintain the road closures beyond the allowed time limits, will be at no additional cost to the Agency. The required traffic control measures will be as determined by the Engineer.

The Engineer will determine when it is safe to reopen roads to traffic. Assessment of liquidated damages will stop when all roads and lanes have been safely reopened. Any liquidated damages assessed under these provisions will be in addition to those listed in 00180.85(b).

00180.88 Workplace Harassment Prevention Plan – Submit a workplace harassment prevention plan for review 10 days before the preconstruction conference. The plan shall ensure all workers are guaranteed a safe and respectful work environment regardless of their identity or status. The plan applies to, but is not limited to, a worker's race, gender, creed, or any protected characteristic under state or federal law. At a minimum, the plan shall include:

- A Statement that the Contractor shall provide a safe and respectful workplace on the jobsite for all workers, subcontractors, suppliers, and other persons performing work.
- A description of how the plan will be implemented and monitored during the project duration.
- A list of the in-person trainings that will be conducted for workers of all ranks working on the project to support, promote, and grow a positive jobsite culture.
- A list of meaningful policies including procedures for aggrieved workers in need of recourse.
- How incidents involving bullying or harassment will be investigated and resolved in a prompt, thorough, and impartial manner.

Contractor shall post on the jobsite and make available copies of policies about hate, intimidation, or harassment including how to report incidents and how to receive support. Materials will be provided in all languages necessary to be inclusive of the workforce.

00180.89 Measurement – No measurement of quantities will be made for workplace harassment prevention plan.

00180.95 Payment – Payment for workplace harassment prevention plan will be paid for at the Contract lump sum amount for the item "Workplace Harassment Prevention Plan". Payment will be payment in full for developing and implementing the plan during construction of the project, in-person training, developing meaningful policies, and investigating incidents.

END OF SECTION

Section 00190 – Measurement of Pay Quantities

Comply with Section 00190 of the Standard Specifications supplemented and/or modified as follows:

00190.20(g) Agency-Provided Weigh Technician: Delete and replace subsection (g) with the following:

The Contractor must provide a weigh technician. The Agency will not provide one for the Contractor.

END OF SECTION

Section 00195 – Payment

Comply with Section 00195 of the Standard Specifications supplemented and/or modified as follows:

00195.10 Payment for Changes in Material Costs Replace this subsection with the following subsection:

00195.10 Asphalt Cement Material Price Escalation/De-escalation - An asphalt cement escalation/de-escalation clause will be in effect during the life of the Contract.

The Agency reserves all of its rights under the Contract, including, but not limited to, its rights for suspension of the Work under 00180.70 and its rights for termination of the Contract under 00180.90, and this escalation/de-escalation provision shall not limit those rights.

(a) Monthly Asphalt Cement Material Price (MACMP) - The Monthly Asphalt Cement Material Price (MACMP) is established by the Agency each month. For the actual MACMP, go to the Agency website at:

https://www.oregon.gov/ODOT/Business/Pages/Asphalt-Fuel-Price.aspx

The MACMP is based on selling prices of asphalt cement published by Poten & Partners, Inc. for primarily PG 64-22 paving grades in the Portland, Oregon area and typical non-modified paving grades in the Boise, Idaho area. The MACMP for a given month is the average of the weekly published prices for each area reported each Friday in that month. If any portion of the Project Site is located within the boundaries of ODOT Maintenance District 13 or 14, the MACMP will be based on the prices for the Boise, Idaho area. If no portion of the Project Site is within the boundaries of ODOT Maintenance District 13 or 14, the Contractor may elect to have the MACMP based on the prices of either the Portland, Oregon area or the Boise, Idaho area. If electing to use Boise, Idaho area prices for determination of the MACMP, the Contractor shall notify the Engineer in writing of the Contractor's election before or within 7 Calendar Days after the date of the preconstruction conference. This election, once acknowledged by the Engineer, will be binding for the entire duration of the Contract. If no such written notification is made, the Portland, Oregon area prices will be used as the basis of the MACMP. The area selected as the basis of the MACMP, once chosen, will become the sole area to be used as the basis for all asphalt cement used on the Project.

If the weekly prices cease to be available from Poten & Partners, Inc. for any reason, the Agency, in its discretion will select and begin using a substitute price source or index to establish the MACMP each month. The Agency does not guarantee that asphalt cement will be available at the MACMP.

(b) Base Asphalt Cement Material Price (Base) - The base asphalt cement material price for this Project is the MACMP published on the Agency website for the month immediately preceding the Bid Opening date.

(c) Monthly Asphalt Cement Adjustment Factor - The monthly asphalt cement adjustment factor will be determined each month as follows:

- If the MACMP is within ± 5% of the Base, there will be no adjustment.
- If the MACMP is more than 105% of the Base, then:

  Adjustment Factor = (MACMP) - (1.05 x Base)

- If the MACMP is less than 95% of the Base, then:

  Adjustment Factor = (MACMP) - (0.95 x Base)

(d) Asphalt Cement Price Adjustment - A price adjustment will be made for the items containing asphalt cement listed below. The price adjustment as calculated in (c) above will use the MACMP for the month the asphalt is incorporated into the Project. The price adjustment will be determined by multiplying the asphalt incorporated during the month for subject Pay Items by the Adjustment Factor.

The Pay Items for which price adjustments will be made are:

Pay Item(s)

Level 2, ½ inch ACP Mixture
Level 3, ½ inch ACP Mixture
Level 3, ½ inch ACP Mixture In Leveling

00195.12 Steel Material Price Escalation/De-Escalation Clause – Add the following sentence:

No steel material price escalation/de-escalations shall be used on this project. There is no option for Contractor participation.

00195.20(b) Significant Changed Work – Add the following:

Significant is defined as:

a) An increase or decrease of more than 25 percent of the total cost of the Work calculated from the original proposal quantities and the unit contract prices; or,
b) An increase or decrease of more than 25 percent in the quantity of any one major contract item.

For condition b) above, a major item is defined as any item that amounts to 10 percent or more of the original total contract price.

00195.50 Progress Payments and Retained Amounts - Modify as follows:

00195.50(a) Progress Payments - Modify as follows:

(1) Progress Estimates - Delete the first sentence and replace with the following:

At a regular period each month to be determined at the Preconstruction Conference, the Contractor will make an estimate of the amount and value of pay item work completed and in place. This estimate will be submitted to the Project Manager for review and approval.

(2) Value of Material on Hand - Delete the section and replace with the following:

(2) Value of Material on Hand - The Contractor will make an estimate of the amount and value of acceptable material to be incorporated in the completed work which has been delivered and stored as given in 00195.60(a) for review and approval.

(4) Limitations on Value of Work Accomplished - In the first sentence, change "Engineer's estimate" to “Contractor’s reviewed estimate”.

00195.50(b) Retainage - Delete the first paragraph and replace with:

The amount to be retained from progress payments will be 5.0% of the value of payments made, and will be retained in one of the forms specified in Subsection (c) below. The County will withhold Retainage from all force account and change order work.

00195.50(c) Forms of Retainage – Delete first paragraph and replace with:

Forms of acceptable retainage are set forth below in Subsections (1) through (3). “Cash, Alternate A” or “Cash, Alternate B” (Retainage Surety Bond) are the Agency-preferred forms of retainage. Unless the Contractor notifies the County otherwise in writing, the County will automatically hold retainage per paragraph (2) “Cash, Alternate B (No Interest Earned). If the Agency incurs additional costs as a result of the Contractor’s election to use “Bonds and Securities”, the Agency may recover such costs from the Contractor by a reduction of the final payment.

Delete and replace paragraph (2) with the following:

> **(2) Cash, Alternate B (No Interest Earned)** – Retainage will be deducted from progress payments and held by the Agency until final payment is made in accordance with 00195.90, unless otherwise specified in the Contract.

00195.50(d) Release of Retainage – Delete this section and replace with the following:

(d) Release of Retainage - As the Work progresses, release of the amounts to be retained under (b) of this Subsection will only be considered for Pay Items that have been satisfactorily completed. For purposes of this Subsection, a Pay Item will be considered satisfactorily completed only if all of the Work for the Pay Item is complete and all contractual requirements pertaining to the Pay Item and Work have been satisfied. Work not included in a Pay Item, or which constitutes part of an uncompleted Pay Item, will not be regarded as satisfactorily completed Work for the purposes of this Subsection.

Upon written application of the Contractor and written approval of the Surety, the Engineer or Project Manager may reduce or eliminate retainage on remaining progress payments if the Work is progressing satisfactorily.

A determination of satisfactory completion of Pay Items or Work or release of retainage shall not be construed as acceptance or approval of the Work and shall not relieve the Contractor of responsibility for defective Materials or workmanship or for latent defects and warranty obligations.

END OF SECTION

Section 00196 – Payment for Extra Work

Comply with Section 00196 of the Standard Specifications supplemented and/or modified as follows:

Add the following subsection:

00196.91 Extra Work Allowance – The Bid schedule of prices contains a bid item for a pre-determined amount of Engineer ordered extra work. All Bidders shall reflect this same amount in their total Bid. No Bidder shall presume in the preparation of the bid or in the course of contract work that there will be a certain payment under that item or a certain order for extra work.

END OF SECTION

Section 00197 – Payment for Force Account Work

Comply with Section 00197 of the Standard Specifications.

END OF SECTION

Section 00199 – Disagreements, Protests and Claims

Comply with Section 00199 of the Standard Specifications supplemented and/or modified as follows:

00199.40 Claim Decision; Review; Exhaustion of Administrative Remedies - Delete the entire section and replace with the following:

The Contractor must properly submit a claim as detailed in 00199.30.

(a) Engineer Claim Review - The Engineer or Project Manager will, as soon as practicable, consider and investigate a Contractor's properly submitted claim for additional compensation, Contract Time, or for a combination of additional compensation and Contract Time. Once the Engineer or Project Manager determines the Agency is in receipt of a properly submitted claim, the Engineer or Project Manager will arrange a meeting, within 28 Calendar Days, or as otherwise agreed by the parties, with the Contractor in order to present the claim for formal review and discussion. A person authorized by the Contractor to execute Change Orders on behalf of the Contractor must be present and attend all claim meetings.

If the Engineer or Project Manager determines that the Contractor must furnish additional information, records, or documentation to allow proper evaluation of the claim, the Engineer will schedule a second meeting, to be held within 14 calendar days, or as otherwise agreed by the parties, at which the Contractor shall present the requested information, records and documentation.

The Engineer or Project Manager will advise the Contractor of the decision to accept or reject the claim. If the Engineer or Project Manager finds the claim has merit, an equitable adjustment will be offered. If the Engineer or Project Manager finds the claim has no merit, no offer of adjustment will be made and the claim will be denied. The County intends to resolve claims at the lowest possible level.

If, at any step in the claim decision or review process, the Contractor fails to promptly submit requested information or documentation that the Agency deems necessary to analyze the claim, the Contractor is deemed to have waived its right to further review, and the claim will not be considered properly filed and preserved.

If the Engineer or Project Manager has denied a claim, in full or in part, for Contract Time only according to 00180.80, or has denied a claim, in full or in part, for correction of final compensation according to 00195.95, those disputed claims may then be resolved, in full or in part, at either of the two progressive steps of claim review procedure as specified in this Subsection. For all claims, all of the actions and review under each step of the review process shall occur before the review can be advanced to the next higher step.

(b)Director Claim Review - Upon request by the Contractor, the Department Director will review the Engineer or Project Manager’s decision on the claim and advise the Contractor of the decision in writing. If the Director finds the claim has merit, and equitable adjustment will be offered. If the Director finds the claim has no merit, no offer of adjustment will be made and the claim will be denied.

Once the Engineer determines the Agency is in receipt of a properly submitted claim, the Engineer will arrange a meeting, within 21 Calendar Days or as otherwise agreed by the parties, with the Contractor in order to present the claim for formal review and discussion.

If the Engineer determines that the Contractor must furnish additional information, records or documentation to allow proper evaluation of the claim, the Engineer will schedule a second meeting, to be held within 14 Calendar Days or as otherwise agreed by the parties, at which the Contractor shall present the requested information, records and documentation.

The Director shall evaluate the claim based on the information provided by the Contractor to the Engineer or Project Manager. However, if the Department Director (or designee) determines that the Contractor must furnish additional information, records or documentation to allow proper evaluation of the claim, the Department Director (or designee) will schedule a meeting, to be held within 14 Calendar Days, or as otherwise agreed by the parties, at which the Contractor shall present the requested information, records and documentation.

The claim is subject to records review, if not all of the records requested by the Department Director (or designee) were furnished. If applicable, advancement of the claim is subject to the provisions regarding waiver and dismissal of the claim or portions of the claim.

The decision of the Department Director shall be the final decision of the Agency.

(c) Commencement of Litigation - If the Contractor does not accept the Director's decision, then the Contractor shall commence any suit or action to collect or enforce any claim filed in accordance with 00199.30 within a period of one (1) year following the mailing of the decision or within one (1) year following the date of "Second Notification", whichever is later. If said suit or action is not commenced in said one (1) year period, the Contractor expressly waives any **and** all claims for additional compensation and any and all causes of suit or action for the enforcement thereof that he might have had.

The Contractor must follow each step in order, and exhaust all available administrative remedies before resorting to litigation. Litigation of a claim that cannot be resolved through the process described above shall be initiated by filing a complaint in the Clackamas County Circuit Court for the State of Oregon.

In any litigation, the entire text of any order or permit issued by the County or any other governmental or regulatory authority, as well as any documents referenced or incorporated therein by reference, shall be admissible for purposes of Contract interpretation.

The Contract shall not be construed against either party regardless of which party drafted it. Other than as modified by the Contract, the applicable rules of contract construction and evidence shall apply. This Contract shall be governed by and construed according to the laws of the State of Oregon without regard to principles of conflict of laws.

The Contractor shall comply with 00170.00.

00199.50 Mediation - Delete the entire section.

00199.60 Review of Determination Regarding Records - Delete the entire section.

END OF SECTION

SECTION 00210 - MOBILIZATION

Comply with Section 00210 of the Standard Specifications.

SECTION 00220 - ACCOMMODATIONS FOR PUBLIC TRAFFIC

Comply with Section 00220 of the Standard Specifications modified as follows:

00220.02(a) General Requirements – Replace the bulleted item that begins 'Allow emergency vehicles immediate' with the following:

- Allow emergency vehicles immediate passage at all times unless otherwise approved or stated. Emergency services access to be maintained by a minimum 12-feet wide travel lane.

Replace the bulleted item that begins 'Do not block driveways' with the following:

- Provide and maintain in a safe condition temporary access to all residence driveways, temporary intersections, and temporary connections with roads, streets, bikeways, sidewalks, and footpaths throughout the life of the project. Communicate with all adjacent properties 48 hours in advance of any work affecting access to allow necessary arrangements to take place between the property owner, Agency, and Contractor. Communications shall be in the form of written text, verbal communication or other means and shall be documented by the Contractor and that documentation shall be available to the Agency. Unless specifically agreed upon in writing by the property owners, no closure to property accesses may occur during this contract.

Add the following bullets to the end of the bullet list:

- Provide at least 3-weeks notification and Agency approval for each stage of construction. Additionally, obtain the Engineer's approval of a traffic control and signage plan for each stage of construction at least 7 days before work begins on that stage. Implement the plan before occupying any portion of the next stage and maintain traffic control in accordance with that plan, or as otherwise directed by the Engineer, for the duration of the work.

- When performing trench excavation or other excavation across or adjacent to a Traffic Lane on a roadway having a preconstruction posted speed greater than 35 mph, backfill the excavation, install surfacing, and open the roadway to traffic by the end of each work shift. Install a "BUMP" (W8-1-48) sign approximately 100 feet before the backfilled area and a "ROUGH ROAD" (W8-8-48) sign approximately 500 feet ahead of the "BUMP" sign. If this requirement is not met, maintain all necessary lane or shoulder closures and provide additional TCM, including flagging, at no additional cost to the Agency. Do not use temporary steel plating to reopen the roadway.

- Before activating a modified traffic signal, revising lane usage, implementing new roadway geometry, or removing a "STOP" sign, protect traffic by installing "NEW TRAFFIC PATTERN AHEAD" (W232) signing according to 00222.40. Keep the signs in place for 30 Calendar Days after completing the modifications.

- When an abrupt edge is created by excavation, protect traffic according to the "Excavation Abrupt Edge" and the "Typical Abrupt Edge Delineation" configurations shown on the Standard Drawings.

- When paving operations create an abrupt edge, protect traffic by installing a "DO NOT PASS" (R4-1) sign before the Work Area at sign spacing "A" from the TCD Spacing Table" shown on the Standard Drawings. Alternate "ABRUPT EDGE" (CW21-7) signs with appropriate (CW21-8) rider and "DO NOT PASS" (R4-1) signs at 1/2 mile spacings. Install a "BUMP" (W8-1) sign 100 feet prior to the transverse paving edge.

00220.03 Work Zone Notifications, (c) Public Notifications – Add the following to the end of this subsection:

The County shall furnish temporary project information signs. The Contractor shall install project signs on wood post supports at locations shown on the Temporary Traffic Control Plans. Signs shall be placed a minimum of 14 days before commencing on-site work.

Submit road closure application at least 30 days prior to Contractor's scheduled closure. Application can be obtained at https://www.clackamas.us/how-to-apply-for-a-permit.

Contractor shall submit and receive approval from ODOT prior to placing temporary traffic control devices within ODOT right-of-way. ODOT's miscellaneous permit application can be obtained at https://www.oregon.gov/odot/maintenance/pages/permits.aspx.

Contractor shall submit and receive approval from City of Lake Oswego prior to placing temporary traffic control devices within City of Lake Oswego right-of-way. City of Lake Oswego's Traffic Control Permit application can be obtained at https://www.ci.oswego.or.us/engineering/traffic-control-permit .

Contractor shall submit and receive approval from City of West Linn prior to placing temporary traffic control devices within City of West Linn right-of-way. City of West Linn's public right-of-way use request can be obtained at https://westlinnoregon.gov/sites/default/files/fileattachments/public_works/page/6280/public_right_of_way_use_request_version_2019.pdf .

Notify emergency services and organizations listed below at least 14 calendar days in advance of street closures. The following information is provided for the Contractor's convenience:

- Emergency Services 911
- Tualatin Valley Fire & Rescue 503-649-8577
- United States Post Office (Non-Emergency & Emergency Services) 800-275-8777
- Lake Oswego School District 503-534-2000
- Republic Disposal 503-682-3900

00220.40(b) Detours and Stage Construction – Add the following to the end of this subsection:

At the Agency's discretion, the Agency will provide an alternate detour route plan that shall be implemented by the Contractor. An alternate detour route may be required due to ODOT's Abernethy Bridge and OR43 construction work.

Prior to Stage 3 Construction 'Winter Shutdown', the following work shall be completed:

1. There shall be preliminary grading around each proposed Portland General Electric (PGE) structure with a minimum 10-foot radius. The preliminary grading shall be within +/- 1 foot of finish grade at each structure location.
2. At the locations shown, the grading shall be fully executed prior to Stage 3 Construction 'Winter Shutdown'. These locations are in relation to the transmission pole line where the cut/fill is most prevalent. This area shall be graded in its entirety to finish grade. This will provide the required work area for PGE and provide adequate electrical clearances for all contractors.

Complete staged construction and detours as follows:

(1) Full Road Closure – When work requires closures of SW Stafford Road, SW Childs Road, or SW Johnson Road, fully implement closure and detour traffic as shown in the plans and supplemented via the Contractor's traffic control plan for Construction Stages 1 through 5. Allow local access only traffic within the road closure area to allow residents access to driveways. Maintain access to all driveways, properties, and businesses unless otherwise shown or approved. Except for a one-time hard closure at the culvert crossing in Stage 2 Construction, emergency services shall be provided immediate passage through the closures, while providing a minimum 12-foot wide travel lane.

(2) Stage 1 Construction – SW Stafford Road and SW Johnson Road closed to traffic from north of Pattulo Way to south of SW Childs Road. Maintain two-lane, two-way traffic along SW Stafford Road between Rosemont Road and SW Childs Road. Maintain local access only within closure. Stage 1 Construction is to occur from May 1, 2025 through July 14, 2025.

(3) Stage 2 Construction – SW Stafford Road and SW Childs Road closed to traffic from north of Johnson Road to south of Rosemont Road. Maintain two-lane, two-way traffic along SW Stafford Road between Pattulo Way and Johnson Road. A one-time, 56-day hard closure will be allowed at the culvert crossing. Maintain local access only within closure. Stage 2 Construction is to occur from July 15, 2025 through September 30, 2025.

(4) Stage 3 Construction 'Winter Shutdown' – SW Childs Road remains closed to traffic at SW Stafford Road. Maintain two-lane, two-way traffic on SW Johnson Road and SW Stafford Road. Maintain local access only within closure. The existing stormwater infrastructure (i.e., roadside ditches and culverts) shall remain operational through the previous two construction stages to provide needed conveyance through Stage 3. Stage 3 Construction consists of a winter shut-down period to enable utility relocations and is to occur from October 1, 2025 through May 31, 2026.

(5) Stage 4 Construction – SW Stafford Road and SW Childs Road closed to traffic from north of Johnson Road to south of Rosemont Rd. Maintain two-lane, two-way traffic along SW Stafford Road between Pattulo Way and Johnson Road. Maintain local access only within closure. Stage 4 Construction is to occur from June 1, 2026 through September 30, 2026.

(6) Stage 5 Construction – SW Stafford Road and SW Johnson Road closed to traffic from north of Pattulo Way to south of SW Childs Road. Maintain two-lane, two-way traffic along SW Stafford Road between Rosemont Road and SW Childs Road. Maintain local access only within closure. Stage 5 Construction is to occur from October 1, 2026 through October 31, 2026.

00220.40(e)(1) Closed Lanes - Replace this subsection, except for the subsection number and title, with the following:

Traffic Lanes may be closed on Stafford Road, Johnson Road, and Childs Road when allowed, shown, or directed during the following periods of time except as specified in 00220.40(e)(2):

Single Lane Closures – One Traffic Lane on Stafford Road, Johnson Road, and Childs Road may be closed during the following times:

- Daily, Monday through Friday, between 9:00a.m. and 3:00p.m.

SECTION 00221 - COMMON PROVISIONS FOR WORK ZONE TRAFFIC CONTROL

Comply with Section 00221 of the Standard Specifications modified as follows:

00221.01(b) Definitions – Add the following paragraph:

Orange Construction Fence – This material is synonymous with Work Zone Fencing.

00221.03 Traffic Safety and Operations - Replace the bullet that begins “When paving operations create…” with the following bullet:

- When paving operations create an abrupt or sloped edge drop off greater than 1 inch, protect traffic by installing signing according to the "2 Lane, 2 Way Roadway Overlay Area" detail shown on the Standard Drawings. Protect longitudinal and transverse Pavement joints by placing and maintaining an asphalt concrete wedge according to 00221.07(c)(1).

00221.07(c)(1) Paving - Replace this subsection, except subsection number and title, with the following:

When the longitudinal joint is greater than 1 inch in height, install additional TCD according to 00221.03. Complete the placing of ACP and construction of paving joints according to 00735.48, 00735.49, 00743.45, 00744.44, 00744.45, 00745.47, and 00745.48, as applicable.

Add the following subsection:

00221.31 Traffic Control Meeting - All personnel who will directly supervise the traffic control must attend the traffic control meeting per Section 00180.42. Contractor to produce and distribute meeting minutes within seven (7) days following the meeting.

00221.80(a) Separate Items – Replace this subsection, except for the subsection number and title, with the following:

The quantities for work zone TCM and TCD will be measured according to 00222.80, 00224.80, 00225.80, 00226.80, 00227.80, and 00228.80.

00221.90(a) Pay Quantities – Replace this subsection, except for the subsection number and title, with the following:

The quantities for work zone TCM and TCD will be measured according to 00222.90, 00224.90, 00225.90, 00226.90, 00227.90, and 00228.90.

00221.90(b) Temporary Protection and Direction of Traffic - Delete the bullet that begins “Moving temporary barrier to and from Contractor’s stockpile areas”.

Replace the bullet that begins "When the Schedule of Items does not include …" with the following bullet:

- Preparing and signing the daily “Traffic Control Inspection Report”, when a TCS is not included in the Schedule of Items or when a TCS is not onsite for a work shift.

Add the following bullets to the end of the bullet list:

- Flaggers and flagging hours needed to complete the work.
- Duties required as the Traffic Control Supervisor.

SECTION 00222 – TEMPORARY TRAFFIC CONTROL SIGNS

Comply with Section 00222 of the Standard Specifications modified as follows:

00222.40(e) Temporary Sign Placement - Add the following to the end of the bullet list:

- Install two sign flag boards, as shown on the Standard Drawings, above the following detour and road closed advance warning signs, where applicable:
    - "DETOUR AHEAD", "DETOUR XXXX FT", "DETOUR X/X MILE" (W20-2) signs.
    - "ROAD CLOSED AHEAD", "ROAD CLOSED XXXX FT", "ROAD CLOSED X/X MILE" (W20-3) signs.

- Install the following warning signs for each new "STOP" sign installed in the intersection. Install a "Stop Ahead" (W31) symbol sign approximately 350 feet in advance of the "STOP" sign. Install a "NEW TRAFFIC PATTERN AHEAD" (W232) sign approximately

350 feet in advance of the "Stop Ahead" sign. Keep the "NEW TRAFFIC PATTERN AHEAD" signs in place 30 Calendar Days after installing the "STOP" sign.

- Install the following warning signs for each permanent "STOP" sign re-installed after the detour is removed. Uncover the "Stop Ahead" (W3-1) symbol sign in advance of the "STOP" sign where applicable. Install a "NEW TRAFFIC PATTERN AHEAD" (W23-2) sign approximately 350 feet in advance of the "Stop Ahead" sign or “STOP” sign if no “Stop Ahead” sign is present. Keep the "NEW TRAFFIC PATTERN AHEAD" signs in place 30 Calendar Days after re-installing the "STOP" sign.

- Install a "NEW TRAFFIC PATTERN AHEAD" (W23-2) sign approximately 350 feet in advance of the Childs Road and Stafford Road intersection, facing northbound, southbound, and eastbound incoming traffic.

- Install a "NEW TRAFFIC PATTERN AHEAD" (W23-2) sign approximately 350 feet in advance of the Johnson Road and Stafford Road intersection, facing northbound, southbound, and westbound incoming traffic.

- Keep the "NEW TRAFFIC PATTERN AHEAD" signs in place 30 Calendar Days after opening the roundabout at Childs Road and intersection at Johnson Road to all traffic.

- At least seven Calendar Days prior to each stage and road closure change, place one or more PCMS displaying a closure message using the PCMS Handbook or as directed:

00222.45 Temporary Electrical Signs – Add the following to the end of this subsection:

(e) Unintegrated Speed Feedback Assembly – Use the unintegrated speed feedback assembly as directed and as follows:

- Location to be determined by the Agency or Engineer.
- Speed feedback sign operation to be coordinated with Agency.
- Install per ODOT Detail DET4456.
- Speed Limit Sign (R2-1) shall match the road segment posted speed adjacent to the sign installation.
- Speed feedback components shall be per the Green Sheets.

00222.80 Measurement – Add the following item to this subsection:

(c) Detour Route Countermeasures – Temporary Detour Route countermeasures will be measured on the unit basis, where the devices are directed to be installed by the Agency or Engineer.

- Temporary turn restriction signs shall include a R3 series sign (up to 24”x24”), mounted on a wood post and a "NEW TRAFFIC PATTERN AHEAD" (W23-2) sign mounted on a wood post to be installed in advance of the intersection, set at a distance determined by the Agency or Engineer.
- Temporary detour route electrical signs will be measured on the unit basis, where the devices are directed to be installed within the duration of the detour timeframe.

00222.90 Payment – Add the following pay items:

	Pay Item	Unit of Measurement
(e)	Detour Route Countermeasures, Signs	Each
(f)	Detour Route Countermeasures, Speed Feedback	Each
(g)	Detour Route Countermeasures, PCMS	Each

Items (e), (f), and (g), include furnishing, mounting, operating, moving, and removing signs and supports, regardless of whether the signs are mounted on supports, trailers, vehicles, or Equipment.

SECTION 00223 - WORK ZONE TRAFFIC CONTROL LABOR AND VEHICLES

Comply with Section 00223 of the Standard Specifications modified as follows:

00223.80(a)(1) Traffic Control Supervisor - Replace this subsection, except for the subsection number and title, with the following:

No measurement of quantities will be measured for Traffic Control Supervisor.

00223.80(b)(1) Flaggers - Replace this subsection, except for the subsection number and title, with the following:

No measurement of quantities will be measured for Flaggers.

00223.90 Payment - Replace this subsection, except for the subsection number and title, with the following:

No payment for work under this Section will be made. Work under this Section is considered incidental to Section 00221.90.

00223.91 Payment, Lump Sum or Incidental Basis - Replace this subsection, except for the subsection number and title, with the following:

When the Contract indicates payment for Work under 00221.98 Payment, Method “B” - Lump Sum Basis or 00221.99 Payment, Method “C” - Incidental Basis, no separate or additional payment will be made for Work performed under this Section. Payment will be included in payment according to 00221.98 or 00221.99.

SECTION 00224 - TEMPORARY TRAFFIC CHANNELIZING DEVICES

Comply with Section 00224 of the Standard Specifications modified as follows:

00224.46 Pavement Edge Delineation - Replace the paragraph that begins “Place tubular or conical markers…” with the following paragraph:

Place tubular or conical markers to delineate the edge of Pavement immediately after construction Work or paving operations create an abrupt or sloped edge drop-off greater than 1 inch in height along the right hand or left hand Shoulder.

SECTION 00225 - TEMPORARY PAVEMENT MARKINGS

Comply with Section 00225 of the Standard Specifications modified as follows:

00225.40 Temporary Pavement Markers - Replace the paragraph that begins "Unless otherwise shown..." and the three bullets with the following paragraphs and bullets:

Install temporary flexible overlay pavement markers for temporary centerline marking as follows:

- Place and maintain one temporary flexible overlay pavement marker on 40 foot spacing in tangent and curve sections except as below.
- Place and maintain one temporary flexible overlay pavement marker on 20 foot spacing in curved alignment sections identified by a speed rider displaying less than the posted speed and channelization areas.

Establish alignment for placing the temporary flexible overlay pavement markers as follows:

- Control markers at:
  - 200 foot intervals on tangents
  - 50 foot intervals on curves
  - 40 foot intervals on curves with speed rider
- Use string line or other appropriate means to maintain proper alignment of the markers. Adjust placement to avoid straddling a longitudinal joint, while maintaining a suitable alignment of markers.
- Remove and replace misaligned markers at no additional cost to the Agency.

00225.42(b) Wearing Course - Replace the bullet that begins “For left hand solid lines…” with the following bullet:

- For left hand solid lines and skip lines striping, use temporary removable tape or pavement markers.

SECTION 00240 - TEMPORARY DRAINAGE FACILITIES

Comply with Section 00240 of the Standard Specifications modified as follows:

00240.40 Construction – Replace the sentence that reads “Determine the actual size, strength and type of facility needed.” with the following sentence:

Determine the actual location, size, strength and type of facility needed.

00240.80 Measurement – Add the following paragraphs to the end of this subsection:

The estimated quantities of Materials required for the temporary drainage facilities are:

Item	Quantity
12 Inch Storm Sewer Pipe, 10 Ft. Depth	40 Feet
Loose Riprap, Class 50	4 Cubic Yard

SECTION 00245 - TEMPORARY WATER MANAGEMENT

Section 00245, which is not a Standard Specification, is included in this Project by Special Provision.

Description

00245.00 Scope - This Work consists of furnishing, installing, operating, maintaining, and removing temporary water management facilities in regulated Work areas.

00245.01 Abbreviations:

TWM - Temporary Water Management
TWMF - Temporary Water Management Facility
TWMP - Temporary Water Management Plan

00245.02 Definitions:

Temporary Water Management Facility - A TWMF that conveys water around or through Work areas, removes water from Work areas, and treats and discharges water at locations outside Work areas.

00245.03 Temporary Water Management Plan - The Agency TWMP is a concept plan. 28 Calendar Days before beginning Work in regulated Work areas, submit stamped Working Drawings of a Contractor-developed TWMP, according to 00150.35, based on either the Agency's concept plan or an independent plan that meets water quality and environmental guideline requirements and does not negatively affect neighboring properties or water rights.

Include the following minimum information in the TWMP:

- The sequence and schedule for dewatering and re-watering. This sequence and schedule must include when to contact the Engineer prior to dewatering and re-watering.
- How the Work area is isolated from the active stream flow upstream, through, and downstream.
- How the stream flow is routed and conveyed around or through the isolated Work area.
- How fish passage is provided around the Work area, if required.

- How the isolated Work area is de-watered.
- How the pumped water is treated, if necessary, before it is discharged downstream.
- Piping design assumptions for diameter, slope and flowrate.
- Description of all construction stages, including appropriate contact points for each stage.
- A list of onsite backup Materials and Equipment.
- Provide the name of the TWM Subcontractor (if applicable) and Contractor's superintendent, and their 24hour contact phone number 10 Days before the pre-Work meeting. If changes in the appointment of the TWM Subcontractor or Contractor's superintendent occur during the term of the Contract, provide written notice to the Engineer within 5 Calendar Days of the change.
- Calculations of water withdraw pump's capacity.
- Details of the proposed water intake screen used to isolate in-water Work area and how it meets the requirements of 00290.34(c)(3).

Any change to the TWMP during construction requires approval prior to implementation.

Obtain the Engineer's written approval before beginning Work in in-water Work areas.

00245.04 Pre-Work Meeting - Before beginning any TWM Work, attend a pre-work meeting at the Project Site with the Engineer no more than 8 Calendar Days prior to implementation of TWM. Required meeting attendees include:

- Engineer
- Contractor
- TWM Subcontractor (if applicable)
- Agency Environmental Coordinator or their appointed representative

The pre-Work meeting agenda typically includes the method of TWM, the TWMP, fish salvage plan and strategy, describe environmental risks, turbidity monitoring, energy dissipation, dewatering and re-watering plan and strategy, site clean-up expectations, and the circumstances under which contacting the Engineer is required.

Materials

00245.10 Materials - Furnish Materials meeting the following requirements:

Dewatering Bag	02320.20
Pipe	00445.11
Plastic Sheeting	00280.14(a)
Riprap	00390.11
Sandbags	00280.15(a)
Water Intake Screening	00290.34(c)

Furnish pumps that are:

- Selfpriming.

- Equipped with a variable speed governor.
- Equipped with a power source.
- Able to pump water that contains soft and hard solid.

Construction

00245.40 Fish Removal - Qualified Agency, ODFW, or ODOT consultant biologists will remove fish and other aquatic organisms from the isolation Work areas. Coordinate fish removal with the Engineer at least 28 Calendar Days before beginning Work in regulated Work areas. Allow access into the isolation Work areas before, during and after installation of the TWMF to perform the specified tasks as follows:

- **Before Installation of TWMF** - Before any in-water Work, including installing TWMF, qualified personnel will remove fish and other native aquatic organisms from within the proposed isolated Work area.

- **After Installation of TWMF** - After installing TWMF and the reduction of the water level through the isolated Work area has begun, qualified personnel will remove all fish and aquatic organisms as the water level is reduced. Do not completely dewater the isolation area until all fish and aquatic organisms have been removed.

00245.41 Installation - During installation of the temporary water management facility, maintain a downstream water flow rate of at least 50 percent of the upstream water flow rate.

00245.42 Operation - Operate temporary water management as follows:

- Protect fish and fish habitat according to 00290.34.
- Maintain and control water flow downstream of the isolated Work area for the duration of the diversion to prevent downstream de-watering.
- Clean, maintain and repair water intake screening to ensure adequate flows and protection of aquatic organisms.
- In the event of containment failure immediately notify the Engineer so arrangements can be made to remove fish and aquatic organisms from the isolation Work areas prior to the continuation of Work within the ordinary high water limits.
- When using a pump for bypassing water during temporary water management, physically monitor the pump in-person and maintain the pump at all times including non-work hours. Provide a back-up pump on-site and ready for use as necessary. Provide the Engineer with a daily report documenting monitoring activities.

Maintenance

00245.60 Maintenance - Monitor water turbidity according to 00290.30(a)(8).

Finishing and Cleaning Up

00245.70 Removal - Prior to removal of the TWMF, obtain approval from the Engineer after completion of all Work within ordinary high water limits. Remove the TWMF and re-water and restore the stream flow. Maintain downstream water flow during removal of the facility. Staged or metered re-watering may be required and will be determined by the Engineer.

Measurement

00245.80 Measurement - No measurement of quantities will be made for temporary water management facilities.

The estimated quantities of Materials required for the temporary water management facility are:

Item	Quantity
Pipe*	700 Feet
Plastic Sheeting	30 Square Yard
Loose Riprap, Class 50	4 Cubic Yard
Sandbags	600 Each
Dewatering Sediment Bag*	1 Each
Water Intake Screen*	2 Each

*Note: Sizes to be determined by Contractor

The quantities of bypass pump monitoring will not be measured and is incidental to temporary water management activity.

Turbidity monitoring will be measured according to 00290.80.

Payment

00245.90 Payment - The accepted quantities of temporary water management facilities will be paid for at the Contract lump sum amount for the item "Temporary Water Management Facility".

The location of the facility will be inserted in the blank.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

Turbidity monitoring will be paid for according to 00290.90.

No separate or additional payment will be made for TWMP, maintaining, operating, monitoring, moving, or removing the facility.

SECTION 00280 - EROSION AND SEDIMENT CONTROL

Comply with Section 00280 of the Standard Specifications modified as follows:

00280.00 Scope - Replace the paragraph that begins "This Work also consists of providing temporary …" with the following paragraph:

This Work also consists of providing temporary erosion and sediment control (ESC) measures and furnishing, installing, moving, operating, maintaining, inspecting, and removing ESC throughout the Project area according to the Standard Drawings, the erosion and sediment control plan (ESCP) with an environmental management plan (EMP), when required for the Project, the Specifications, or as directed, until the site is permanently stabilized. Included also is the monitoring of weather, of stormwater and receiving waters, the reporting of monitoring observations, the reporting of corrective actions (when necessary) and the updates and revisions of the ESCP, including ESCP cover sheet, necessary to keep it representative of current site conditions and compliant with the 1200-CA Permit.

Add the following paragraph to the end of this subsection:

The Agency's NPDES 1200-CA Permit is applicable to the Project.

00280.02 Definitions -

Replace the sentence that begins "**Temporary Stabilization"** with the following sentence:

Temporary Stabilization - Measures or methods necessary to prevent erosion until permanent stabilization measures are in place and established.

Replace the sentence that begins "**Wet Season Work"** with the following sentence:

Wet Season Work – Wet Season Work is defined as Work between January 1 and December 31.

00280.04 Erosion and Sediment Control Plan on Agency Controlled Lands - Replace the bullets with the following bullets:

- When using the Agency's ESCP with only modifications required to keep the ESCP current during construction, submit a written notification indicating the Agency's ESCP is used without modifications prior to construction.
    - Prior to beginning construction, edit the ESCP to provide a list of all contractors working on the site.
    - Prior to beginning construction edit the ESCP cover sheet to list all personnel by name and position who are responsible for the installation and maintenance of stormwater control measures including their individual responsibilities and certifications. Keep list current for the duration of the project.
- When using a Contractor modified version of the Agency's ESCP, include the following:
    - Proposed ESCP showing all ESC Work, and quantities of Work.
    - An EMP that addresses pollution prevention and control of potentially contaminated sites or Materials.
    - Implementation schedules for the ESCP
    - Plans for each phase of Contractor's Work
    - Names and positions of all personnel engaged in construction activities.
    - Names and positions of all personnel responsible for the installation and maintenance of stormwater control measures.
    - Information required under 1200-CA permit.

- When using a Contractor developed ESCP, develop and stamp the ESCP by a professional with one of the following credentials. Include their name and credentials in the ESCP. The ESCP preparer shall be one of the following:
  - Oregon Registered Professional Engineer,
  - Oregon Registered Landscape Architect; or
  - Oregon Certified Engineering Geologist
- When using a Contractor developed ESCP where engineered facilities such as sedimentation basins or diversion structures for erosion and sediment control are required, prepare and stamp the ESCP by one of the following:
  - Oregon Registered Professional Engineer; or
  - Oregon Registered Landscape Architect.
- When using a Contractor developed ESCP, provide plans for each phase of Contractor's work implementation schedule and information required under the 1200CA permit and as directed in ODOT's Erosion Control Manual.

00280.15(d) Temporary Slope Drains – Replace this subsection, except subsection number and title, with the following:

Furnish either plastic pipe and flared end sections meeting the requirements of Section 02415 or metal pipe and flared end sections meeting the requirements of Section 02420.

00280.15(f)(1) Filter Sock Material - Add the following sentence to the end of this subsection:

Furnish filter sock Material with a diameter of 18 inches.

00280.16(i) Concrete Washout – Replace this subsection, except subsection number and title, with the following:

Furnish impermeable, spill resistant, leak proof concrete washout basin of sufficient size and quantity to retain all concrete wash water and concrete waste developed during construction, meeting the following requirements:

(1) Field fabricated washout basin as shown and consisting of the following:

- **Straw Bales** - Standard rectangular straw bales, with straw Material according to 01030.15, except no certification is required.
- **Plastic Sheeting** - Minimum 10mil thick polyethylene plastic sheeting.
- **Staples** - 1/8inch diameter steel wire staples. 2inch "U" width with a length of 6 inches minimum

(2) Manufactured basins sufficiently durable to be removed intact, or cleaned of content without releasing concrete material or concrete washout water.

00280.30 Erosion and Sediment Control Manager - Replace this subsection, except for the subsection number and title, with the following:

If the Agency's NPDES 1200-CA Permit is applicable to the Project, designate and provide an ESCM who possesses a valid ODOT ESCM certificate or who has successfully completed an erosion control training that is acceptable to the Engineer.

The ESCM duties include:

- Manage and ensure proper implementation of the ESCP.
- Accompany the Engineer during field review of the ESCP prior to construction activities.
- Monitor rainfall, snow melt and runoff on and in the vicinity of the Project Site.
- Monitor water quality in receiving streams in the vicinity of the Project Site.
- Monitor water in sediment traps receiving runoff from soils amended with cementitious material for acidity or alkalinity.
- Monitor locations identified in Section 00294 for compliance.
- Inspect ESC and monitor receiving waters on active construction site on initial date and every 14 Days for effective functioning.
- Inspect ESC on inactive sites every 14 Days for effective functioning.
- Inspect ESC for effective functioning and monitor receiving waters, on all active and inactive sites at least within 24 hours of rainfall events sufficient to result in runoff from the Project Site.
- Ensure that ESC are regularly cleaned and maintained.
- Mobilize crews to make immediate repairs to ESC or install additional ESC during working and non-working hours when ESC is not effectively functioning.
- Record actions taken to clean up discharged sediment.
- Report potential permit violations to the Agency immediately upon discovery.
- Repair conditions that caused permit violations and prepare submittals for corrective actions that document repairs for Agency review and submittal to regulatory agencies.
- Update the ESCP monthly and within 7 Days after changes or major ESC modifications are implemented in the field.
- Submit ESCP revisions in electronic format, to Engineer within 30 Days after making revisions.
- Prepare a contingency plan in preparation for emergencies and for the periods between October 1 and May 31.
- Accompany the Engineer on inspections and, if required, on inspections by representatives of regulating agencies. If any of the following occur, revise the ESCP to reflect the change(s) within 7 Days.
    - Changes to the construction plans that impact erosion and sediment control measures;
    - Changes to the stormwater control BMPs, their location, maintenance required, and any other revisions necessary to prevent erosion and control sediment runoff;
    - An increase in the area impacted by construction activities;
    - Other activities at the site that are no longer accurately reflected in the ESCP. This includes changes made in response to corrective actions triggered;
    - To reflect areas on the site map where operational control has been transferred (and the date of transfer) since initiating permit coverage;

- If inspections by DEQ determine that ESCP revisions are necessary for compliance with the 1200-CA permit;
- Where DEQ determines it is necessary to install or implement additional controls at the site in order to meet the requirements of the 1200-CA permit. Include the following in the ESCP:
  - A copy of any correspondence describing such measures and requirements; and
  - A description of the controls to be used to meet such requirements.
- Change of Subcontractors that engage in construction activities on site, and the areas of the site where the Subcontractor(s) engage in construction activities;
- Change of any personnel (by name and position) that are responsible for the design, installation and maintenance of stormwater control measures;
- Change of the certified erosion and sediment control inspector, or of their contact information and any applicable certification and training experience;
- To reflect any revisions to applicable federal, state, tribal, or local requirements that affect the stormwater controls implemented at the site; and
- If a change in chemical treatment systems or chemically enhanced stormwater control is made, including use of a different treatment chemical, different dosage rate, or different area of application as applicable. Furnish temporary sediment trap as shown on drawings, stamped and signed by licensed engineer.

Submit revised ESCP to Engineer for signature by licensed professional (see 00280.04) and submission to DEQ when changes are made for the following reasons:

- Part of a corrective action requirement;
- An increase or decrease in project size;
- An increase or decrease in size or location of disturbed areas;
- Changes to BMPs, such as type, design or location;
- Change of the ESCM.

Add the following subsection

00280.41(e) Buffers - Retain and preserve buffer zones of natural, undisturbed vegetation, 50 feet in width between Work and Waters of the State. Where 50 foot buffers are not attainable, provide erosion, runoff and sediment control BMPs with effectiveness equivalent to a 50 foot buffer. Identify and mark buffer zones with flagging, construction fencing or other readily identifiable means.

00280.46(a) Construction Entrances - Add the following to the end of this subsection:

Construct the construction entrances as shown or directed.

00280.46(h) Temporary Sediment Trap - Add the following paragraph to the end of this subsection:

Where location of Temporary Sediment Trap is used post-construction for water quality treatment, storage or infiltration, remove sediment and soil to a depth of 18” and replace to finish grade with material approved by engineer.

00280.46(i) Concrete Washout - Add the following paragraph to the end of this subsection:

Locate concrete wash basins and concrete waste disposal to prevent stormwater that has been in contact with concrete wash or waste concrete from contaminating Waters of the State or stormwater inlets or conveyances. Handle wash water as waste. Do not dispose of concrete wash water or wash out concrete trucks or tools onto the ground, or into storm drains, open ditches, streets, or streams.

00280.48 Emergency Materials - Add the following paragraphs after the paragraph that begins "Provide, stockpile, and protect...":

Provide and stockpile the following emergency Materials on the Project site:

Item	Quantity
Certified Weed-Free Straw Bales	20 Each
Plastic Sheeting	200 Square Yards

00280.62 Inspection and Monitoring - Replace this subsection, except for the subsection number and title, with the following:

Perform site inspection, complete all applicable parts of the ODOT Erosion Control Monitoring Form, and submit the form to the Agency as follows:

- On initial day of construction activity
- Every 7 days
- 24 hours after any rainfall event or snow melt event that results in runoff, including weekends and holidays.
- When directed by the Engineer

00280.80(c) Length Basis – Add the following to the end of the bullet list:

- Orange construction fence will be measured along the long axis.

00280.90 Payment – Add the following Pay Item to the end of the Pay Item list:

Pay Item	Unit of Measurement
(h) Orange Construction Fence	Foot

Item (h) includes furnishing, placement, equipment, labor, and incidentals necessary to complete the work as specified.

SECTION 00290 - ENVIRONMENTAL PROTECTION

Comply with Section 00290 of the Standard Specifications modified as follows:

Add the following subsection:

00290.30(a)(7) Water Quality:

- Do not discharge contaminated or sediment-laden water, including drilling fluids and waste, or water contained within a work area isolation, directly into any waters of the State or U.S. until it has been satisfactorily treated (using a best management practice such as a filter, settlement pond, bio-bag, dirt-bag, or pumping to a vegetated upland location).
- Do not use permanent stormwater quality treatment facilities to treat construction runoff unless prescribed by an ESCP approved under Section 00280.
- If construction discharge water is released using an outfall or diffuser port, do not exceed velocities more than 4 feet per second, and do not exceed an aperture size of 1 inch.
- Do not use explosives under water.
- Implement containment measures adequate to prevent pollutants or construction and demolition materials, such as waste spoils, fuel or petroleum products, concrete cure water, silt, welding slag and grindings, concrete saw cutting by-products and sandblasting abrasives, from entering waters of the State or U.S.
- Implement containment measures adequate to prevent flowing stream water from coming into contact with concrete or grout within the first 24 hours after placement.
- Do not end-dump riprap into the waters of the State or U.S. Place riprap from above the ordinary high water line.
- Cease Project operations under high flow conditions that may result in inundation of the Project area, except for efforts to avoid or minimize resource damage.
- The Engineer retains the authority to temporarily halt or modify the Work in case of excessive turbidity or damage to natural resources.
- If Work activities violate permit conditions or any requirement of this subsection, stop all in-water work activities and notify the Engineer.

Add the following subsection:

00290.30(a)(8) Meter Turbidity Monitoring - In addition to any turbidity monitoring required by 00280.62(c) to comply with NPDES 1200 series requirements, monitor turbidity using a turbidity meter every two hours during in-water work according to the following:

- Use a turbidity meter that has been maintained and calibrated according to the manufacturer's specifications.
- Measure stream turbidity before beginning each day's in-water work to establish pre-construction turbidity levels.
- Measure upcurrent and downcurrent turbidity at two-hour intervals during in-water work and perform work based on turbidity measurements according to the following:
    - Take upcurrent samples at a location representative of background turbidity approximately 100 feet from the in-water work area.
    - Take downcurrent samples at a location approximately 100 feet from the in-water work area at approximately mid-depth of the water body and within any visible turbidity plume.

- If the downcurrent reading is less than 5 nephelometric turbidity units (NTU) higher than the upcurrent reading, continue to work and take readings every two hours.
- If the downcurrent reading is greater than or equal to 5 and less than 30 NTU higher than the upcurrent reading, modify work procedures and repair or implement best management practices (BMP), continue work, and continue to take readings every two hours. If after four hours the downcurrent reading is still greater than or equal to 5 NTU higher than the upcurrent reading, stop all inwater work and repair or implement additional BMP. Resume inwater work activities only after the downcurrent reading is less than 5 NTU above the upcurrent reading.
- If the downcurrent reading is greater than or equal to 30 and less than 50 NTU higher than the upcurrent reading, modify work procedures, repair or implement BMP and continue work. If, at the subsequent two-hour reading, the downcurrent reading is still more than 30 NTU higher than the upcurrent reading, stop all inwater work and repair or implement additional BMP. Resume inwater work activities only after the downcurrent reading is less than 5 NTU above the upcurrent NTU reading.
- If the downcurrent reading is 50 NTU or more higher than the upcurrent reading, stop all inwater work, repair or implement additional BMP, and inform the Agency. Resume inwater work activities only after the downcurrent reading is less than 5 NTU above the upcurrent NTU, as determined by continued readings made at least every two hours, or the next day's initial turbidity reading.
- Document all turbidity monitoring observations on form 734-2755, “Turbidity Monitoring Report”, or another form approved by the Agency. Submit reports to the Engineer weekly during in-water work and keep copies of the reports at the Project Site.

00290.32 Noise Control – Replace the first bullet with the following:

- Do not operate equipment or perform construction activities within 1,000 feet of an occupied dwelling on Sundays or legal holidays, or between the hours of 9:00 p.m. and 7:00 a.m. on other days, without the approval of the Engineer.

00290.34 Protection of Fish and Fish Habitat - Add the following paragraph:

Meet with the Agency Biologist, Resource Representative, Engineer, and inspector on site, before moving equipment on-site or beginning any work, to ensure that all parties understand the locations of sensitive biological sites and the measures that are required to be taken to protect them.

00290.34(a) Regulated Work Areas - Add the following to the end of this subsection:

The regulated work area is the area at or below the ordinary high water (OHW) elevation shown on the plans. Additional ‘No Work Zones’ are indicated on the erosion control plans.

Perform work within the regulated work area only during the in-water work period. The in-water work period is from July 15 thru September 30.

The total volume of material filled or discharged into waters of the State and waters of the U.S. shall not exceed the cubic yards identified in the applicable permitting documents.

The total volume of material excavated from the waters of the State and waters of the U.S. shall not exceed the cubic yards identified in the applicable permitting documents.

Review and comply with the quantities identified within the applicable permitting documents furnished by the Agency.

Submit a schedule to complete all work within the regulated work area within the in-water work period at least 10 days prior to the preconstruction conference.

Add the following subsection:

00290.34(c) Aquatic Species Protection Measures Required by Environmental Permits:

(1) General Requirements:

- Do not install fish ladders (for example: pool and weirs, vertical slots, fishways) or fish trapping systems.
- Do not apply surface fertilizer within 50 feet of any stream channel.

Use heavy equipment as follows:

- Choice of equipment must have the least adverse effects on the environment (for example: minimally sized, low ground pressure).
- Secure absorbent material around all stationary power equipment (for example: generators, cranes, drilling equipment) operated within 150 feet of wetlands, waters of the State, waters of the U. S., drainage ditches, or water quality facilities to prevent leaks, unless suitable containment is provided to prevent spills from entering waters of the State or waters of the U.S.
- Do not cross directly through a stream for construction access, unless shown or approved. If shown or approved, cross perpendicular to the stream and do not block stream flow. When a crossing is no longer needed, completely remove the crossing and restore the soils and vegetation to the original condition.
- Store fuel and maintain all equipment in staging areas that are at least 150 feet away from any waters of the State, waters of the U.S., or storm inlet or on an impervious surface that is isolated from any waters of the State, waters of the U.S., or storm inlet.
- If temporary access roads are needed within 150 feet of any body of water, use existing routes unless new routes are shown or approved.
- Before beginning work on temporary access routes that are not shown, submit a proposal to the Engineer for approval.

(2) Work Area Isolation - Provide work isolation according to Section 00245. Provide safe passage around or through the isolated work area for adult and juvenile migratory fish unless passage did not previously exist.

(3) Water Intake Screening - Install, operate, and maintain fish screens on each water intake used for project construction, including pumps used to isolate an in-water work area. When drawing or pumping water from any stream, protect fish by equipping intakes

with screens having a minimum 27 percent open area and meeting the following requirements:

- Perforated plate openings shall be 3/32 inch or smaller.
- Mesh or woven wire screen openings shall be 3/32 inch or smaller in the narrowest direction.
- Profile bar screen or wedge wire openings shall be 1/16 inch or smaller in the narrow direction.

Choose size and position of screens to meet the following criteria in Table 00290-1:

Table 00290-1

Type	Approach Velocity [1] (Ft./Sec.)	Sweeping Velocity [2] (Ft./Sec.)	Wetted Area of Screen (Sq. Ft.)	Comments
Ditch Screen	≤ 0.4	Shall exceed approach velocity	Divide max. water flow rate (cfs) by 0.4 fps	If screen is longer than 4 feet, angle 45° or less to stream flow
Screen with proven self-cleaning system	≤ 0.4	–	Divide max. water flow rate (cfs) by 0.4 fps	–
Screen with no cleaning system other than manual	≤ 0.2	–	Divide max. water flow rate (cfs) by 0.2 fps	Pump rate 1 cfs or less
[1] Velocity perpendicular to screen face at a distance of approximately 3 inches [2] Velocity parallel to screen				

Provide ditch screens with a bypass system to transport fish safely and rapidly back to the stream.

(4) Special Aquatic Habitats - The following exploration or construction activities are not allowed in special aquatic habitats:

- Use of pesticides and herbicides, unless allowed according to Section 01030.
- Use of short pieces of plastic ribbon to determine flow patterns.
- Temporary roads or drilling pads built on steep slopes, where grade, soil type, or other features suggest a likelihood of excessive erosion or slope failure.
- Exploratory drilling in estuaries that cannot be conducted from a work barge, or an existing bridge, dock, or wharf.
- Installation of a fish screen on any permanent water diversion or intake that is not already screened.
- Drilling or sampling in an EPA-designated Superfund Site, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified

by historical information, U. S. Army Corps of Engineers representative, or the Agency.

(5) Site Restoration - Restore damaged streambanks to a natural slope, pattern, and profile suitable for establishment of permanent woody vegetation unless precluded by pre-project conditions (for example: natural rock substrate):

- Replant all damaged streambanks before the first April 15 following construction.
- If use of large wood, native topsoil, or native channel material is required for the site restoration according to the roadside development plans, stockpile all large wood, native vegetation, weed-free topsoil, and native channel material displaced by construction. Cut trees or large wood and trees into pieces of no less than 20 feet in length, or as shown on the roadside development plans or as directed. Stockpiled native wood and vegetation remain the property of the Agency.
- Stabilize all disturbed soils, including obliteration of temporary access roads, following any break in work unless construction will resume in 4 Calendar Days.

(6) Surface Water Diversions - Surface water may be diverted to meet construction needs other than work area isolation, consistent with Oregon law, only if water from sources that are already developed, such as municipal supplies, small ponds, reservoirs, or tank trucks, is unavailable or inadequate, and meeting the following conditions:

- When alternative surface sources are available, divert from the stream with the greatest flow.
- Install, operate, and maintain a temporary fish screen.
- Do not exceed a pumping rate and volume of 10 percent of the available flow. For streams with less than 5 cubic feet per second, do not exceed drafting of 18,000 gallons per day. Do not use more than one pump for each site.

(7) Ditch and Culvert Cleaning - Complete ditch cleaning, culvert and trash rack cleaning by working from the top of bank, unless work area isolation would result in less habitat disturbance.

- Do not work more than 20 feet upstream or downstream the culvert or trash rack.
- Remove only the minimum amount of wood, sediment, or other natural debris necessary to maintain the facility's function, without disturbing spawning gravel or changing the configuration of the original ditch, unless the new configuration is part of the project design.
- Place all large wood, cobbles, and gravels recovered from during culvert and trash rack cleaning downstream from the structure.
- Complete drift removal in the following priority, as directed:

    - Pull and release whole logs or trees downstream.
    - Pull whole logs and trees and place in the riparian area, as directed.
    - Remove whole logs or trees only if roadside development plans have been developed for replacement in-kind.
    - Pull, cut only as necessary, and release logs and trees downstream.

(8) Injured Fish Notification - If a dead or injured fish is found in the project area, immediately notify the Agency. If the injured fish is in a location where further injury or stress may take place, attempt to move the fish to a safer location, if one is available, near the capture site while keeping the fish in the water and reducing its stress as much as possible. Do not disturb the fish after it has been moved. If the fish is dead or dies while being captured or moved, save the fish and any tags. The Agency will notify appropriate regulatory agencies about the injured or dead fish and provide additional direction to the Contractor.

00290.36(a) Migratory Birds - Add the following to the end of this subsection:

Bird management activities to comply with the Migratory Bird Treaty Act (16 U.S.C. 703 712) will be performed by Clackamas County and its permitted agents, as documented in the Clackamas County MBTA permit, Section J. Ensure that the County and its permitted agents have access to the project area, including existing work platforms, as needed to prevent migratory bird nesting. Nesting prevention may include daily bird harassment and the installation and maintenance of devices that exclude birds.

Do not disturb migratory bird nesting habitat (shrubs, trees, and structures), or clear vegetation from March 1 to September 1 of each year without prior written approval from the Engineer. Notify the Engineer, in writing, a minimum of 10 calendar days prior to starting activities that could harm nesting birds.

(1) Bird Management - Submit a migratory bird protection plan and implementation schedule for review and approval at least 10 Calendar Days before the pre-construction conference. Do not begin Work until the migratory bird protection plan and implementation schedule are approved.

The migratory bird protection plan shall include the following elements:

(a) The name of the individual who will oversee bird management activities for the project and a summary of their qualifications. This individual must have a biology or related natural resources degree and a minimum of 2 years of work experience identifying nesting birds, preferably in the Pacific Northwest.

(b) A description of measures to prevent birds from nesting on structures or vegetation at the project site, from March 1 to September 1 of each calendar year, that could result in project conflicts; include the timing, intensity and location of the activities. If exclusionary devices will be used (e.g., netting), install them prior to March 1 and remove them at the completion of the project or by September 1 each calendar year, whichever comes first. Include how exclusionary devices will be installed and document their inspection schedule. Exclusionary devices must be inspected daily to ensure their functionality. Repair damaged exclusionary devices as soon as the damage is discovered. Document inspections and maintain documentation on site.

(c) A description of measures to avoid disturbing active migratory bird nests if they are encountered. The typical avoidance measure is to move project activities away from the active nest until the young have left the nest.

00290.41 Protection of Waters of the U.S. or State - Add the following to the end of this subsection:

Permits have been obtained for this project from the US Army Corps of Engineers (Corps) and the Department of State Lands (DSL). Keep a copy of Corps and DSL permits at the project site during construction. Changes to the project that may increase the amount of fill placed or material removed in waters of the U.S. or State, or the acreage of waters impacted are not authorized. The following waters of the U.S. or State are present and have been determined to be unavoidable as indicated in Table 00290-2:

Table 00290-2
D

Impact Waters of the US or State	Removal Volume (cu yds.)	Fill Volume (Cu yds)	Station	Duration of Impact (Temporary or Permanent)	Area of impact (Acres)
Pecan Creek / Waters 1	240	2	S 33+00 LT	Permanent	0.11
Pecan Ck. Tributary / Waters 2	154	2	S 31+50 LT	Permanent	0.08
Wetland A	1	36	S 36+00 LT	Permanent	0.07
Wetland B	1	25	S 39+00 RT	Permanent	0.02
Ditch A	317	190	S 47+00 LT	Permanent	0.20
Ditch B	347	208	S 13+00 RT	Permanent	0.22
Ditch C	600	360	S 27+00 RT	Permanent	0.38
Ditch D	198	119	S 37+00 RT	Permanent	0.12
Ditch E	12	10	S 40+00 RT	Permanent	0.01

00290.90 Payment - Add the following paragraph(s) to the end of this subsection:
The work containment plan will be paid for at the Contract lump sum amount for the item "Work Containment Plan".

Payment will be payment in full for furnishing all Materials, Equipment, labor, and Incidentals necessary to complete the Work as specified. Payment includes providing and updating the Work Containment Plan.

The accepted quantities of turbidity monitoring will be paid for at the Contract lump sum amount for the item "Turbidity Monitoring".

Payment for turbidity monitoring will be payment in full for furnishing and placing all Materials and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate or additional payment will be made for work zone fencing.

SECTION 00305 - CONSTRUCTION SURVEY WORK

Comply with Section 00305 of the Standard Specifications modified as follows:

00305.05 3D Engineered Models - Replace the bullet that begins "A detailed outline and list of…" with the following bullet:

- An automated machine guidance (AMG) work plan containing a detailed outline, list of the Pay Items and Work that will be controlled by the 3D Construction Models, and a narrative outlining any differences between the Agency prepared 3D Engineered Models and the 3D Construction Models.

Delete the bullet that begins "A narrative outlining…"

SECTION 00310 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Comply with Section 00310 of the Standard Specifications modified as follows:

00310.90 Payment - Add the following to the end of this subsection:

No separate or additional payment will be made for removal or disposal Work included in Section 00330 according to 00310.02.

SECTION 00320 - CLEARING AND GRUBBING

Comply with Section 00320 of the Standard Specifications modified as follows:

00320.01 Areas of Work - Add the following to the bulleted list:

- Work with the Power Supplier according to Section 00150.50 for clearing within 10 feet of active lines.

SECTION 00330 - EARTHWORK

Comply with Section 00330 of the Standard Specifications modified as follows:

00330.02 Definitions – Add the following definitions:

Rock Excavation - Rock excavation shall consist of excavation of non-decomposed rock which, by actual demonstration, cannot in the Engineer's opinion, be reasonably excavated with a Caterpillar 345 DL with a rock bucket or similar approved equipment and exceeds one

cubic yard in volume. The Engineer reserves the right to waive the demonstration of the excavation of the material if it is deemed well defined rock by the Engineer.

The term “Rock Excavation” indicates a method or removal and not a geological formation.

Boulder Excavation – The removal, without drilling, blasting or splitting, of masses of Rock having one or more dimensions of three feet or greater, with an overall volume up to one cubic yard.

00330.03 Basis of Performance - Add the following paragraph to the end of this subsection:

Perform all earthwork under this Section except for Rock Excavation and Boulder Excavation on the excavation basis.

00330.14 Selected Granular Backfill - Delete the sentence that begins “Reclaimed glass meeting the requirements of Section 02695…”.

00330.15 Selected Stone Backfill - Delete the sentence that begins “Reclaimed glass meeting the requirements of Section 02695…”.

Add the following subsection:

00330.41(f) Rock Excavation – Where rock excavation as defined in this Section is required, remove the rock to excavate the material needed to develop the line, grade, and cross sections of the roadway section. Excavate and remove the overburden and expose the rock to allow the Engineer to measure the rock prior to removal.

If using explosives, comply with the requirements of 00170.94. Prior to blasting, obtain the approval of the Engineer and the appropriate permits. Provide all tools and devices required for loading and using explosives, blasting caps and accessories. When blasting rock in trenches, cover the area to be shot with blasting mats or other protective material to prevent the scattering of rock fragments outside of the excavation.

00330.41(a)(9) Excavation Below Grade - Delete subsection 00330.41(a)(9)(c).

00330.42(c)(1) General - Add the following paragraph to the end of this subsection:

Contractor shall construct the Childs Road embankment between Station ‘C’ 102+10 to Station ‘C’ 106+98 to roadway subgrade elevation over the full width of the proposed roadway and allow settlement of underlying layers to occur. The proposed embankment will act as a surcharge load and a settlement monitoring program shall be maintained for 4-8 weeks following the embankment and wall construction. Contractor shall install settlement plates, submit detail for approval, at a maximum 100 feet spacing along the center of the roadway widening embankment of Childs Road. Contractor shall survey settlement plate and embankment surface elevation at least two times a week for the first four (4) weeks following embankment/wall construction and then once a week through the remaining settlement period. Survey elevation information shall be provided to the County within three (3) days of collection.

00330.42(c)(3) Embankment Slope Protection - Add the following paragraph to the end of this subsection:

Construct the outer 12 inches of embankments with suitable materials to establish slope stabilization through permanent seeding. If suitable material is not available, provide suitable materials from a Contractor-provided source which conforms to the requirements of 00330.11 or 00330.13 and provides favorable conditions for germination of seed and growth of grass.

00330.81 Excavation Basis Measurement – Add the following to the end of this subsection:

The quantities of rock excavation and boulder excavation will be measured as follows:

(a) Rock Excavation - Rock excavation will be measured on the volume basis. Measurement will be of the actual dimensions of rock removed within the following limits:

• **Length -** Length will be the horizontal distance measured along the centerline of the roadway.

• **Width -** Width will be the width of the rock removed.

• **Depth -** Depth will be measured at 30-foot intervals, or as specified, along the centerline of the roadway. The depth will not be greater than 12 inches below the line, grade and cross section of the roadway section.

No separate measurement will be made for the following:

• Soft or disintegrated Rock.

• Hardpan or cemented gravel that can be removed with a hand pick or power-operated excavator or shovel.

• Loose, shaken, or previously blasted Rock or broken stone in Rock fillings or elsewhere.

• Rock outside of the minimum limits of measurement allowed, which may fall into the excavation.

(b) Boulder Excavation - Boulder excavation will be measured on the volume basis. Measurement will be made in the field by the Engineer after removal of each boulder from the excavation but prior to removal from the site. Each boulder removed will be measured for length, width, and height. The volume of each boulder will be determined as the product of 85 percent of each of the three measured dimensions.

00330.91(d) General Excavation - Delete the bullet that begins "Includes Unsuitable Material…".

00330.92 Kinds of Incidental Earthwork – Add the following to the bulleted list:

- Removal of cement treated base (CTB) and/or underlying concrete roadway encountered during excavation activities.
- Additional quantities of materials required due to settlement of the ground and required monitoring according to 00330.42(c)(1). Installation, protection, monitoring, and surveying of the settlement plates shall all be considered incidental.

00330.93 Excavation Basis Payment – Add the following pay items:

Pay Item	Unit of Measurement
(f) Rock Excavation	Cubic Yard
(g) Boulder Excavation	Cubic Yard

SECTION 00331 - SUBGRADE STABILIZATION

Comply with Section 00331 of the Standard Specifications.

SECTION 00350 - GEOSYNTHETIC INSTALLATION

Comply with Section 00350 of the Standard Specifications modified as follows:

00350.01 Definitions - Replace the sentence that begins "**Embankment Geotextile** - For installation…" with the following sentence:

Embankment Geotextile - Embankment geotextile is used as a reinforcement within embankments and as a separation and reinforcement under embankments.

Replace the bullet that begins "**Nonwoven Geotextile** - A textile…" with the following bullet:

- **Nonwoven Geotextile** A textile produced by bonding or interlocking of fibers by mechanical, heat or chemical means.

Replace the sentence that begins "**Riprap Geotextile** - For installation…" with the following sentence:

Riprap Geotextile - Riprap geotextile is used as a filter and separator behind or beneath riprap, Buttresses, inlays, shear keys and erosion control applications.

Replace the sentence that begins "**Subgrade Geotextile** - For installation…" with the following sentence:

Subgrade Geotextile - Subgrade geotextile is used as a separator and reinforcement on Subgrades and in other material separation applications.

00350.41(f)(5) Geotextile Placement - Replace the paragraph that begins “Slit wrinkles or folds …“ with the following paragraph:

Slit wrinkles or folds exceeding 1 inch and lay flat. Shingle-lap not more than 6 inches in the direction of the paving. Broom or squeegee to smooth the geotextile and pneumatic roll to maximize geotextile contact with the Pavement surface. Additional hand-placed sealant material may be required at laps as determined.

SECTION 00390 - RIPRAP PROTECTION

Comply with Section 00390 of the Standard Specifications modified as follows:

00390.01 Definitions - Add the following:

Planted Riprap Mixture - Specified classes of graded rock mixed with salvaged streambed material, native soil or topsoil, as approved by the Engineer, to fill voids and prepare riprap for planting.

00390.11 Riprap Requirements – Add the following paragraph to this subsection:

(d) Cuttings – Furnish willow cuttings for planted riprap mixture according to Section 01040 and 01091.

Add the following subsection:

00390.14 Ancillary Materials – Furnish materials meeting the following requirements:

Commercial Grade Concrete..... 00440
Metal Reinforcement..... 02510.10

00390.42 Filter Blanket Construction - Replace the sentence that begins “If required, place the filter…” with the following sentence:

Place the filter blanket on the prepared area to the full specified thickness in one operation, using methods which do not cause segregation.

00390.43 Riprap Backing - Delete this subsection.

Add the following subsection:

00390.44(f) Planted Riprap Mixture - Furnish and mix salvaged streambed material, native soil or topsoil with the specified class of riprap to form a homogeneous mass suitable for planting. Mix the soil and riprap prior to placement and then place in the prepared areas, finished to specified grade, with equipment and methods that do not cause segregation. Install planted riprap mixture in rows so that the buried ends of willow bundles contact native soil as shown.

Add the following subsection:

00390.45 Ancillary Items – Construct reinforced concrete endwalls where shown with Commercial Grade Concrete according to Section 00440. Cast endwalls in place using an approved commercial concrete bonding agent applied to all surfaces in contact with the endwall. Where endwalls are applied to PVC, first prepare the PVC surface for bonding to the concrete by applying a dense coating of clean mortar sand to the pipe using PVC solvent cement. After the cement has cured, apply an approved commercial bonding agent to the sand surface prior to placement of the concrete.

00390.80(a) Filter Blanket - Delete this subsection.

00390.80(b) Riprap Backing - Delete this subsection.

00390.80(c) Riprap – Add the following paragraph to this subsection:

No measurement of planted riprap mixture will be made. Measurement of individual constituents for planted riprap mixture will be made according to Section 01091.

Add the following subsection:

00390.80(e) Ancillary Items – No measurement for reinforced concrete endwalls will be made.

00390.90 Payment - Delete Pay Items (a) and (b) from the Pay Item list.

Add the following three paragraphs to this subsection:

Payment for filter blanket is incidental to items (c) and for planted riprap mixture.

Payment for planted riprap mixture will be made according to Section 01091.

Item (c) includes payment for Ancillary Items to construct reinforced commercial grade concrete endwalls.

SECTION 00405 - TRENCH EXCAVATION, BEDDING, AND BACKFILL

Comply with Section 00405 of the Standard Specifications modified as follows:

00405.02 Definitions – Replace the “Rock Excavation” definition with the following definition:

Rock Excavation - Rock excavation shall consist of excavation of non-decomposed rock which, by actual demonstration, cannot in the Engineer’s opinion, be reasonably excavated with a Caterpillar 345 DL with a rock bucket or similar approved equipment and exceeds one cubic yard in volume. The Engineer reserves the right to waive the demonstration of the excavation of the material if it is deemed well defined rock by the Engineer. The term “Rock Excavation” indicates a method or removal and not a geological formation.

Replace the “Boulder Excavation” definition with the following definition:

Boulder Excavation – The removal, without drilling, blasting or splitting, of masses of Rock having one or more dimensions of three feet or greater, with an overall volume up to one cubic yard.

00405.42 Rock and Boulder Excavation – Add the following to the end of this subsection:

Rock and boulder excavation associated with 156 Inch x 81 Inch Structural Plate Radius Arch construction is addressed separately in Section 00510.

SECTION 00415 - VIDEO PIPE INSPECTION

Comply with Section 00415 of the Standard Specifications modified as follows:

00415.22 Mainline Inspection Equipment with Laser Profiler - Replace this subsection, except for the subsection number and title, with the following:

Provide laser profiler, software and equipment according to 00415.20 and ASTM F3080.

00415.42 Post Installation Video Inspection - Replace this subsection, except for the subsection number and title, with the following:

Perform post construction video inspection according to 00415.40 and 00415.41. Video inspect the pipe interior no sooner than 30 Days after the trench backfill and compaction have been completed, and before any paving is performed. If the Contract duration does not permit a 30 Day waiting period the Engineer may adjust the duration period.

(a) Deflection Testing for Flexible Pipe - Perform post construction deflection testing for all flexible pipe including plastic, metal, and aluminum pipe using one of the approved following methods.

(1) Remote Video Inspection with Laser Profiler - Calibrate and perform deflection inspection according to ASTM F3080. Use video inspection equipment meeting the requirements of 00415.22.

(2) Manual Deflection Test - Use Equipment meeting the requirements of 00415.23.

In addition to 00415.41(b):

Measure the deflection of the pipe using either a metal or a fabric tape and read at least to the nearest 1/2 inch. Measure the smallest inside diameter three times for each pipe section in the run. Take the first measurement vertically from the crown to invert (12 o’clock to 6 o’clock positions). Take the second measurement by rotating 60 degrees from vertical (2 o’clock to 8 o’clock positions). Take the third measurement by rotating 120 degrees from vertical (4 o’clock to 10 o’clock positions). For all measurements, stretch tape to full extent across the inside of the pipe.

Calculate percent deflection using the following formula:

Percent Deflection = [(D1 - D2) ÷ D1] × 100

where:

D1 = Initial measurement according to AASHTO Nominal Diameter
D2 = Most deflected measurement in each pipe run after construction

00415.70 Video Inspection Recording and Written Inspection Report - Replace the title of this subsection with "**Video Inspection Recording and Inspection Report"**.

00415.70(a) Inspection Report - Replace this subsection, except for the subsection number and title, with the following:

Provide a written inspection report that includes each defect, deformity, and joint along with the distance from the inspection starting point. Provide still digital images in the report along with a reference and description of each defect, deformity and joint.

00415.70(b) Deflection Report - Replace this subsection, except for the subsection number and title, with the following:

For laser profiler provide an inspection report according to ASTM F3080.

If a manual deflection test was performed provide a written deflection inspection report that includes each deformity with the distance from the inspection starting point. Include in the report all measurements, calculations and still digital images and descriptions of each deformity.

00415.71 Corrections to Deficiencies in Work - Replace the paragraph that begins "Submit a repair plan to the Engineer for approval …" with the following paragraph:

Submit a repair plan to the Engineer for approval of all detrimental pipe deficiencies that are revealed in the video recording and written report. Repair all deficiencies within 48 hours after receiving notification from the Engineer. Re-perform the video inspection, submit the new video, and update the written report at no additional cost to the Agency.

SECTION 00430 - SUBSURFACE DRAINS

Comply with Section 00430 of the Standard Specifications modified as follows:

00430.80 Measurement - Add the following to the end of this subsection:

Measurement for the subsurface drains associated with Mechanically Stabilized Earth Retaining Walls will be made in accordance with subsection 00596A.80.

00430.90 Payment - Add the following to the end of this subsection:

Payment for subsurface drains for Mechanically Stabilized Earth Retaining Walls will be made in accordance with subsection 00596A.90.

SECTION 00440 - COMMERCIAL GRADE CONCRETE

Comply with Section 00440 of the Standard Specifications modified as follows

00440.12 Properties of Commercial Grade Concrete - Replace the bullet that begins "**Slump** - 5 inches…" with the following bullets:

- **Slump** - 5 inches or less
  - For concrete sidewalks, ramps, driveways, or other hand finished surface applications, and when using a high range water reducing admixture, provide a slump of 8 inches or less as approved by the Engineer.

00440.13 Field-Mixed Concrete - Replace the subsection, except for subsection number and title, with the following:

CGC Work items listed in 00440.14(a) may be field-mixed conventionally, or by volumetric/mobile mixers conforming to ASTM C685. When approved, concrete sidewalks, concrete curb ramps, concrete driveways, and other flat concrete surfaces may be field-mixed using volumetric/mobile mixers conforming to ASTM C685, request approval prior to placement. For all other CGC applications, submit written request to the Engineer for approval to use volumetric/mobile mixers conforming to ASTM C685 at least 21 Days prior to placement.

Pre-packaged dry blended concrete from the QPL may be used for Work items listed in 00440.14(a).

00440.40(b) Placing - Add the following bullet to the end of the bullet list:

- When haul time or placement conditions warrant exceeding the time of discharge, submit a detailed breakdown of the estimated time needed from batching to discharge of a load along with the measures that will be taken to ensure slump, temperature and uniformity will be maintained. Submit in advance to establish a new time limit at the Engineer's discretion.

SECTION 00445 - SANITARY, STORM, CULVERT, SIPHON, AND IRRIGATION PIPE

Comply with Section 00445 of the Standard Specifications modified as follows:

00445.11 Materials – Delete the item "Polyvinyl Chloride Pipe" from the list of items.

00445.43(b) Concrete Pipe - Replace this subsection, except for the subsection number and title, with the following:

Lay elliptical reinforced pipe so that the top or bottom marks are not more than 5 degrees from vertical.

00445.43(c) Polyvinyl Chloride Pipe - Delete this subsection.

00445.43(h) Pipe Joints – Replace the reference to Section 00445.72 with 00445.73.

00445.70 General - Replace this subsection, except for the subsection number and title, with the following:

(a) Culvert Installations - Inspect culverts to ensure that the lines are free of obstructions and leakage. Perform video and deflection testing.

(b) Storm Sewer, Siphon, Irrigation and Sanitary Sewer Installations - After laying and joining pipe for storm sewer, siphons, irrigation, sanitary sewers, and backfilling trenches, perform video, and deflection testing.

00445.71(a) General - Replace the paragraph that begins "All sanitary gravity systems, siphon systems…" with the following paragraph:

All storm gravity sewer systems, sanitary gravity systems, siphon systems and irrigation systems and appurtenances shall be free of visible infiltration of water. Test manholes as specified in Section 00470.

00445.72(a) General - Replace the paragraph that begins “After completing installation….” with the following paragraph:

After completing installation of the system, including all service connections, backfilling and compaction, and prior to wearing surface paving, perform video and deflection testing.

00445.72(b) – Delete this subsection.

00445.72(c) – Delete this subsection.

00445.72(d) – Delete this subsection.

00445.73 Deflection Testing for Flexible Pipe - Replace this subsection, except for the subsection number and title, with the following:

Prior to wearing surface paving, conduct deflection tests of culverts, sanitary sewers, and storm sewers constructed of flexible pipe. Perform the deflection testing using one of the following methods.

(a) Remote Video with Laser Profiler - Conduct remote video with laser profiler testing according to 00415.42.

(b) Manual Deflection Test - Conduct manual inspection deflection testing according to 00415.42.

(c) Mandrel Deflection Test - Conduct the testing by pulling an approved mandrel through the completed pipeline. Use a mandrel having at least 9 vanes and a diameter 95 percent of the pipe's initial inside diameter.

Conduct testing on a manhole-to-manhole basis after the line has been completely flushed out with water. Conduct the tests not less than 30 Days after the trench backfill and compaction have been completed. Tests may be conducted sooner if approved by the Engineer. Conduct the test concurrently with video inspection. Pull the mandrel in front of the camera so that the deflection testing is clearly recorded on the video tape unless approved by the Engineer. Provide a water depth gauge, located on the video camera side of the mandrel with the following characteristics:

- Graduated with marks at 0.50 inch increments clearly visible during video inspection.
- Capable of measuring water depth in 0.50 inch increments from 0.50 inch to 2.50 inches.
- Designed so that it will remain plumb regardless of the rotation of the mandrel or video camera.

00445.74 Video Inspection of Sanitary and Storm Sewers - Replace this subsection with the following subsection:

00445.74 Video Inspection of Culverts, Sanitary and Storm Sewers:

(a) Pre-Construction Video Inspection - For all existing culverts being extended or repaired perform video pipe inspection according to Section 00415.

For all existing sanitary sewer and storm sewers being altered or repaired, perform video pipe inspection, according to Section 00415. Video the sewer system between the nearest upstream manhole where Work is not being performed and the nearest downstream manhole where Work is not being performed, including all lateral runs between end manholes.

When replacing entire pipe sections or runs a video pipe inspection is not required prior to replacement.

(b) Post-Construction Video Inspection - When constructing a new run, an extension, or a repair of sanitary sewer, storm sewer, or culvert pipe, perform video pipe inspection, according to Section 00415, including the locations where new pipe meets existing pipe.

SECTION 00450 - STRUCTURAL PLATE SHAPED STRUCTURES

Comply with Section 00450 of the Standard Specifications modified as follows:

00450.47 Footings and Headwalls - Replace this subsection, except for the subsection number and title, with the following:

Construct footings for arches according to the design shown and the requirements of Sections 00440 and 00530. Construct the headwalls for arches according to the design shown and the requirements of Sections 00596A and 00596C.

00450.80 Measurement - Replace the paragraph that begins “Concrete for footings and headwalls…” with the following paragraph:

Concrete for footings will be measured on the volume basis, and will be the volume within the Neat Lines of the Structure as shown or directed. Concrete for headwalls will be measured according to Sections 00596A and 00596C.

Replace the paragraph that begins “Reinforcement for footings and headwalls…” with the following paragraph:

Reinforcement for footings will be measured on the weight basis according to Section 00530.80. Reinforcement for headwalls will be measured according to Sections 00596A and 00596C.

00450.90 Payment - Replace the description for Pay Item (f) with the following description:

(f) Structural Plate Concrete Footings…….. Cubic Yard

Replace the paragraph that begins “Reinforcement for footings and headwalls…” with the following paragraph:

Reinforcement for footings will be paid according to Section 00530.90. Reinforcement for headwalls will be paid according to Sections 00596A and 00596C.

SECTION 00470 - MANHOLES, CATCH BASINS, AND INLETS

Comply with Section 00470 of the Standard Specifications modified as follows:

00470.41(c) Grates, Frames, Covers and Fittings - Replace this subsection, except for the subsection number and title, with the following:

Set metal frames for manholes on full non-shrink grout beds to prevent infiltration of surface water or groundwater between the frame and the concrete of the manhole section. If concrete is to be poured around the frames, coat the portion of the frame that will contact the concrete with hot asphalt before placing the concrete. Set frames, covers and grates true to the locations and grades established. Clean bearing surfaces and provide uniform contact. The use of a bolt adjustment system for frames from the QPL is allowed. Secure all fastenings. Construct all mortared, sanitary sewer manhole necks and all riser ring joints made with non-shrink grout using an approved commercial concrete bonding agent applied to all cured concrete surfaces being grouted.

00470.42 Precast Concrete Catch Basins and Inlets - Add the following sentence to the end of this subsection:

Grade adjustments using a bolt system from the QPL is allowed.

SECTION 00480 - DRAINAGE CURBS

Comply with Section 00480 of the Standard Specifications.

SECTION 00490 - WORK ON EXISTING SEWERS AND STRUCTURES

Comply with Section 00490 of the Standard Specifications modified as follows:

00490.43 Abandoning Pipe in Place - Replace the second paragraph with the following:

Fill abandoned pipes greater than 10 inches diameter with sand, controlled low-strength material meeting the requirements of 00442, or other approved material.

00490.90 Payment - Replace Pay Item (h) with the following Pay Item:

(h) Abandon Existing Structures, ____ Inch Culvert Pipe ... Foot

Replace the paragraph that begins “Item (h) applies to filling abandoned pipes….” With the following:

In item (h), the nominal diameter of pipe will be inserted in the blank. Item (h) applies to filling abandoned pipes and their associated manholes, inlets, boxes and other similar structures.

SECTION 00495 - TRENCH RESURFACING

Comply with Section 00495 of the Standard Specifications.

SECTION 00510 - STRUCTURE EXCAVATION AND BACKFILL

Comply with Section 00510 of the Standard Specifications modified as follows:

00510.80(b)(1) Lump Sum - Add the following to the end of this subsection:

The estimated quantity of structure excavation is:

Location	Structure Excavation (Cubic Yard)

156 Inch x 81 Inch Structural Plate Radius Arch	18,260

Rock and boulder excavation will be measured according to Section 00330.81

00510.80(d)(1) Lump Sum - Add the following to the end of this subsection:

The estimated quantities of granular structure backfill are:

Location	Granular Structure Backfill (Cubic Yard)
156 Inch x 81 Inch Structural Plate Arch	808

00510.80 Measurement – Add the following paragraph to the end of this Section:

Measurement for structure excavation and backfill for retaining walls is done in accordance with Sections 00596A and 00596C.

00510.90 (b) Structure Excavation - Add the following to the end of this Section:

Rock and boulder excavation will be paid according to Section 00330.93

00510.90 Payment - Add the following paragraph to the end of this Section:

Payment for structure excavation and backfill for retaining walls is done in accordance with Sections 00596A and 00596C.

SECTION 00530 - STEEL REINFORCEMENT FOR CONCRETE

Comply with Section 00530 of the Standard Specifications modified as follows:

00530.80(a) Lump Sum - Add the following to the end of this subsection:

The estimated quantity of reinforcement is:

Structure Number	Uncoated Reinforcement Quantity (Pound)			
	Grade 60	Grade 80	Grade 100	Stainless Steel Grade
Structural Plate Arch Footing	592			

The weight of miscellaneous metal, based on weights listed in 00530.80(b) and Project quantities, is included in the estimated quantity of uncoated reinforcement.

SECTION 00596A - MECHANICALLY STABILIZED EARTH RETAINING WALLS

Comply with Section 00596A of the Standard Specifications modified as follows:

00596A.01 Proprietary MSE Walls - Add the following to the end of this subsection:

Select one of the following preapproved proprietary MSE retaining wall systems for the wall, structure no. W1 as shown:

- Reinforced Soil Embankment Smooth Face (MSE System) MSE Retaining Wall System, provided by Hilfiker Retaining Walls, HW^{R} , telephone: (800) 762-8962.
- Reinforced Earth^{R} (MSE system) MSE Retaining Wall System, provided by The Reinforced Earth^{R} Company , telephone: (303) 790-1481.
- MSE Plus (precast panel face MSE System) MSE Retaining Wall System, provided by SSL^{TM}, LLC , telephone: (831) 430-9300.

00596A.04(b) Design Calculations - Add the following to the end of this subsection:

The following retaining wall design parameters have been established for this Project:

Structure No. W1: Sta. W1 0+25 to Sta. W1 3+30

- Foundation soil unit density 120 lbs./cu. ft.
- Foundation soil angle of internal friction 28 degrees
- Foundation soil nominal (unfactored)
- bearing resistance 15,000 lbs./sq. ft.
- Retained soil unit density 110 lbs./cu. ft.
- Retained soil angle of internal friction 30 degrees
- Reinforced soil unit density 130 lbs./cu. ft.
- Reinforced soil angle of internal friction 34 degrees
- Peak ground acceleration coefficient (*PGA*) 0.26
- Short period spectral acceleration coefficient (S_S). 0.58
- Long period spectral acceleration coefficient (S_1) 0.21
- Site class D
- Peak seismic ground acceleration coefficient
- modified by zero period site factor (A_s) 0.35
- Horizontal seismic acceleration coefficient (k_h) 0.17

- Between Station W1 0+25 and Station W1 3+30
  - Minimum length of soil reinforcement for overall stability 8 ft.
  - Minimum length of soil reinforcement for external stability 8 ft.

00596A.11(c) Modular Block Core and Drainage Backfill - Replace this subsection, except for the subsection number and title, with the following:

Furnish 3/4" - No. 4 PCC Aggregate Material meeting the requirements of 02690.20(a) through (e).

00596A.12(e)(1) Portland Cement Concrete - Add the following paragraph to the end of this subsection:

Furnish Class 4000 structural concrete meeting the requirements of Section 02001.

00596A.15 Elastomeric Bearing Pads for Precast Concrete Facing Panels - Replace this subsection, except for the subsection number and title, with the following:

In horizontal and diagonal joints between precast concrete panels, furnish the grade, size, number and type of bearing pads shown in the stamped Working Drawings and design calculations prepared by the manufacturer. Determine the stiffness, size, and number of bearing pads so that the final joint opening is 3/4 inch ± 1/8 inch or as shown.

00596A.80 Measurement - Add the following to the end of this subsection:

The estimated quantities of retaining walls are:

Structure Number W1:

Station Limits	Area
Sta. W1 0+25 to Sta. W 13+30	5,500 sq. ft.

The estimated quantities of listed Materials are:

Structure No. W1: Sta. W1 0+25 to Sta. W1 3+30

Material	Estimated Quantities
Structure excavation	850 cu. yd.
MSE granular wall and drainage backfill	2,900 cu. yd.
Granular wall backfill	190 cu.yd.
Leveling pad	305 foot
Standard coping	305 foot
Drainage Geotextile	3,200 sq. ft.
6 inch drain pipe	350 foot
Structural Concrete Class 4000 (Headwall)	5 cu. Yd.
Reinforcement (Headwall), Grade 60	600 lb.

Rock and boulder excavation will be measured according to Section 00330.81

00596A.90 Payment - Add the following to the end of bulleted list:

- Cast-in-place reinforced concrete headwall

Add the following to the end of this subsection:

Rock and boulder excavation will be paid according to Section 00330.93

SECTION 00596C - CAST-IN-PLACE CONCRETE RETAINING WALLS

Comply with Section 00596C of the Standard Specifications modified as follows:

Add the following section:

00596C.16 Prefabricated Geocomposite Wall Drains – Provide one of the following products, or approved equal:

- SiteDrainTM Sheet-184 by by American Wick Drain, Inc., Monroe, NC
- Delta® Drain 6000 HI-X by Cosella-Dorken Products, Inc., Beamsville, ON
- TenCate Mirafi® G100N by TenCate Geosynthetics Americas, Pendergrass, GA

Provide geocomposite drains in rolls wrapped with a protective covering and stored in a manner which protects the drains from mud, dirt, dust, sunlight and damage.

00596C.80 Measurement - Add the following to the end of this subsection:

The estimated quantities of retaining walls are:

Station Limits	Area
Sta. W2 0+06 to Sta. W2 0+76	950 sq. ft.

The estimated quantities, for estimating purposes only, of concrete, steel reinforcement, excavation, shoring, and specified backfill for retaining wall systems are:

Structure Number	Material	Estimated Quantities
W2	Structure excavation	295 cu.yd.
	Retaining wall granular backfill	485 cu.yd.
	Class 4000 structural concrete	145 cu. yd.
	Geocomposite Drain	950 sq.ft.
	Steel reinforcement	15,300 lb.

Rock and boulder excavation will be measured according to Section 00330.81

00596C.90 Payment - Add the following to the end of this subsection:

Rock and boulder excavation will be paid according to Section 00330.93.

SECTION 00620 - COLD PLANE PAVEMENT REMOVAL

Comply with Section 00620 of the Standard Specifications modified as follows:

00620.40(e) Warning Signs - Replace this subsection, except for the subsection number and title, with the following:

Provide warning signs as required where abrupt or sloped drop-offs occur at the edge of the existing or new surface according to Sections 00221 and 00222.

00620.43 Maintenance Under Traffic - Replace this subsection, except for the subsection number and title, with the following:

Traffic is not allowed on the cold planed surface. Before opening the area to traffic, pave the surface according to 00745.51.

SECTION 00641 - AGGREGATE SUBBASE, BASE, AND SHOULDERS

Comply with Section 00641 of the Standard Specifications modified as follows:

00641.20 Mixing Plant - Replace the sentence that begins "Mix Aggregate and water…" with the following two sentences:

Mix Aggregate and water according to subsection 00641.20(a). Road mix is not allowed on this Project.

00641.41 Mixing, Hauling, and Placing - Replace the sentence that begins "Add water to the Aggregate…" with the following two sentences:

Add water to the Aggregate while mixing to provide a moisture content according to 00641.12 and subsection 00641.41(a). Road mix is not allowed on this Project.

SECTION 00730 - EMULSIFIED ASPHALT TACK COAT

Comply with Section 00730 of the Standard Specifications modified as follows:

00730.11 Emulsified Asphalt - In the paragraph that begins "Obtain samples according to AASHTO T 40…" replace the words “AASHTO T 40” with the words “AASHTO R 66”.

00730.22 Asphalt Distributor – Add the following to the end of this subsection:

Apply emulsified asphalt material to vertical surfaces (curb faces, catch basin faces, butt joints, etc.). Avoid excess tack coat overspray being applied to vertical surfaces. Shields

protecting vertical faces shall be provided and used during tacking operations. All overspray shall be promptly removed.

00730.44 Applying Tack Coat – Replace the sentence beginning with "Apply the emulsified asphalt…" with the following sentence:

Apply the emulsified asphalt to the prepared surface at a rate between 0.08 and 0.20 gallons per square yard as directed and with the emulsified asphalt temperature between 140 °F and 185 °F as recommend by the manufacture. Additional application of tack may be required, as directed by the Inspector, to obtain the necessary residual asphalt.

00730.90 Payment - Replace this subsection, except for the subsection number and title, with the following:

No separate or additional payment will be made for Emulsified Asphalt tack coat. Approximately 14 Tons of Emulsified Asphalt in tack coat will be required on this Project.

Tack coat shall be considered incidental to the asphalt concrete paving work, and no separate payment will be made.

SECTION 00745 - ASPHALT CONCRETE PAVEMENT - STATISTICAL ACCEPTANCE

Comply with Section 00745 of the Standard Specifications modified as follows:

00745.11 Asphalt Cement, Additives, and Aggregate Treatment – Replace subsection (a) Asphalt Cement with the following:

(a) Asphalt Cement - Use PG 64-22 asphalt cement.

00745.42 Preparation of Underlying Surfaces - Add the following to the end of the subsection:

a) **Overlay Preparation** - Existing pavement surfaces shall be cleaned of all loose material, dirt vegetation, aggregate shoulder material, and dust by brooming, by flushing with water or other approved methods prior to applying the tack coat. Any aggregate shoulder material, grass or other vegetation on the existing asphalt concrete pavement shall be totally removed. Any vegetation that exists over the face of the curb line shall be removed in a neat workman like manner. The existing curb shall be cleaned and a tack coat applied to the curb face prior to paving.

   NOTE: The Contractor is responsible for street sweeping. Special attention will be given to organic materials in cracks and the removal of all materials on the edge of the existing pavement. The Contractor shall use vacuum sweepers that are self-propelled equipped with rotating brooms and brushes that are capable of loosening dirt and debris from the road surface and collecting the material by vacuum device.

All work required in the cleaning and preparing the work site as described above and payment for this item shall be considered incidental to and included in the unit price for asphalt concrete material, and no additional compensation shall apply.

b) **Leveling Courses** – Existing pavements have occasional surface irregularities and uneven crown section. In the case of this project, along Stafford Road, significant leveling is required to address these irregularities, shift the crown of the roadway, and to address the corridor superelevation needs. It is the intent that these conditions are addressed through the means of application of asphalt concrete leveling courses prior to the placing of the uniform top base and wearing courses as shown in the plans. These leveling courses are needed to prepare the surface grade to which the final courses are to be placed and may require the asphalt mixture to be laid in two or more layers. In each case, the compacted thickness of any one layer shall not exceed 3 inches.

   All pre-leveling work must be performed at the direction of the County and quantities identified on the schedule of prices are approximate. Asphalt concrete mixture to achieve the necessary pre-leveling work will be paid on the contract unit price per ton.

00745.46(b) Depositing - Replace the paragraph that begins "Deposit ACP from..." with the following paragraph:

Deposit ACP from the hauling vehicles so segregation is prevented. Do not deliver the ACP directly into the paving machine for wearing Courses where the continuous length of the Panel is greater than 500 feet. Deliver the ACP to the paving machine by either a windrow pick-up machine or an end-dump transfer machine.

00745.47(b) Drop-Offs - Replace the bullet that begins “Provide warning signs and markings…” with the following bullet:

- Provide warning signs and markings according to Sections 00221, 00222, 00224 and 00225 where abrupt or sloped edge drop-offs greater than 1 inch in height occur.

Add the following subsection:

00745.51 Opening Sections to Traffic - Schedule Work so that, during the same shift, the surfaces being paved are paved full width and length through the wearing Course before opening to traffic.

00745.76 Sand Seal - Add the following subsection:

All joints between asphalt concrete pavement, Portland Cement Concrete, old surfaces, curbs, gutters, inlet structures, manholes, etc. shall be sealed by an application of CSS-1 emulsified asphalt followed immediately by a cover coat of clean sand. Width of joint seal coat shall be no less than four inches and no more than six inches.

00745.77 Cleanup - Clean and remove all excess asphalt, debris and tack from all facilities including but not limited to manhole covers, valve boxes, catch basins, concrete gutter and curb faces.

Keep a sweeper on site at all times to sweep areas at the end of each work shift, as needed and as directed.

00745.80 Measurement - Add the following paragraph to the beginning of this subsection:

The quantities of ACP shown in the Contract Schedule of Items were computed on the basis of Aggregates having a specific gravity of 2.80.

Replace the paragraph that begins "The quantities of ACP..." with the following paragraph:

The quantities of ACP will be measured on the weight basis. No separate measurement will be made for asphalt cement used in the mixture. No deduction will be made for lime or any other additive used in the mixture.

00745.90 Payment - Replace the paragraph that begins "No separate or additional..." with the following paragraph:

No separate or additional payment will be made for:

- asphalt cement, mineral filler, lime, and anti-stripping or other additives contained in the mixture
- Furnish and acceptably place the required tack coat
- Acceptably clean the existing pavement surfaces in preparation for applying the tack
- power sweeping existing surfaces
- Seal all cold and transverse joints with hot liquid asphalt and clean sand
- Provide all necessary quality control tests in accordance with Section 00745
- temporary asphalt concrete pavement placed to open the roadway to traffic
- sawing, cleaning, and filling joints on bridge deck overlays

00745.95 Price Adjustments - Replace this subsection with the following:

There will be ACP Price Adjustments for this project.

Asphalt concrete placed that does not comply with the compaction requirements herein shall be removed and replaced at the discretion of the Engineer.

SECTION 00749 - MISCELLANEOUS ASPHALT CONCRETE STRUCTURES

Comply with Section 00749 of the Standard Specifications, modified as follows:

00749.91 Method “A” – Weight and Extra Basis – Replace the paragraph starting with “Payment will be in full…” with:

Payment will be payment in full for all extra or additional costs involved in placing asphalt concrete in the respective Structures as specified. No separate or additional payment will be made for placing the Water Bars at the locations shown in the Plans. These costs are in addition to those which are included in the payment made for the asphalt concrete incorporated into the Structures.

SECTION 00759 - MISCELLANEOUS PORTLAND CEMENT CONCRETE STRUCTURES

Comply with Section 00759 of the Standard Specifications modified as follows:

00759.03 Required Submittals - Replace this subsection, except for the subsection number and title, with the following:

Material ordered or Work done before the Engineer reviews and returns the documents shall be at the Contractor's risk.

Submit the following:

(a) ADA Certification for Contractors - For all supervisory personnel who directly supervise the curb ramp Work, submit the names, telephone numbers, and copies of the ODOT ADA Certification for Contractors at least 10 Calendar Days before the preplacement conference.

(b) Curb Ramp Work Plan - Do not begin any curb ramp Work before the plan for completing the Work has been approved. At least 21 Calendar Days before the curb ramp Work is scheduled to begin, submit a plan for accomplishing all phases of the curb ramp Work, including but not limited to the following (also see 00180.41):

- Surface preparation
- Compliance with Working Drawings and details submitted under 00759.03(c)
- Compliance with current Standard Drawings and Plans
- Waste handling and disposal

(c) Working Drawings - At least 10 Calendar Days before the construction of a grouping of one or more curb ramp location(s), not to exceed 32 ramps unless otherwise approved under 00180.41, submit unstamped Working Drawings according to 00150.35. Include field verification of each ramp site, and all dimensions, slopes and grades necessary to demonstrate compliance with the Standard Drawings and Plans. Marked up Supplemental Drawings, if field verified, may be submitted as Working Drawings. Notify the Engineer of any deficiencies or noncompliance with the Standard Drawings or Plans. The Engineer will provide additional or modified Plans as needed. Do not begin Work at a curb ramp until submittals for that curb ramp have been received, reviewed, and accepted in writing by the Engineer.

After submittal of the unstamped Working Drawings, according to 00150.35 a site visit may be requested by the Contractor or Engineer. The site visit will include a review of any field markings and discuss the submitted unstamped Working Drawings. The Engineer will provide additional or modified information, as needed.

Include the following in the Working Drawings:

- Verification of elevations, slopes, grades and dimensions necessary to demonstrate compliance with the Standard Drawings and Supplemental Drawings,

- Verification of potential utility conflicts or other street furnishings that may require relocation or adjustment.
- Identification of infeasibilities or constructability issues with the Standard Drawings and Supplemental drawings.

(d) Corrective Action Plan - Unless otherwise approved, notify the Engineer before performing corrective action. Include TPAR necessary to complete corrective action work.

At least 21 Calendar Days before concrete Structures Work is scheduled to begin, submit a corrective action plan. The corrective action plan shall address procedures to correct deficient Structures through minor corrective action or replacement according to 00759.55(a), and include:

- List of minor corrective actions that will be used to correct deficiencies, according to 00759.50 and 00759.55.
- Procedures for performing corrective action.
- Proposed concrete grinding Equipment and method of grinding.
- Proposed concrete repair Material used for resurfacing ground concrete surfaces according to Section 02015.
- Construction activities, Equipment and staging necessary to complete corrective action Work.

The Engineer will review the corrective action plan(s) and provide a response to the Contractor within 5 Days after receiving the plan. Do not begin concrete Structure Work until the corrective action plan is approved by the Engineer.

00759.04 Preplacement Conference - Replace this subsection, except for the subsection number and title, with the following:

Before beginning any curb ramp Work, meet with the Contractor's ODOT ADA Certified supervisory personnel and any quality control personnel if applicable, any curb ramp Subcontractors' supervisory personnel, and the Engineer at a mutually agreed upon time.

If the Contractor's personnel change, or if the Contractor proposes a significant revision to the plan for accomplishing the curb ramp Work, the Engineer may require additional preplacement conferences. If the Contractor’s schedule of work identifies multiple groups of curb ramp construction, as allowed by 00180.41, additional preplacement conferences may be required for each ramp group, at a mutually agreed upon time before Work begins.

All supervisory personnel who have an active ODOT ADA Certification for Contractors and directly supervise the curb ramp Work are required to attend the preplacement conference.

Add the following subsection:

00759.13 Detectable Guide Strips - Furnish surface applied or liquid applied detectable guide strips. Use only adhesives recommended or supplied by the manufacturer. Furnish slip-resistant detectable guide strips from one of the following list of pre-approved products:

Manufacturer	**Material**

Vanguard ADA Systems
18122 SR9 Suite F
Snohomish, WA 98296
Phone: (360) 668-5700

Liquid Applied GuideStrip / TWSI
Color: Blue

Add the following subsection:

00759.23 Concrete Resurfacing Equipment - Furnish power-operated scarifying Equipment capable of uniformly removing and preparing the existing surface to depths required. For concrete grinding operations, furnish 12 segment grinders, fine-toothed scarifying Equipment, or other approved grinding Equipment.

00759.31 Qualifications - Add the following sentence to the end of the paragraph:

Provide onsite supervisory personnel that are ODOT ADA Certified during construction of the curb ramps.

00759.46 Concrete - Replace this subsection, except for the subsection number and title, with the following:

Construct the Structures between suitable forms or by the extrusion method. Place concrete according to the Plans, Section 00440, and this Section.

00759.50(a) General - Add the following paragraphs to the end of this subsection:

Install truncated domes as shown. Place according to the manufacturer's recommendation. Install abutting truncated dome panels with no more than 1/4 inch spacing. Install anchors along cut edges of truncated dome panels according to manufacturer's recommendations.

In addition, finish concrete surfaces of Structures to be within the established Slopes and dimensions allowed by the Standard Drawings and Plans. Repair or remove and replace Structures not meeting the Standard Drawings and Plans at no additional cost to the Agency.

Install detectable guide strips as shown. Place according to the manufacturer's recommendation. Place abutting panels within 1/4-inch of each other and install anchors, as specified by manufacturers, along cut edge. Miter adjacent panels at locations where detectable guide strips change direction. Install detectable guide strips on clean and dry concrete surfaces.

00759.50(c) Driveways, Walks, and Surfacings - Replace this subsection, except for the subsection number and title, with the following:

Prevent segregation of the concrete during placement. Strike-off the concrete to the grade shown, and float the surface smooth. After the water sheen disappears, edge the joints and remove edging tool marks prior to final finishing. Lightly cross-broom the surface to a uniform texture. Do not trowel joints or edges after brooming surface.

The 24 inch smart level will be used to measure driveway and sidewalk cross slopes on the Pedestrian Access Route.

00759.50(d) Curb Ramps - Replace this subsection, except for the subsection number and title, with the following:

Prevent segregation of the concrete during placement. Strike-off the concrete to the grade shown and float the surface smooth. After the water sheen disappears, edge the joints and remove edging tool marks prior to final finishing. Lightly cross-broom the surface to a uniform texture. Do not trowel joints or edges after brooming surface.

The 6 inch smart level will be used to measure curb running slope. The 6 inch smart level will be used to measure slopes on portions of the curb ramp, gutter pan, or adjacent surfaces that cannot accommodate a 24 inch smart level. All other curb ramp locations will use a 24 inch smart level to measure slopes.

00759.51 Curing - Add the following paragraph to the end of this subsection:

Do not apply curing compounds to areas designated for detectable guide strip installation.
Add the following subsection:

00759.55 Correction of Deficient Structures - Unless otherwise approved, notify the Engineer before performing corrective action. Correct deficiencies at no additional cost to the Agency. Perform corrective actions as directed, according to the approved corrective action plan, and according to the following:

(a) Minor Corrective Action - Submit Equipment and procedure for minor corrective action to the Engineer for approval. Minor corrective action can be performed to correct a deficiency up to 1 square foot per panel. Corrective action exceeding 1 square foot per panel requires removal and replacement according to 00150.25. Perform minor corrective action according to the following:

(1) Concrete Grinding - Grinding to correct high area deficiencies is limited to 3/16 inch. Use equipment meeting the requirements of 00759.23. Resurface all ground concrete surfaces according to 00759.55(a)(2).

(2) Concrete Resurfacing - Resurfacing to correct low area deficiencies is limited to 3/16 inch depth. Existing concrete is to be at least 7 Days old prior to resurfacing. Resurface repair areas according to the following:

a. **Keyway** - Sawcut a keyway at the boundaries of repair areas that are not already defined by panel control joints. Sawcut shall be 1/8 inch wide and 1/4 inch deeper than the edge of the repair area. Bevel inside edge of keyway at a 45 degree angle.

b. **Surface Preparation** - Prepare limits of repair area by grinding using Equipment from 00759.23. After grinding, sandblast the surface of the repair area. Clean the surface using a low pressure washer, less than 5,000 psi.

c. **Presoak** - Presoak the repair area for a minimum of 30 minutes to saturated surface dry. Prior to resurfacing, ensure there is no ponding water on the surface.

d. **Resurface** - Provide concrete resurfacer from the QPL according to 02015.60; refer to QPL remarks to select an appropriate material based on allowable installation depths. Furnish resurfacer in a color that closely matches the color of

surrounding concrete surfaces. Mask boundaries of the repair area. Use hand tools to work resurfacer into keyways and match existing grade at boundaries. Apply a light broom-finish to achieve non-slip surface.

e. **Curing and Return to Traffic** - Wet cure for a minimum of 1 hour or per the manufacturer's recommendation, whichever is more restrictive. Follow manufacturer's recommendation for return to traffic time.

(3) ACP Grinding - Taper grind to match existing Pavement with a minimum grinding width of 1 foot for each 1/4 inch of ACP removed.

(b) Acceptance of Structures - Once the corrective work or replacement has been completed, acceptance will be based on the Engineer's inspection and approval of the Structure.

00759.90 Payment – Add the following Pay Items to the end of the Pay Item list:

Pay Item	Unit of Measurement
(o) Concrete Truck Apron	Square Foot
(p) Detectable Guide Strips, Blue	Square Foot

Replace the paragraph that begins "Item (k) includes the additional Work required …" with the following paragraph:

Item (k) includes the additional Work required to construct a curb ramp or replace an existing curb ramp. Payment for the area of the curb ramp will be made under the concrete walks Pay Item.

Item (o) includes the welded wire fabric.

Add the following paragraph:

Item (p) includes installation of blue detectable guide strips on a concrete or asphalt surface.

Replace the paragraph that begins "No separate or additional payment will be…" with the following paragraph and bullet list:

No separate or additional payment will be made for:

- curb ramp Working Drawings
- curb ramp plan
- preplacement conference
- concrete form verification
- any necessary repair or removal and replacement of Structures
- providing supervisory personnel who have an active ODOT ADA Certification for Contractors to directly supervise the curb ramp Work
- developing corrective action plans
- Welded Wire Fabric

SECTION 00810 - METAL GUARDRAIL

Comply with Section 00810 of the Standard Specifications modified as follows:

00810.13 Guardrail Anchors - Replace this subsection, except for the subsection number and title, with the following:

Furnish steel guardrail anchors according to Section 02820.

00810.41 Excavation and Backfill - Add the following paragraph to the end of this subsection:

Hand dig guardrail post holes or use other non-invasive methods when posts are located within 24 inches surrounding the outside dimension of all sides of underground utilities as shown or directed.

SECTION 00840 - DELINEATORS AND MILEPOST MARKER POSTS

Comply with Section 00840 of the Standard Specifications.

SECTION 00850 - COMMON PROVISIONS FOR PAVEMENT MARKINGS

Comply with Section 00850 of the Standard Specifications.

SECTION 00855 - PAVEMENT MARKERS

Comply with Section 00855 of the Standard Specifications.

SECTION 00865 - LONGITUDINAL PAVEMENT MARKINGS - DURABLE

Comply with Section 0865 of the Standard Specifications.

SECTION 00867 - TRANSVERSE PAVEMENT MARKINGS - LEGENDS AND BARS

Comply with Section 00867 of the Standard Specifications.

SECTION 00902 - CROSSWALK CLOSURE SUPPORTS

Section 00902, which is not a Standard Specification, is included in this Project by Special Provision.

Description

00902.00 Scope - This Work consists of constructing crosswalk closure supports and associated signs as shown.

Materials

00902.10 Materials - Furnish Materials meeting the following requirements:

Commercial Grade Concrete	00440
Steel	01070.10 and 01070.12
Signs	00940

Construction

00902.40 General - Install crosswalk closure supports and associated signs as shown or directed.

Measurement

00902.80 Measurement - The quantities of crosswalk closure supports will be measured on the unit basis. No separate measurement will be made for signs attached to crosswalk closure supports.

Payment

00902.90 Payment - The accepted quantities of Work done under this Section will be paid for at the Contract unit price, per each, for the item "Crosswalk Closure Supports".

Payment will be payment in full for furnishing and placing all Materials, including signs, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

SECTION 00905 - REMOVAL AND REINSTALLATION OF EXISTING SIGNS

Comply with Section 00905 of the Standard Specifications modified as follows:

00905.40 General - Add the following:

Protect existing signs and posts that are designated for "removal only". Deliver removed signs and posts to Clackamas County at 19246 Wacheno Parkway, Oregon City 97045. Contact the Inspector, 48 hours prior to removal.

SECTION 00920 - SIGN SUPPORT FOOTINGS

Comply with Section 00920 of the Standard Specifications modified as follows:

00920.80 Measurement - Add the following to the end of this subsection:

The estimated quantities of concrete for minor sign supports are:

Support Type	Quantity
Perforated Steel Square Tube Anchor Sign Supports	6 cu. yd.

SECTION 00930 - METAL SIGN SUPPORTS

Comply with Section 00930 of the Standard Specifications modified as follows:

00930.40(d) Bolt Installation - Delete the sentence beginning “Clean and lubricate fasteners…”

00930.40(d)(1) Bolt Installation for Slip Bases (Breakaway) - Replace the paragraph beginning “Remove any dirt and moisture…” with the following paragraph:

Remove any dirt and moisture from the lubricated anchor rods, and recoat the lubricated fasteners with a fresh, second coat of lubricant to the bolt threads and bearing surfaces that turn during installation according to 02560.70 immediately before tightening. Tighten the bolts, in the presence of the Engineer, to the minimum torque or tension shown to seat the bolts in the base plate slots. After all the bolts in the slip base are tightened, loosen each bolt and retighten to the prescribed torque or tension shown in the same order as the initial tightening.

00930.40(d)(2)(a) Direct Tension Indicator Tightening - Replace the paragraph beginning “After attaining a snug-tight condition,…” with the following paragraph:

After attaining a snug-tight condition, tighten all fasteners in the connection by progressing systematically from the most rigid part of the connection to the free edges until the direct tension indicator spaces between the protrusions refuse entry of a 0.005 inch feeler gauge

in all spaces except one. "Cheater" bars, multiplier wrenches, or impact wrenches are allowed. Provide impact wrenches with enough capacity and supplied air to tighten each bolt in 10 seconds or less. Do not use a slugging wrench or similar method for final tightening.

00930.40(e)(1) General - Add the following sentence to the beginning of this subsection:

Notify the Engineer in writing at least 24 hours before starting installation.

00930.40(e)(2) Direct Tension Indicator Method – Replace this subsection, except subsection number and title, with the following:

Upon completion of a bolted joint, the Engineer will determine that all bolts have been tightened. A minimum of 10 percent, but not less than two bolts in each joint, will be inspected. The joint will be accepted as properly tightened when one open space allows entry of a 0.005 inch feeler gauge. If there is more than one space between the direct tension indicator protrusions that allow entry of a 0.005 inch feeler gauge, re-inspect all bolts, retighten bolts in the joint as required, and resubmit the joint for inspection. If no spaces exist between the direct tension indicator protrusions that allow entry of a 0.005 inch feeler gauge, replace bolt assembly, tighten bolts in the joint as required, and resubmit the joint for inspection. For connections with all bolts fully tightened, one bolt at a time may be replaced without providing crane support of the mast arm.

00930.80 Measurement - Add the following to the end of this subsection:

The estimated quantities of structural steel are as follows:

Item	Estimated Quantity (Pound)
Minor Sign Supports	
Perforated Steel Square Tube Anchor Sign Supports	1,700

SECTION 00940 - SIGNS

Comply with Section 00940 of the Standard Specifications.

SECTION 00960 - COMMON PROVISIONS FOR ELECTRICAL SYSTEMS

Comply with Section 00960 of the Standard Specifications modified as follows:

00960.02 Equipment List and Drawing Submittals - Replace the paragraph that begins "Within 30 Calendar Days after execution of the Contract, submit …" with the following paragraph:

Within 30 Calendar Days after execution of the Contract, submit the Blue Sheets (see 00160.00 and 00160.07) and the Green Sheets (see 00160.00 and 00160.07) according to 00150.37 for all materials the Contractor proposes to install. Blue Sheets and Green Sheets contain submittal instructions and will be made available to the Contractor by the Engineer.

00960.10 Materials – Add the following to the end of this subsection:

Use only Schedule 80 PVC conduits and fittings for all underground conduits.

00960.30 Licensed Electricians - Replace the paragraph that begins "According to the Oregon Administrative Rule …" with the following paragraph:

According to the Oregon Administrative Rule 918-282-0120(1), no person or entity shall allow any individual to perform electrical work for which the individual is not properly registered or licensed. Every person who installs electrical systems on the Project shall submit a copy of their electrical license or apprentice registration to the Engineer prior to performing any Work. They must be licensed as an S or a J under Oregon Administrative Rule 918-282.

00960.46 Service Cabinet and Electrical Energy - Replace this subsection, except for the subsection number and title, with the following:

Install service cabinet and associated equipment, then arrange for the Utility providing power to have the service cabinet inspected and make the electrical hook-up prior to field testing. Field test according to 00990.70(g) for traffic signals, or according to 00970.70 for illumination.

Furnish and install a meter base approved by the serving Utility (with cover by the Utility), where shown.

Electrical energy costs will be billed to the Agency for permanent installations.

SECTION 00962 - METAL ILLUMINATION AND TRAFFIC SIGNAL SUPPORTS

Comply with Section 00962 of the Standard Specifications modified as follows:

00962.05(c) Illumination Supports - Replace this subsection, except for the subsection number and title, with the following:

Provide illumination supports as specified in the Project Plans and/or from the PGE Approved Street Lighting Equipment List in effect on the date the Project is advertised.

00962.10 Materials - Replace this subsection, except subsection number and title, with the following:

Provide lighting equipment as specified in the Project Plans and/or from the PGE Approved Street Lighting Equipment List in effect on the date the Project is advertised.

00962.46(j)(2) Assembly of Supports and Bolt Tightening – Delete the sentence “Nuts shall have full thread engagement.”

00962.46(j)(2)(a) Anchor Rods for Signal Supports and Fixed Base Luminaire Supports - Replace this subsection, except for the subsection number and title, with the following:

1. Installation - After foundation concrete strength and curing requirements are satisfied and after inspection of the foundation, pole installation may begin.

Protect anchor rods, washers, and nuts from dirt and moisture. Lubricate anchor rod threads, nuts, and bearing surfaces that will turn during installation according to 02560.70. Estimate the required rake, if any, and set the lubricated leveling nuts accordingly, so that when pole installation is complete and all appurtenances are installed on the pole, the top of the pole is plumb with the base of the pole.

Lift the pole into position on the leveling nuts and washers. Make sure all leveling nuts and washers are in full contact with the base plate.

Install washers with lubricated bearing surfaces that turn during installation and lubricated top nuts, and bring to a snug tight condition. Snug tight is defined as the condition when all plies of the connection are in firm contact and can be obtained by the full effort of a worker on the end of a 12 inch long wrench. Several passes may be required to obtain uniform snug tightness.

When all anchor rods are snug tight, proceed with installation of arms and other appurtenances, if not previously installed. When installation of arms and appurtenances is complete, and the pole is plumb as defined above, final anchor rod tightening may begin. If the pole is not plumb, adjust as required and repeat snug tightening as described above. Make sure all leveling nuts and washers are in full contact with the base plate. As a safety measure, provide crane support of the pole until anchor rods tightening is completed.

Mark the initial relative position of each anchor rod and an outside ridge of each first nut above the base plate with a permanent felt tip pen or similar marker. Retain visibility of the marks for at least 7 Days to verify subsequent nut rotation. Rotate all first nuts above the base plate past snug tight an additional amount shown in 00962.46(j)(2)(e) in two passes. "Cheater" bars, multiplier wrenches, or slugging wrenches are allowed if required for large diameter anchor rods. After final tightening of the first nut above the base plate, tighten the second nut to a snug tight condition for assemblies with two nuts above the base plate.

2. Inspection - Notify the Engineer in writing at least 24 hours before starting installation. The Engineer will observe the installation and tightening operations to ensure that proper procedures are followed.

The installation will be rejected if the geometry does not satisfy the requirements of 02560.05 or no permanent felt tip pen marks are present for at least 7 Days after installation showing the rotation past snug tight.

00962.46(j)(2)(b) Anchor Rods for Slip Base (Break-away) Luminaire Supports - Replace this subsection with the following:

00962.46(j)(2)(b) Anchor Rods and High-Strength Bolts for Slip Base (Break-away) Luminaire Supports

1. Installation - After foundation concrete strength and curing requirements are satisfied and after inspection of the foundation, pole installation may begin.

Furnish, at no additional cost to the Agency, a calibrated torque wrench of a capacity appropriate to the size and type of the bolts being tightened. Confirm the accuracy of the calibrated torque wrench through calibration by an approved independent testing agency at least once a year.

Protect anchor rods, washers, and nuts from dirt and moisture. Lubricate anchor rods, nuts, and bearing surfaces that will turn during installation according to 02560.70. Estimate the required rake, if any, and set the lubricated leveling nuts accordingly, so that when pole installation is complete and all appurtenances are installed on the pole, the top of the pole is plumb with the base of the pole.

Install the anchor plate on the leveling nuts and washers. Make sure all leveling nuts and washers are in full contact with base plate.

Install washers with lubricated bearing surfaces that turn during installation and lubricated top nuts, and bring to a snug tight condition. Snug tight is defined as the condition when all plies of the connection are in firm contact, and can be obtained by the full effort of a worker on the end of a 12 inch long wrench. Several passes may be required to obtain uniform snug tightness.

When all anchor rods are snug tight, proceed with the "Slip Base Bolting Procedure" as shown and lubricate bolt threads and bearing surfaces that turn during installation according to 02560.70. When the slip base bolting procedure is complete, final anchor rod tightening may begin. As a safety measure, provide crane support of the pole until anchor rod tightening is complete.

Mark the initial relative position of each anchor rod and an outside ridge of each first nut above the base plate with a felt tip pen or similar marker. Retain visibility of the marks for at least 7 Days to verify subsequent nut rotation Rotate all first nuts above the base plate past snug tight an additional amount shown in 00962.46(j)(2)(e) in two passes. "Cheater" bars, multiplier wrenches, or slugging wrenches are allowed if required for large diameter anchor rods.

2. Inspection - Notify the Engineer in writing at least 24 hours before starting installation. The Engineer will observe the installation and tightening operations to ensure that proper procedures are followed.

The installation will be rejected if the geometry does not satisfy the requirements of 02560.05 or no permanent felt tip pen marks are present for at least 7 Days after installation showing the rotation past snug tight.

00962.46(j)(2)(c) High-Strength Bolts in Mast Arm-to-Pole Connections and Luminaire Arm-to-Pole Connections - Replace this subsection with the following:

00962.46(j)(2)(c) High-Strength Thru Bolts in Mast Arm-to-Pole Connections and Luminaire Arm-to-Pole Connections -

1. Installation - Do not reuse galvanized high strength bolts. Retightening previously tightened bolts that may have been loosened by the tightening of adjacent bolts will not be considered a reuse.

Provide all high strength bolts according to the details shown. Use bolt, nut, and washer combinations from the same rotational capacity lot with new and unused direct tension indicators with protrusions in contact with the hardened washer.

Protect fasteners from dirt and moisture. Do not remove the lubricant that is present in as-delivered condition. Lubricate threads, nuts, and bearing surfaces that turn during installation according to 02560.70.

Bring the connection to a snug-tight condition. Snug-tight is defined as the condition when all plies of the connection are in firm contact and can be attained by applying the full effort of a worker on the end of a 12 inch long wrench to each bolt in the connection. Tighten all fasteners in the connection by progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize relaxation of previously tightened fasteners. In some cases, proper tensioning of the bolts may require more than a single cycle of systematic partial tightening. After attaining a snug-tight condition, tighten all fasteners in the connection by progressing systematically from the most rigid part of the connection to the free edges until the direct tension indicator spaces between the protrusions refuse entry of a 0.005 inch feeler gauge in all spaces except one. "Cheater" bars, multiplier wrenches, or impact wrenches are allowed. Provide impact wrenches with enough capacity and supplied air to tighten each bolt in 10 seconds or less. Do not use a slugging wrench or similar method for final tightening.

2. Inspection - Notify the Engineer in writing at least 24 hours before starting installation. The Engineer will observe the installation and tightening of bolts to determine that the tightening procedures are properly used. Inspect all bolts in each joint. The joint will be accepted as properly tightened when one open space allows entry of a 0.005 inch feeler gauge. If there is more than one space between the direct tension indicator protrusions that allow entry of a 0.005 inch feeler gauge, re-inspect all bolts, retighten bolts in the joint as required, and resubmit the joint for inspection. If no spaces exist between the direct tension indicator protrusions that allow entry of a 0.005 inch feeler gauge, replace bolt assembly, tighten bolts in the joint as required, and resubmit the joint for inspection. Connections that have all bolts fully tightened can replace one bolt at a time without providing crane support of the mast arm.

The installation will be rejected if the geometry does not satisfy the requirements of 02560.05.

00962.46(j)(2)(d) Final Tightening - Replace this subsection with the following:

00962.46(j)(2)(d) High-Strength Bolts in Tapped Holes in Mast Arm-to-Pole Connections and Luminaire Arm-to-Pole Connections -

1. Installation - Protect fasteners from dirt and moisture. Lubricate bolt threads and bearing surfaces that turn during installation according to 02560.70. Provide all high-strength bolts with hardened flat washers under the element turned during tightening.

If arms or appurtenances are attached after pole erection, support them until bolts are snug tight.

Install high-strength tapped hole connections to a snug tight condition. Snug tight is defined as the condition when all plies of the connection are in firm contact, and can be obtained by the full effort of a worker on the end of a 12 inch long wrench. Mark the initial relative position of the outside ridge of each turned element (nut or bolt head) and plate with a permanent felt tip pen or similar marker. Retain visibility of the marks for at least 7 Days to verify subsequent nut rotation. Rotate the top nut of each bolt past snug tight by the amount in 00962.46(j)(2)(e). Several passes may be required to obtain uniform snug tightness. "Cheater" bars, multiplier wrenches, and impact wrenches are allowed. Provide impact wrenches with enough capacity and supplied air to tighten each bolt in 10 seconds or less. Do not use a slugging wrench or similar method for final tightening.

2. Inspection - Notify the Engineer in writing at least 24 hours before starting installation. The Engineer will observe the installation and tightening operations to ensure that proper procedures are followed.

The installation will be rejected if the geometry does not satisfy the requirements of 02560.05 or no permanent felt tip pen marks are present showing the rotation past snug tight.

Add the following subsection:

00962.46(j)(2)(e) Final Tightening - Required final tightening of anchor rods and high-strength bolts are shown in the following Table:

Connection Type	Rotation Past Snug Tight
ASTM F1554, Grade 36 Anchor Rods	30° (1/12 turn)
ASTM A449 Anchor Rods	60° (1/6 turn)
ASTM F1554 Grade 55 Anchor Rods	60° (1/6 turn)
ASTM F3125, Grade A325 Bolts	60° (1/6 turn)

SECTION 00970 - HIGHWAY ILLUMINATION

Comply with Section 00970 of the Standard Specifications modified as follows:

00970.00 Scope - Add the following:

This Work includes furnishing and installing Clackamas County approved materials and providing a roadway illumination system on separate illumination poles that meets the requirements and standards of Portland General Electric (PGE) Schedule 32 or Schedule 95

Option A as shown on the plans. If there is a conflict between PGE standards and these specifications, the more stringent standard shall control.

Provide lighting equipment as specified in the Special Provisions, the Project Plans and/or from the PGE Approved Street Lighting Equipment List in effect on the date the Project is advertised.

Add the following subsection:

00970.04 Required Submittals - In addition to the requirements of Section 00960, submit installation details for the following equipment:

- Light fixture including LED board and driver
- Photoelectric control

Add the following subsection:

00970.11 LED Street Lighting - For Projects with LED street lighting, provide the following pre-approved Equipment from the PGE Approved Street Lighting Equipment List:

- **Fixture** - LED fixtures shall be dimmable, four-bolt mounting bracket, gray finish, field adjustable drive current, ANSI 7-wire photocontrol receptacle and utility wattage label. Fixture voltage, color temperature, distribution and drive current as shown on the Plans. Where a single photocell is used for the lighting system, shorting caps shall be provided for each fixture.

- **Photoelectric Control** - Photoelectric controls shall be long life with a minimum 10 year guarantee and a 25 year rated life.

00970.30 Qualified Worker - In addition to the requirements of 00960.30, provide a Qualified Worker meeting the requirements of 00970.02 for performing work under this Section.

00970.43 Photocontrol Electronic Relay - Replace this subsection, except the subsection number and title, with the following:

Install photoelectronic control relay as shown on the plans.

00970.50 Grounding and Bonding - Delete the paragraph beginning with "On the inside of…".

Add the following paragraph:

Ground the LED fixture to the pole per the street light manufacturer’s instructions. Bonding of street lights on distribution poles shall meet utility requirements.

00970.80 Measurement - Replace this subsection, except for the subsection number and title, with the following:

No measurement of quantities will be made for Work performed under this Section.

The quantities of lighting poles and arms are listed on the Project Plans. Any adjustment to the contract lump sum amount will be made according to 00190.10(h).

SECTION 00987 - TELECOMMUNICATIONS

Section 00987, which is not a Standard Specification, is included in this Project by Special Provision.

Description

00987.00 Scope - This Work consists of furnishing and installing fiber optic cabling for the telecommunications of signalized intersection devices.

00987.01 Regulations, Standards, and Codes - Comply with the following standards where applicable:

- Telecommunications Industry Association (TIA/EIA)
  - EIA-455-3A (FOTP-3) Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components
  - TIA-455-8 (FOTP-8) Measurement of Splice or Connector Loss and Reflectance Using an OTDR
  - TIA-526-7 (OFSTP-7) Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
  - EIA-455-25 (FOTP-25) Impact Testing of Optical Fiber Cables
  - EIA-455-33 (FOTP-33) Fiber Optic Cable Tensile Loading and Bending Test
  - EIA-455-41 (FOTP-41) Compressive Loading Resistance of Fiber Optic Cables
  - EIA-455-81 (FOTP-81) Compound Flow (Drip) Test for Filled Fiber Optic Cable
  - EIA-455-82 (FOTP-82) Fluid Penetration Test for Fluid Blocked Fiber Optic Cable
  - EIA-455-104 (FOTP-104) Fiber Optic Cable Cyclic Flexing Test
  - EIA-455-171 (FOTP-171) Attenuation by Substitution Measurement for Short-Length Multimode Graded-Index and Single Mode Optical Fiber Cable Assemblies
  - EIA/TIA-568-B.3 Optical Fiber Cabling Components
  - EIA/TIA-758 Customer Owned Outside Plant Telecommunications Cabling
  - EIA-598-B Optical Fiber Cable Color Coding
- American National Standards Institute/Insulated Cable Engineers Association (ANSI/ICEA)
  - ANSI/ICEA S-87-640 Standard for Optical Fiber Outside Plant Communications Cable
- International Telecommunication Union - Telecommunication Standardization Sector (ITU-T)
  - G.652 (11/09) Characteristics of a single-mode optical fiber and cable Telecommunications Industry Association (TIA)

- G.652 (11/16) Characteristics of a single-mode optical fiber and cable

00987.02 Submittals - Within 30 Calendar Days after the execution of the Contract, submit the following:

- Disruption Request according to 00987.04
- Outside plant fiber optic cable according to 00987.10
- Fiber optic jumper/patch cables according to 00987.11.
- Splice closures and installation instructions according to 00987.12
- Splice trays according to 00987.13.
- Fiber Optics Installer or Fiber Optics Technician Certification according to 00987.30.
- OSP cable installation procedure according to 00987.40(a)
- Fiber optic cable test plan according to 00987.41(a)
- Factory testing according to 00987.41(b)
- Arrival on-site testing according to 00987.41(c)
- Fiber optic cable testing according to 00987.41(d) and (f)

Include the manufacturer's name, model numbers, catalog sheets and other descriptive literature of proposed materials. Provide the catalog sheets and literature including technical data, physical properties and operational description in sufficient detail to demonstrate the Equipment meets these specifications.

00987.04 Existing System Disruption and Restoration - Work of this Contract requires disruptions to the specified existing systems, circuits, and equipment.

Notify the Engineer 14 Calendar Days before existing Ethernet switches are impacted.

Obtain Engineer's approval before disrupting the system. Disruptions will only be considered for non-holiday weekdays between 8 a.m. and 4 p.m. For each written disruption request include the following:

- System(s) to be affected
- Disruption start date and time
- Estimated duration required

Existing systems that require disruption include the following:

- City of Lake Oswego Public Works feed

Do not disrupt any other communication systems not listed or approved.

Materials

00987.10 Outside Plant Fiber Optic Cable - Furnish and install outside plant (OSP) single mode fiber optic (SMFO) cable containing single mode dual window (1310 nm and 1550 nm) fibers.

(a) Optical Fiber - Meet optical, mechanical and environmental requirements for all usable fibers in buffer tubes.

(b) Fiber Characteristics and Tests - Meet the requirements in Table 00987-1 for single mode fibers:

Table 00987-1

Fiber Characteristic Table	
Parameters:	Single Mode
Type:	Step Index
Core diameter:	8.3 µm (nominal)
Cladding diameter	125 µm ± 1.0 µm
Core to cladding offset:	≤1.0 µm
Coating:	dual layer, UV-cured acrylate strippable mechanically or chemically without damaging fibers
Optical fibers:	doped silica core with concentric silica cladding
Coating diameter:	250 µm ± 15 µm
Cladding non-circularity defined as:	≤2.0% [1-(min. cladding dia÷max. cladding dia.)]x100 FOP cable: all dielectric, gel-filled or water blocking tape, duct-type
Proof/Tensile Test:	345 MPa, min
Attenuation at 1310 nm:	≤0.4 dB/km
Attenuation at 1550 nm:	≤0.4 dB/km
Design Standard:	ANSI/ICEA S-87-640
Test cable according to:	EIA-455-25 (FOTP-25) EIA-455-33 (FOTP-33 Condition II) EIA-455-41 (FOTP-41) EIA-455-81 (FOTP-81) EIA-455-82 (FOTP-82) EIA-455-104 (FOTP-104 Conditions I and II)
Test optical fiber according to:	EIA-455-3A (FOTP-3)
Attenuation at the Water Peak:	≤2.1 dB/km @ 1383 ± 3 nm
Chromatic Dispersion	
Zero Dispersion Wavelength:	1301.5 to 1321.5 nm
Zero Dispersion Slope:	≤0.092 ps/(nm^2 *km)
Maximum Dispersion:	≤3.3 ps/(nm^2 *km) for 1285 – 1330 nm ≤0.092 ps/(nm^2 *km) for 1550 nm
Cut-Off Wavelength:	<1250 nm
Mode Field Diameter	9.3 ± 0.5 µm at 1310 nm
Petermann II	10.5 ± 1.0 µm at 1550 nm

(c) Color Coding - Distinguish each fiber from others in the same tube or cable by means of color coding according to the following:

1. Blue (BL)	7. Red (RD)
2. Orange (OR)	8. Black (BK)
3. Green (GR)	9. Yellow (YL)
4. Brown (BR)	10. Violet (VL)
5. Slate (SL)	11. Rose (RS)
6. White (WT)	12. Aqua (AQ)

Target colors according to the Munsell color shades and comply with EIA/TIA-598.

The color formulation needs to be compatible with the fiber coating and the buffer tube filling compound, be heat stable, not fade, smear, be susceptible to migration, and it must not affect the transmission characteristics of the optical fibers and not cause the fibers to stick together.

(d) Cable Construction - Furnish fiber optic cables with the following components:

(1) Buffer Tubes - Furnish clearance in the loose buffer tubes with fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers are to be loose or suspended within the tubes. Do not adhere the fibers to the inside of the buffer tube. Do not exceed a maximum of 12 fibers in each buffer tube. Furnish the number of fibers per cable as shown.

Extrude loose buffer tubes from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. Furnish material that is tough and abrasion resistant to furnish mechanical and environmental protection of the fibers, yet designed to permit safe intentional “scoring” and breakout, without damaging or degrading the internal fibers.

Furnish buffer tube filling compound that is a water blocking tape or gel based filling compound with anti-oxidant additives to prevent water intrusion and migration homogenous hydrocarbon. Furnish filling compound that is non-toxic, dermatologically safe to exposed skin, as well as chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. Furnish filling compound free from dirt and foreign matter and be readily removable with conventional nontoxic solvents.

Strand buffer tubes around a central member by a method, such as reverse oscillation stranding process that will prevent stress on the fibers when the cable jacket is placed under strain.

(2) Central Member - Furnish a central member that functions as an anti-buckling element that is a glass reinforced plastic rod with similar expansion and contraction characteristic as the optical fibers and buffer tubes. To ensure the proper spacing between buffer tubes during stranding, a symmetrical linear overcoat of polyethylene may be applied to the central member to achieve the optimum diameter.

(3) Filler Rods - Fillers may be included in the cable to maintain the symmetry of the cable cross section. Furnish filler rods that are solid medium or high-density

polyethylene. Filler rods are to be the same diameter as the outer diameter of the buffer tubes.

(4) Stranding - Strand completed buffer tubes around the over-coated central member using stranding methods, lay lengths and positioning such that the cable meets mechanical, environmental and performance specifications. A polyester binding is to be applied over the stranded buffer tubes to hold them in place. Apply binders with sufficient tension to secure the buffer tubes to the central member without crushing the buffer tubes. Furnish a binder that is non-hygroscopic, non-wicking, and dielectric with low shrinkage.

(5) Core and Cable Flooding - Furnish a cable core that contains a water blocking tape material to prevent water ingress and migration. Furnish water blocking tape material that is either a polyolefin-based compound, which fills the cable core interstices, or an absorbent polymer, which fills voids and swells to block the ingress of water. The flooding compound or material needs to be homogeneous, non-hygroscopic, non-conductive, and non-nutritive to fungus. Furnish compound or material that is nontoxic, dermatologically safe and compatible with other cable components.

(6) Tensile Strength Member - Furnish tensile strength by high tensile strength aramid yarns or fiberglass, which are helically stranded evenly around the cable, core and not adhere to other cable components.

(7) Ripcord - Furnish cable that contains at least one ripcord under the jacket for easy sheath removal.

(8) Outerjacket - Furnish jacket that is free of holes, splits, and blisters and be medium or high density polyethylene, or medium density cross linked polyethylene with minimum nominal jacket thickness of 1 mm ± 0.076 mm. Apply jacketing material directly over the tensile strength members and water blocking materials and not adhere to the aramid strength material. The polyethylene needs to contain carbon black to provide ultraviolet light protection and not promote the growth of fungus.

Mark the jacket or sheath with the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every meter. The marking is to be of contrasting color to the cable jacket.

(e) Packaging and Shipping Requirements - Pack completed cable on reels for shipment. Wrap cable in weather and temperature resistant covering. Seal both ends of cable to prevent ingress of moisture. Secure each cable end to the reel to prevent the cable from coming loose during transit. Have at least 6 feet of cable length accessible for testing purposes.

Label each cable reel with a durable, weatherproof label showing manufacturer's name, cable type, actual length of cable on the reel, Contractor's name, contract number, and reel number. Include a shipping record in a weatherproof envelope showing the above information and include the date of manufacturer, cable characteristics (size, attenuation, bandwidth), factory test results, cable identification number and any other pertinent information.

Minimum hub diameter of reel needs to be at least thirty times the cable diameter. Fiber optic cable is to be continuous length on each reel. Mark reel indicating direction reel should be rolled to prevent loosening of cable.

Furnish installation procedures and technical support information at delivery.

00987.11 Fiber Optic Jumpers/Patch Cable - Furnish a minimum of 2 duplex or 4 simplex jumper cables in each cabinet that has new or modified fiber optic cable installation. Use jumpers of simplex or duplex design. Use duplex jumpers of duplex round cable construction. Use jumpers that are at least 6 feet in length, sufficient to avoid stress and allow orderly routing. Use an outer jacket of duplex jumpers that is yellow in color. Use the two inner simplex jackets that are contrasting colors to provide easy visual identification of polarity. Store jumpers within the cabinets. The Agency will connect at the time of commissioning.

Use connectors that are ceramic ferrule for single mode fiber with ultra-physical contact (UPC) polishing, type as shown. Furnish connector body housing that is glass-reinforced polymer. The associated coupler is to be of the same material as the connector housing. Each connector is not to exceed 0.75 dB loss as specified by EIA/TIA-568-B.3.

00987.12 In Handhole Splice Closures - Enclose the fiber optic field splices in splice closures, complete with splice organizer trays, brackets, clips, cable ties, seals and sealant, as needed. Furnish splice closures suitable for direct burial application. Supply the Manufacturer's installation instructions to the Engineer prior to the installation of any splice closures. Furnish splice closures that meet the following requirements:

- Non-filled thermoplastic case
- Rodent proof, waterproof, re-enterable and moisture proof
- Expandable from 2 cables per end to 8 cables per end by using adapter plates if necessary
- Cable entry ports that accommodate 10 mm to 25 mm diameter cables
- Multiple grounding straps
- Accommodate the splicing of all fibers of the largest cable plus 12 additional splices
- Suitable for “butt” or “through” cable entry configurations
- Place no stress on finished splices within the splice trays

Attach the splice closure to the inside wall of the handhole.

00987.13 Splice Trays - Furnish splice trays that accommodate a minimum of 12 fusion splices and allow for a minimum bend radius of 1-3/4 inches. Loop individual fibers one full turn within the splice tray to allow for future splicing. Do not apply stress on the fiber when it is located in its final position. Secure buffer tubes near the entrance of the splice tray. Secure buffer tubes with channel straps.

Furnish splice trays of the same manufacturer as the splice closure or fiber distribution panel depending on use.

00987.14 Warning Tags - Furnish warning tags with a long life material, orange in color, and marked in a permanent and consistent manner with black lettering.

Include the text “CAUTION FIBER OPTIC CABLE” on all warning tags and show the cable fiber count.

Attach warning tags to fiber optic cables using UV-resistant zip ties according to the manufacturer’s recommendations. Do not affix in a manner that causes damage to the fiber.

Attach warning tags to the cables in at least two locations in junction boxes and handholes, and at least one location in cabinets.

00987.15 Labels - Use labels to identify cables and jumpers and patch cords at all termination points, junction boxes, handholes, and cabinets. Use labels to identify all communications equipment and devices in junction boxes, handholes, and cabinets. Use yellow or white colored labels with permanent black lettering. Mechanically imprint labels, do not use handwritten labels.

Use tubular plastic labels on cables and jumpers and patch cords. Label duplex jumpers to provide a visual distinction between the two fibers. Provide labels with the following information:

- Owner
- Number of fibers
- Fiber number
- Cable origin
- Cable destination

Labor

00987.30 Fiber Optic Work - Individuals performing fiber optic installation are to possess either a Fiber Optics Installer or Fiber Optics Technician Certification recognized by the Electronics Technicians Association (ETA) or a Fiber Optics for ITS certificate from the International Municipal Signal Association (IMSA). Submit a copy of certification to the Engineer prior to performing any work.

Construction

00987.40 Fiber Optic Cable Installation and Setup:

(a) OSP Cable Installation - Submit a fiber optic cable installation plan including the manufacturer’s recommended procedures for pulling fiber optic cable for review 30 Calendar Days of execution of the Contract. Use mechanical aids to install cable. Place tension measuring device or breakaway swivel between ends of cable grip and pull rope to ensure tension does not exceed 80 percent of recommended tension or 500 pounds, whichever is less. Use cable grips with a ball bearing swivel for installing fiber optic cable to prevent cable from twisting during installation.

During installation, maintain a minimum bend radius of 20 times the outside diameter of the cable per EIA/TIA-568-B.3. Do not stress the cable beyond the minimum bend radius. Install fiber optic cable using cable pulling lubricant as recommended by the manufacturer. Use a non-abrasive pull tape. Station personnel at each splice vault and hand hole to

lubricate the cable and prevent kinking or other damage. Install fiber optic cable without splices, except as specifically allowed for on the plans, as described herein, or as directed. Divide slack equally on each side of splice closures. Following installation of cable in conduit, seal all entrances in cabinets, junction boxes and vaults with duct sealing compound to keep out moisture, foreign materials, and rodents.

(b) Splicing - Use fusion type splices for all optical fibers that do not exceed a maximum optical attenuation of 0.3 dB per splice as required by EIA/TIA-568-B.3. Place completed splices in a splice tray. Place splice tray in a splice closure unless using a splice enclosure. Protect all splices with a thermal shrink sleeve.

(c) Cable Terminations - At the splice closure, the cable jacket of the SMFO cable is to be removed exposing the aramid yarn, filler rods, and buffer tubes. The exposed length of the buffer tubes needs to be at least the length recommended by the splice closure manufacturer which allows the tubes to be secured to the splice trays. Secure each buffer tube to the splice tray in which it is to be spliced. Remove the remainder of the tube to expose sufficient length of the fibers in order to properly install in the splice tray.

Splice and secure fiber optic cable with tie warps and route to its appropriate fiber distribution unit location.

When applicable, the moisture blocking gel is to be removed from the exposed buffer tubes and fibers. The transition from the buffer tube to the bundle of jacketed fibers is to be treated by an accepted procedure for sleeve tubing, shrink tube and silicone blocking of the transition to prevent future gel leak. Follow manufacturer's installation instructions to ensure that throughout the specified temperature range gel will not flow from the end of the buffer tube if using gel filled fiber optic cable. Strip and prepare the cable for splicing.

All fibers of the fiber distribution panel are to be labeled within the cabinet.

Make a transition with flexible tubing, to isolate each fiber to protect the individual coated fibers. The final transition from bundle to individual fiber tube is to be secured with an adhesive heat shrink sleeve.

00987.41 Fiber Optic Testing:

(a) Test Plan - Prior to beginning testing, submit for approval copies of installation and test plan detailing methods of installation and testing for all materials, equipment, and systems. At the same time, submit the associated schedule of activities. Notification of approval or rejection will be made within 28 Calendar Days. If the test plan is rejected, submit a revised test plan within 28 Days. Do not begin testing until receiving approval of the test plan by the Engineer. Submit all test results, including results of failed tests or re-tests to the Engineer. Supply all test equipment.

Provide 48 hours notice of intent to proceed prior to commencing each functional or subsystem test. In the notice, provide location(s) of test(s). Conduct environmental tests of field equipment as part of the functional tests. Subsystem testing and inspections are to include visual inspection from damaged or incorrect installation, adjustments, alignments, and measurement of parameters and operating conditions.

(b) Factory Testing - Documentation of compliance with the fiber specifications as listed herein is to be supplied by the original equipment manufacturer. Before shipment, but while on the shipping reel, test 100 percent of all fibers for attenuation. Maintain copies of the results on file by the manufacturer with a file identification number, attached to the cable reel in a waterproof envelope, and submitted to the Contractor and Engineer.

(c) Arrival On-Site Testing - Physically inspect each cable upon delivery. Attenuation test 100 percent of the fibers to confirm that the cable meets the requirements at wavelengths of both 1310 nm and 1550 nm with the Optical Time Domain Reflectometer (OTDR) test equipment. The failure of any single fiber in the cable is cause for rejection of the entire reel. Record test results and compare and file with the copy accompanying the shipping reel in a waterproof envelope. Do not install the cable until completion of this test sequence and the Engineer provides written approval. Submit copies of traces and test results to the Engineer. If the tests are unsatisfactory, the reel of cable is considered unacceptable and all records corresponding to that reel are to be marked accordingly. Replace the unsatisfactory reels of cable with new reels of cable. Test the new reels of cable to demonstrate acceptability. Submit copies of the test results to the Engineer.

(d) Fiber Optic Cable Testing - Testing is to include the tests on elements of the passive fiber optic components: (1) at the factory; (2) after delivery to the project site, but prior to installation; (3) after installation, but prior to connection to any other portion of the system. Provide all personnel, Equipment, instrumentation, and Materials necessary to perform all on-site testing.

Provide documentation of all test results to the Engineer at most 3 Days after the test is completed. At least 21 Calendar Days prior to the arrival of cable on site, provide detailed field testing procedures. In the procedures include the test involved and method by which tests are to be conducted. Include in the notification the model, manufacturer, configuration, calibration, and alignment procedures for all proposed test equipment

(e) Outdoor Splices - Verify insertion loss quality of each splice prior to sealing splice closure.

(f) Cable Verification:

(1) OTDR Testing - Once the cabling system has been installed and is ready for splicing, test all fiber links with the OTDR test equipment for attenuation at wavelengths of both 1310 nm and 1550 nm. Index matching gel is not allowed in connectors during testing. Record, date and compare test results and file with previous copies. Submit hard copy printout of traces and test results to the Engineer. Use OTDR test equipment capable of recording and displaying anomalies of at least 0.02 dB. Calibrate the OTDR with traceability to a national metrology unit such as the National Institute of Standards and Technology (NIST).

(2) Power Meter and Light Source Testing - At the conclusion of the OTDR testing, 100 percent of the fiber links are to be tested end to end with a power meter and light source, according to FOTP-171 and in the same wavelength specified for the OTDR tests. Conduct tests in one direction. Calculate the insertion. Record test results, compared, and filed with the other recordings of the same links. Submit test results to the Engineer. Use a power meter that was calibrated with traceability to the National Institute of Standards and Technology (NIST).

(3) Test Failures -
If the link loss measured from the power meter and light source exceeds the calculated link loss, or the actual location of the fiber ends does not agree with the expected location of the fiber ends (as would occur with a broken fiber), the FO link will be rejected. Replace the unsatisfactory segments of cable, or splices with a new segment of cable or splice. Complete the OTDR testing, power meter and light source testing for the repair to determine acceptability. Submit copies of the test results to the Engineer. The removal and replacement of a segment of cable will be interpreted as the removal and replacement of a single continuous length of cable connecting two splices, two connectors. The removal of only the small section containing the failure and therefore introducing new unplanned splices is not allowed.

If the attenuation measured after installation does not match the attenuation measured on-site before installation then the fiber optic link will be rejected. Replace the unsatisfactory segments of cable with a new segment of cable. Complete the OTDR testing for the repair to determine acceptability. Submit copies of the test results to the Engineer. The removal and replacement of a segment of cable will be interpreted as the removal and replacement of a single continuous length of cable. The removal of only the small section containing the failure and therefore introducing new unplanned splices is not allowed.

(4) Allowed Loss - Evaluate fiber optic cable tests based on the following maximum allowable loss per EIA/TIA-568-B.3:

- Fiber on-reel: 0.40 dB/km at 1310nm and 0.30 dB/km at 1550nm
- Installed fiber: 0.40 dB/km at 1310nm and 0.30 dB/km at 1550nm
- Per connector: 0.75 dB bi-directional average
- Per splice: 0.30 dB bi-directional average

Losses exceeding the above limits are only allowed with written approval from the Engineer.

Measurement

00987.80 Measurement - No measurement of quantities will be made for Work performed under this Section.

Payment

00987.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Telecommunications, Material	Lump Sum
(b) Telecommunications, Installation	Lump Sum
(c) Telecommunications, Splicing and Testing	Lump Sum

Item (a) includes furnishing outside plant fiber optic cable, fiber optic jumpers, fiber optic patch cable, splice closures, splice trays, and all other Incidental items necessary to complete the Work.

Item (b) includes installation of all materials as shown or specified.

Item (c) includes fiber optic cable splicing and fiber optic testing as shown or specified.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate or additional payment will be made for required submittals and documentation.

No separate or additional payment will be made for replacement of disturbed earthwork, base, and surfacing.

SECTION 00990 - TRAFFIC SIGNALS

Comply with Section 00990 of the Standard Specifications modified as follows:

Add the following subsections:

00990.13 Power Service Cabinet - Service cabinets shall be the following or an approved equal:

Fouch Drwg #0600-0074-00 (NEMA 3-R Metered Base Mount Service Cabinet Clackamas County).

00990.14 Rectangular Rapid Flashing Beacons – The installation of rectangular rapid flashing beacons (RRFB) shall be as follows:

(a) RRFB Assembly Unit – The RRFB shall be a Carmanah (P/N: SC315-G) with AC Power Kit and uni- or bi-directional light bar configurations as shown on the Contract Plans or approved equal.

(b) Push Button System – RRFB push button system shall be a Polara Crosswalk Button Station (P/N: iNX9WN0-Y) or approved equal.

00990.90 Payment - Delete Pay Item (c) from the pay item list.

Delete the paragraph that begins “Item (c) includes furnishing and installing…”

Replace Pay Item (f) with the following:

(f) RRFB System Installation ..... Lump Sum

Replace the paragraph that begins “In Items (a), (b), (c), (d), (f) …” with the following paragraph:

In Items (a), (b), (d), and (g), the intersection location will be inserted in the blank.

Replace the paragraph that begins “Item (f) includes furnishing and installing…” with the following paragraph:

Item (f) includes furnishing and installing all items of the RRFB System.

Replace the paragraph that begins "Mast arm pole and strain pole foundations …" with the following paragraph:

Drilled shaft foundations for traffic signal 15 foot through 55 foot mast arm supports will be paid for according to 00963.90. Drilled shaft foundations for traffic signal 60 foot through 75 foot mast arm supports will be paid for according to 00921.90.

Crosswalk closure supports will be paid for according to 00902.90.

SECTION 01011 - STORMWATER CONTROL, PONDS

Section 01011, which is not a Standard Specification, is included for this Project by Special Provision.

Description

01011.00 Scope - This Work consists of furnishing and installing stormwater ponds as shown.

01011.03 Submittals - Submit the following according to Section 00150.35:

- Unstamped Working Drawings for each Drainage Facility listed in Table 01011-1, that include the following information:
  - All design and construction details.
  - Structure plan view with dimensions.
  - Typical section with dimensions.
  - All appurtenances labeled.
  - Installation and pipe connection details.
  - Manhole, risers, frames and lids.
  - Bedding and backfill details.
  - Peak flow bypass details.
  - Water quantity storage curves

Table 01011-1

Drainage Facility Identification	Location (Station)	Contributing Impervious Area (Acres)	On-line or Off-line	Water Quality Design Flow Rate Discharge (cubic feet per second)	On-line 25-year Structure Peak Flow Rate (cubic feet per second)
Bioretention Pond, Johnson	'J' 52+00 RT	±2.3	On-line	0.80	11.09
Bioretention Pond, Childs	'S' 33+00 LT	±2.7	On-line	1.09	2.88

Materials

01011.10 Materials - Furnish Material meeting the following requirements:

Slope Matting, Type C.....00280.14(e)
Riprap 00390.11
Subsurface Drain Pipe 00430.10
Granular Drain Backfill 00430.11
Commercial Grade Concrete..... 00440.10
Storm Sewer Pipe 00445.11
Manholes, Catch Basins, and Inlets 00470.11
Aggregate Base 00640.10
Seeding..... 1030.13
Planting..... 1040
Compost 03020.10

01011.11 Porous Pavers – Not used.

01011.12 Water Quality Mixture - Furnish Medium Compost meeting the requirements of Section 03020. Furnish soil meeting the following gradation requirements:

Sieve Size	Percent Passing (by Weight)
No. 4	100
No 10	95 - 100
No. 40	40 - 60
No. 100	10 - 25
No. 200	5 - 10

Sample soil according to AASHTO R 90. Determine sieve analysis according to AASHTO T 27 and AASHTO T 11.

Blend the Medium Compost and soil so that the mixture:

- Is composed of between 20 percent and 25 percent Medium Compost material and between 75 percent and 80 percent soil material.
- Has a pH between 5.5 and 8.0.

- Does not have clumps greater than 3 inches in any direction.

01011.13 Granular Drain Backfill - Furnish Open Graded Aggregate according to Section 00430. Where 3/4" – 1/4" Separation Layer is shown, provide 3/4 Inch to No.4 Open-Graded Aggregate mixture conforming to the gradation requirements of Table 02630-2.

Construction

01011.40 General - Complete General Excavation and shape subgrade to the lines and grades shown and dispose of excavated materials according to Section 00330. Excavate Rock, hardpan, or other unyielding materials a minimum of 4 inches below the established grade for granular drain backfill material. Backfill to subgrade elevation with soil. Perform general excavation and fine grading work only when the facility area is dry and only from the top of the pond area. Do not stockpile material in the facility area.

01011.41 Storage Pond – Not used.

01011.42 Bioretention Pond:

(a) General – Scarify the subgrade area a minimum 12 inches deep.

(b) Laying Pipe - Lay the pipe according to Sections 00430 and 00445. Place drain pipe with perforations down unless otherwise directed.

(c) Joining Pipe - Fasten pipes together with coupling fittings or bands as specified for the type of pipe used. Cap the upstream end of drain pipe.

(d) Granular Drain Backfill – Place 1-1/2" -3/4" Open Graded Aggregate drain rock base and 3/4 Inch - No.4 Open Graded Aggregate separation layer shown. Place granular drain backfill in accordance with Section 00430.46. Only install granular drain backfill within the plan view limits of the 'Bottom of Pond Elevation' shown.

(e) Inspection and Repair - Place Water Quality Mixture only after all the pipe is laid, joined, and inspected, and covered with granular drain backfill material. Remove and reinstall or replace all pipe that is out of alignment, has settled, or is damaged at no additional cost to the Agency.

(f) Placement of Water Quality Mixture - Only install Water Quality Mixture within the plan view limits of the 'Top of Pond Elevation' shown. Place Water Quality Mixture in maximum 12 inch Lifts. Compact each lift by using a water filled roller.

(g) Seeding and Mulch – Install seeding and mulch according to Section 01030.

(h) Slope Matting - After seeding install slope matting as shown or directed.

(i) Planting and Mulch – Install planting and mulch according to Section 1040.

01011.43 Facility Field Markers – Not used.

Maintenance

01011.70 Cleaning - If a stormwater control facility is used for erosion and sediment control, remove all accumulated sediment and debris before completing the facility.

Measurement

01011.80 Measurement - No measurement of quantities will be made for Work performed under this Section. The estimated quantities of Materials are:

Bioretention Pond, Childs Quantities:

Item	Quantity
General Excavation	1865 Cu. Yd.
1-1/2" -3/4" Open Graded Aggregate	335 Cu. Yd.
3/4 Inch - No.4 Open Graded Aggregate	65 Cu. Yd.
Water Quality Mixture	400 Cu. Yd.

Bioretention Pond, Johnson Quantities:

Item	Quantity
General Excavation	1530 Cu. Yd.
1-1/2" -3/4" Open Graded Aggregate	215 Cu. Yd.
3/4 Inch - No.4 Open Graded Aggregate	45 Cu. Yd.
Water Quality Mixture	260 Cu. Yd.

No measurement will be made for riprap, subsurface drain pipe, concrete, storm structures, aggregate base, slope matting, seeding, mulch or planting under this Section.

Payment

01011.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract lump sum amount for the item:

Pay Item	Unit of Measurement
(a) Bioretention Pond, _____	Lump Sum

The drainage facility identification will be inserted in the blank.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate payment will be made for riprap, subsurface drain pipe, concrete, storm structures, aggregate base, slope matting, seeding, mulch, or planting under this Section.

SECTION 01012 - STORMWATER CONTROL, WATER QUALITY BIOFILTRATION SWALE

Section 01012, which is not a Standard Specification, is included for this Project by Special Provision.

Description

01012.00 Scope - This Work consists of furnishing and installing a water quality biofiltration swale as shown.

Materials

01012.10 Materials - Furnish Material meeting the following requirements:

Slope Matting, Type C	00280.14(e)
Channel Liner Matting, Type F	00280.14(e)
Check Dam, Type 1: Aggregate	00280.15(a)
Riprap	00390.11
Commercial Grade Concrete	00440
Storm Sewer Pipe	00445.11
Manholes, Catch Basins, and Inlets	00470.11
Seeding and Mulch	01030.13

01012.11 Porous Pavers – Not used.

01012.12 Water Quality Mixture - Furnish medium compost meeting the requirements of Section 03020. Furnish soil meeting the following gradation requirements:

Sieve Size	Percent Passing (by Weight)
No. 4	100
No 10	95 - 100
No. 40	40 - 60
No. 100	10 - 25
No. 200	5 - 10

Sample soil according to AASHTO R 90. Determine sieve analysis according to AASHTO T 27 and AASHTO T 11.

Blend the medium compost and soil so that the mixture:

- Is composed of between 20 percent and 25 percent medium compost material and between 75 percent and 80 percent soil material.
- Has a pH between 5.5 and 8.0.
- Does not have clumps greater than 3 inches in any direction.

01012.13 Plastic Board – Not used.

01012.14 Stone Embankment Material - Not used.

01012.15 Slope and Channel Liner Matting - Furnish channel liner matting meeting the requirements of 00280.14(e) for resistance to shear stresses calculated for a 10-year storm event.

Construction

01012.40 General - Construct water quality biofiltration swale facility as shown. Excavate Rock, hardpan, or other unyielding materials a minimum of 4 inches below the established grade for granular drain backfill material. Backfill to subgrade elevation with soil. Perform general excavation, fine grading, and placement work only when the facility area is dry and only from the top of the swale area. Do not stockpile excavated material in the facility area. Perform work in sequence as follows:

(a) General - Scarify the subsoil area a minimum 12 inches deep.

(b) Granular Drain Backfill – Place 1-1/2" -3/4" Open Graded Aggregate drain rock base and 3/4 Inch - No.4 Open Graded Aggregate separation layer shown. Place granular drain backfill in accordance with Section 00430.46.

(c) Placement of Water Quality Mixture - Place the water quality mixture in maximum 12 inch lifts. Compact each lift with a water filled landscape roller.

(d) Seeding and Mulch – Seed and mulch according to Section 01030.

(e) Slope and Channel Liner Matting - After seeding install slope and channel liner matting as shown or directed.

(f) Check Dams - Install aggregate check dams spaced as shown or directed.

(g) Stone Embankment – Not used.

(h) Plastic Boards – Not used.

01012.41 Facility Field Markers – Not used.

Maintenance

01012.70 Cleaning - If a stormwater control facility is used for erosion and sediment control, remove all accumulated sediment and debris before completing the facility.

Measurement

01012.80 Measurement - No measurement of quantities will be made for Work performed under this Section. The estimated quantities of Materials are:

Water Quality Swale, Stafford Quantities:

Item	Quantity
General Excavation	1275 Cu. Yd.
1-1/2" -3/4" Open Graded Aggregate	385 Cu. Yd.

3/4 Inch - No.4 Open Graded Aggregate..... 75 Cu. Yd.
Water Quality Mixture ..... 464 Cu. Yd.
Check Dam, Type 1 ..... 9 Each

Water Quality Swale, Rosemont Quantities:

Item	Quantity
General Excavation	0 Cu. Yd.
Water Quality Mixture	0 Cu. Yd.
Check Dam, Type 1	3 Each

No measurement will be made for riprap, concrete, storm structures, aggregate base, slope matting, channel liner matting, seeding or mulch under this Section.

Payment

01012.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract lump sum amount for the item "Water Quality Swale, _____".

The drainage facility identification will be inserted in the blank.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

No separate payment will be made for riprap, concrete, storm structures, aggregate base, slope matting, channel liner matting, seeding or mulch under this Section.

SECTION 01030 - SEEDING

Comply with Section 01030 of the Standard Specifications modified as follows:

01030.13(c) Pure Live Seed - Replace this subsection, except subsection number and title, with the following subsection:

Ensure the PLS application rate meets the PLS specified rate. Apply pre blended seed mixes, with multiple species, at a PLS application rate ensuring all species meet or exceed the PLS specified rate for each species in the seed mix.

PLS application rate for an individual seed species is determined by using the Oregon certified seed tags on the package as follows:

- PLS factor is obtained by multiplying the seed label germination percentage times the seed label purity percentage. Use the purity and germination percentages from the label on actual bags of seed to be used on the Project.
- PLS application rate is obtained by dividing the PLS specified rate by the PLS factor.

For a seed mix, make this calculation for each seed species in the mix and then adjust as follows:

- Using the seed tag, determine the weight of each seed species in the bag and use this information to find the percentage, by weight, of each seed species is in 1 pound for the pre-blended mix.
- Divide the percentage by weight of each seed species, per pound, for the pre-blended mix, by the PLS application rate for that specific seed species.

Determine the highest application rate in the seed mix and apply the seed mix at that application rate.

01030.13(f) Types of Seed Mixes - Add the following to the end of this subsection:

Provide the following seed mix formulas:

- **Temporary and Permanent (Mix No. 1) Seeding**

Botanical Name (Common Name)	**PLS Specified Rate (lb/acre)**
Hordeum brachyantherum (Meadow Barley)	17.45
Bromus carinatus (California Brome)	15.27
Festuca rubra rubra (Native Red Fescue)	8.73
Deschampsia cespitosa (Tufted Hairgrass)	1.31
Agrostis exerata (Spike Bentgrass)	0.87

- **Water Quality Seeding**

Botanical Name (Common Name)	**PLS Specified Rate (lb/acre)**
Elymus Glaucus* (Blue Wildrye)	4.37
Festuca Rubra Rubra* (Native Red Fescue)	6.56
Hordeum Brachyantherum* (Meadow Barley)	2.19
Glyceria Occidentallis* (Northwestern Mannagrass)	13.11
Beckmannia Syzigachne* (American Sloughgrass)	6.56
Deschampsia Caespitosa* (Tufted Hairgrass)	10.93

- **Native Uplands Seeding**

Botanical Name (Common Name)	PLS Specified Rate (lb/acre)
Elymus Glaucus* (Blue Wildrye)	21.86
Festuca Rubra Rubra* (Native Red Fescue)	13.11
Bromus Carnatius* (California Brome)	4.37
Agrostis Exarata* (Spike Bentgrass)	4.37

- **Native Riparian Seeding**

Botanical Name (Common Name)	PLS Specified Rate (lb/acre)
Elymus Glaucus* (Blue Wildrye)	26.23
Hordeum Brachyantherum* (Meadow Barley)	13.11
Bromus Carnatius* (California Brome)	4.37

* Oregon Certified Seed

01030.13(g) Availability - Add the following sentence to the end of this subsection:

Submit the seed and seed mixes to be used on the project according to 00150.37.

Add the following subsection:

01030.14(b)(4) Organic Fertilizer - Furnish organic fertilizer that analyzes >7% nitrogen, 2% phosphoric acid, and 3% soluble potash. Furnish fertilizer that has no toxicity to sites where it will be applied.

Biosol is a manufacturer that provides an equivalent product as specified.

01030.15 Mulch - Add the following paragraph and bullets to the end of this subsection:

Furnish straw mulch for all temporary roadside erosion control seeding, except hydromulch may be used under the following conditions:

- Spring planting west of the Cascades between March 1 and May 15.
- Slopes are steeper than 1V to 1.5H and longer than 16 feet.
- Residential or commercial sites with low erosion potential such as sidewalk, median, or parking lot planter strips.

Projects that have variable slopes may include straw mulch and hydromulch when approved.

01030.40 General - Add the following sentence after the sentence beginning “Notify the Agency…”:

Notify the Agency of the acreage to be seeded at least 7 Days before seeding begins.

01030.42 Weed Control - Add the following paragraph and bullets after the paragraph that begins "If a pesticide has been approved for…" and before subsection (a):

The Specified Weeds and plant species to be removed include the following:

- Himalayan blackberry
- Canary grass
- English ivy

Add the following subsection:

01030.43(c) Seed Application Rates - Determine the seeding application rate according to 01030.13(c). Apply seed mixes at the highest application rate calculated to provide not less than the specified application rate for each individual seed species in the mix.

Add the following subsection:

01030.44(c) Organic Fertilizer - Apply organic fertilizer at a rate of 1,800 pounds per acre at the following locations:

- Stormwater Control Facility

SECTION 01040 - PLANTING

Comply with Section 01040 of the Standard Specifications modified as follows:

01040.02 Definitions - Add the following definition:

Weed Free - See 01030.02 for Weed Free definition.

01040.20(e) Wood Chip Mulch - Add the following to the end of this subsection:

Provide wood chip mulch in the following size range:

- 3” to 1/4” chipped wood material and vegetative debris, free of any noxious weeds or invasive vegetation.

01040.48 Planting Area Preparation - Replace the sentence that begins ”Identify, kill, and remove…” with the following sentence:

Identify, kill, and remove Weeds according to 01030.62(b)(3).

01040.50(g) Plant Cuttings - Add the following to the end of this subsection:

Install cuttings in planted riprap mixture according to 00390.44(f) and 01091.

01040.70 General – Revise and replace the paragraph starting with "The Contractor is responsible for the survival…" with the following:

The Contractor is responsible for the survival of all plant material until the end of a plant Establishment Period of 3 calendar years. The plant Establishment Period will begin when all the original planting is complete. The original planting is considered complete when all the plant material has been planted to the satisfaction of the Agency.

01040.71 Plant Care and Success Criteria - Add the following to the end of this subsection:

The following watering frequencies are required:

- Deciduous trees that are 1 1/2 inch and larger, water at a frequency of 15 gallons weekly.
- Conifer trees that are over 4 feet tall, water at a frequency of 15 gallons weekly.
- All shrubs, water at a frequency of 8 gallons weekly.

01040.72 Periodic Inspections – Replace the paragraph and bullets starting with "During the plant Establishment Period…" with the following:

During the plant Establishment Period, the Agency will make three plant establishment inspections jointly with the Contractor at the following times:

- Following Year 1
- Following Year 2
- Following Year 3

01040.80(d) Plant Materials - Add the following to the end of this subsection:

No measurement of willow cuttings installed in planted riprap mixture will be made for Work performed under this Section. Quantities for willow cuttings are provided in Section 01091.

01040.90(d) Plant Materials - Add the following to the end of this subsection:

Cuttings installed in planted riprap mixture is paid under Section 01091.

Add the following bullet to the end of the paragraph beginning 'No separate or additional payment will be made for:"

- Cuttings, willow

SECTION 01050 - FENCES

Comply with Section 01050 of the Standard Specifications.

SECTION 01065 – MONUMENT BOXES

Section 01065, which is not a Standard Specification, is included in this Project by Special Provision.

Description

01065.00 Scope - In addition to the requirements of Section 00470 and the Specifications, this Work consists of the following:

- Installing new monument frames and covers at the locations shown and where designated by the Engineer.
- Adjusting existing monument boxes to finish grade.

Materials

01065.10 Materials – Furnish Materials meeting the following requirements:

01065.11 Concrete – Provide Commercial Grade Concrete according to Section 00470, modifying the compressive strength requirement of 00440.12 from 3,000 to 4,000 psi at 28 days.

01065.12 Monument Box Frame and Cover –

- SW Stafford Road, SW Johnson Road & SW Childs Road has a speed designation of 35 MPH or more.

(a) Roadways With 35 MPH Speed, or Less - Provide frames and covers consistent with Clackamas County Standard Drawing No. M100.

(b) Roadways Exceeding 35 MPH Speed - Provide frames and covers consistent with Clackamas County Standard Drawing No. M150.

Source materials from the following manufacturers, or approved equal:

East Jordan Iron Works, Inc.
13127 State Avenue
Marysville, WA 98271
(360) 651-6144
Fax (360) 651-6150

Anders Jorgenson
Oregon Sales Representative (503) 774-4144
Fax (503) 775-3263
Cell (503) 367-7925
ajorgenson@ejiw.com

- Product No. 00367311 12" x 7-7/8" Monument Frame (catalog #3673Z)

- Product No. 00367324 Monument Cover with drop handle (catalog #3673A)
- Paving riser rings available

Olympic Foundry Inc.
6530 NE 42nd Avenue
Portland, OR 97218
(503)-281-3381
Fax (503)-284-5880

- Part No. 14-6329 for 12" Monument Frame
- Part No. 14-6338 for Cover
- Paving riser rings available

Construction

01065.40 General - Set monument case just below the pavement finished surface (0.00 inch to 0.25 inch) at the slope of the street surface.

For asphalt streets, there are two acceptable installation methods:

- When paving sequence allows for a break between base lifts and final lift, contractor shall construct base lift paving before installing monument boxes. Upon completion of base lifts, contractor shall excavate and install monument boxes, filling the void spaces with commercial grade concrete. The contractor will then pave final lift around monument boxes.

- When paving sequence does not allow for a break between base lifts and final lift, contractor shall complete paving before installing monument boxes. Upon completion of paving, contractor shall core drill through asphalt and install monument box, filling void spaces with commercial grade concrete to match finished grade.

For concrete streets, monument boxes must be set and secured in place prior to concrete pour.

The location of the required monument boxes have been indicated on the plans. The final location of the required monument boxes will be determined during construction. The County or designated representative will mark the locations of the required monument boxes. At a minimum, the P.C.'s, P.T.'s, P.R.C.'s, P.C.C.'s, and tangents at a minimum of 1000 foot increments along the centerline will be marked. Following acceptance of installed boxes, the Engineer will install monumentation.

Measurement

01065.80 Measurement – The quantity of monument boxes will be measured on the unit basis.

Payment

01065.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Monument Boxes	Each

No separate or additional payment will be made for adjusting existing monument boxes to finish grade. When the Contract Schedule of Items does not indicate payment for Work performed under this Section, no separate or additional payment will be made. Payment will be included in payment made for the appropriate items under which this Work is required.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

SECTION 01069 - METAL HANDRAIL AND PEDESTRIAN FENCE

Section 01069, which is not a Standard Specification, is included in this Project by Special Provision.

Description

01069.00 Scope - This Work consists of furnishing and installing metal handrails and pedestrian rail units as shown or directed.

Materials

01069.10 Materials - Furnish Materials meeting the following requirements:

Commercial Grade Concrete	00440
Metal Handrail	02830
Pedestrian Fence	02831

Construction

01069.40 Metal Handrail and Pedestrian Fence:

(a) Handrail - Fabricate and install imbedded and bolted down metal handrail as shown.

(b) Pedestrian Fence - Fabricate and install pedestrian fence units as shown.

01069.41 Welding - Welding, welder qualifications, prequalification of weld details and inspection of welds shall conform to AWS D1.1 or AWS D1.2. Submit all welding procedure specifications 7 Days prior to fabrication to the Engineer for approval.

01069.42 Concrete Footings - Dimensions of footings shall not be less than shown and shall fill the excavated areas. Place the concrete with contact against firm Soil at the sides and bottom and tamp around the posts and brace ends after the posts and braces have been

brought to and firmly held in proper position. Strike off, slope or crown and smooth the surface of the concrete at the ground level to shed water. Allow to cure for at least 5 Calendar Days before subjecting the posts to strain.

Excavate for concrete footings to reasonably Neat Lines, but not less than the specified dimensions in Soil, or not less than 18 inches deep in Rock. Prevent disturbance of original ground at the sides and bottom of the excavation.

Dispose of Materials removed under these provisions, including excess excavation, in a satisfactory manner.

01069.43 Bolt Holes:

(a) Punched Holes - Use a die with a diameter not exceeding the diameter of the punch by more than 1/16 inch. Ream holes that are required to be enlarged to admit the anchor bolts. Make clean cut holes without torn or ragged edges.

(b) Accuracy of Punched Holes - After punching the holes in the plate, stack the plates with the edges even and insert a cylindrical pin, 1/8 inch smaller in diameter than the nominal size of the punched hole, through the punched holes perpendicular to the face of the plate. No drifting of the rod while passing through each of the punched holes in the stack is allowed. Ensure that the edges of the stack stay in alignment. Non-conforming pieces will be rejected.

Measurement

01069.80 Measurement - The quantities of Work performed under this Section will be measured according to the following:

- **Length Basis** Metal handrail will be measured on the length basis, by measuring along the top rail member, from center of end post to center of end post.

- **Unit Basis** Pedestrian fence will be measured on the unit basis. Pedestrian fence will be counted for each 62 inch long unit.

Payment

01069.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Metal Handrail, _____ Rails	Foot
(b) Pedestrian Fence	Each

In item (a), the number of rails will be inserted in the blank.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

SECTION 01070 - MAILBOX SUPPORTS

Comply with Section 01070 of the Standard Specifications modified as follows:

01070.00 Scope - Add the following paragraph to the end of this subsection:

This Work includes removing, maintaining, and reinstalling existing mailboxes and existing supports. Upon installation of the new mailbox supports at the locations shown in the Plans and/or as directed, new mailboxes shall be furnished and installed.

01070.15 Mailbox - Add the following subsection:

01070.15 Mailbox – Furnish black, large sized, steel mailboxes similar to Model #E1600BAM or approved equal.

01070.80 Measurement - Add the following paragraph to the end of this subsection:

The quantities of mailboxes and supports removed, maintained, and reinstalled will be measured on the unit basis, regardless of type, installed in permanent locations.

01070.90 Payment - Add the following Pay Items to the Pay Item list:

(d) Remove and Reinstall Mailbox Supports ..... Each
(e) Standard Mailbox, Size ___ ..... Each

Item (d) includes removing mailboxes and supports, maintaining them at temporary locations, and reinstalling them at their permanent locations.

Item (e) includes furnishing all materials, hardware, and labor to complete the mailbox installation at the permanent location. The commonly referred to mailbox size will be inserted in the blank, if appropriate.

SECTION 01091 - WATERWAY ENHANCEMENTS

Section 01091, which is not a Standard Specification, is included in this Project by Special Provision.

Description

01091.00 Scope - This Work consists of constructing waterway enhancements such as fish rocks, large woody material, Engineered Streambed Material, and related appurtenances as shown or directed.

01091.05 Pre-Work Meeting - Attend a pre-work meeting at the Project Site in accordance with Section 00245.04.

Materials

01091.10 Material - Furnish materials meeting the following requirements:

(a) Streambed Gravels – Materials are comprised of:

- Salvaged Streambed Material (SSM)
- Streambed Sediment
- Streambed Sand
- Streambed Cobbles 4 inch
- Streambed Cobbles 6 inch
- Streambed Cobbles 8 inch
- Streambed Cobbles 10 inch
- Streambed Cobbles 12 inch

(b) Salvaged Streambed Material (SSM) – Existing soils excavated during construction from the riparian corridor may be reused as Salvaged Streambed Material (SSM) upon approval of the Engineer. SSM is residual soil generally consisting of soft to very soft stiff, silty clay with varying amounts of sand, gravel (CL); medium stiff to very stiff, silt with some sand and sandy silt with trace gravel (ML); stiff, slay (CH); medium stiff, silty slay to clay with some sand (CL/CH); and/or dense, sandy silty gravel (GM). The residual soil is anticipated to exhibit relict basalt textures, slight to heavy iron oxide staining, and cobbles. The approved SSM must contain varying amounts of fine to coarse sand, and the gravel constituent is fine to coarse and subangular to subrounded. The fines constituent is generally nonplastic to high plasticity.

(c) Streambed Sediment - Streambed Sediment gradation is required to meet the following percentage by weight:

Sieve Size	Percent Passing
2 1/2” square	100
2” square	65 - 100
1” square	50 - 85
U.S. No. 4	26 - 44
U.S. No. 40	16 max.
U.S. No. 200	5.0 - 9.0

Components of the existing SSM which meet the criteria for Streambed Sediment may be used to supplement the Streambed Sediment and will be based upon visual acceptance by the Engineer.

(d) Streambed Sand - Material meeting the following requirements expressed as a percentage by weight:

Sieve	Percent Passing	
	Natural Sand	Manufactured Sand

	Min.	Max.	Min.	Max.
No. 4	99	100	99	100
No. 8	90	100	90	100
No. 16	60	90	60	90
No. 30	35	70	35	70
No. 50	10	30	20	40
No. 100	0	5	10	25
No. 200	0	3	0	10

(e) Streambed Cobbles - Streambed Cobbles include material gradations according to the following requirements expressed as a percentage by weight:

Percent Passing					
Approx. Size[1]	**4" Cobbles**	**6" Cobbles**	**8" Cobbles**	**10" Cobbles**	**12" Cobbles**
12"					99-100
10"				99-100	70-90
8"			99-100	70-90	
6"		99-100	70-90		
5"		70-90			30-60
4"	99-100			30-60	
3"	70-90		30-60		
2"		30-60			
1 1/2"	20-50				
3/4"	10 max.	10 max.	10 max.	10 max.	10 max.

[1]Approximate size can be determined by taking the average dimension of the three axes of the Rock, length, width, and thickness, by use of the following calculation. Length is the longest axis, width is the second longest axis, and thickness is the shortest axis.

$$\frac{\text{Length + Width + Thickness}}{3} = \text{Approximate Size}$$

The grading of the Cobbles will be determined by the Engineer by visual inspection of the load before it is placed.

Components of the existing SSM which meet the criteria for Streambed Cobbles may be used to supplement the Streambed Cobbles and will be based upon visual acceptance by the Engineer.

(f) Engineered Streambed Material - Provide a material of mixed Streambed Gravels with the associated ratios:

Streambed Sediment	20% by volume
Streambed Cobbles 8 inch	40% by volume
Streambed Cobbles 10 inch	32% by volume
Streambed Sand	8% by volume

Provide uncrushed, free of deleterious material, hard, durable material that is well graded from the maximum size to the minimum size meeting the following test requirements for quality:

Aggregate Property	Test Method	Requirement
Degradation Factor	ODOT TM 208	15 min,
L.A. Wear, 500 Rev.	AASHTO T 96	50% max
Bulk Specific Gravity	ODOT TM 203	2.55 min.

(g) Boulder Weirs - Furnish Fish Rocks used in the construction of boulder weirs in either Grade Control Terminals or Grade Control Baffles as shown.

(h) Fish Rocks – Streambed rocks or boulders shall be hard, sound, subangular, durable material free from seams, cracks, and other defects tending to destroy its resistance to weather. Round Rock, non-durable Rock, shale, or Rock with shale seams will not be accepted. Furnish fish rocks at the locations shown, with sizes approximately as follows:

Type 1 - 700 pounds to 900 pounds size, hard, durable, angular shaped rock. Furnish a single Rock with a single rock with a thickness of not less than one-third its length.

Type 2 – Greater than 900 pounds to 1,800 pounds size, hard, durable, angular shaped rock. Furnish a single rock with a thickness of not less than one-third its length.

Type 3 - Greater than 1,800 pounds to 2,200 pounds size, hard, durable, subangular rock. Furnish a single rock with a thickness of not less than three-fourths its length.

(i) Large Woody Material - Furnish 10 inch to 18 inch nominal diameter conifer trees. Provide trees with length of 16 to 20 feet long, measured above the rootwad as shown. Furnish structurally sound logs that are free of rot and disease.

(j) Vegetated Riprap – Material is comprised of Loose Riprap and Engineered Streambed Material mixed with the associated ratios:

Loose Riprap, Class 100 65% by volume
Salvaged Streambed Material: 35% by volume

Provide Class 100 loose riprap according to Section 00390

Provide Plant Cutting material for placement in riprap as shown, and in accordance with Section 01040.19(h).

(k) Woven over Non-woven Coir Matting – Furnish materials meeting the following requirements:

- Coir fabrics shall consist of 100% biodegradable matting material. Only those coir fabrics specified will be accepted unless otherwise approved by the Owner's Representative.
- Nonwoven Coir Fabric: Furnish Nonwoven Coir Fabric for the inner, covered layer of matting fabric than meets the following. North American Green (NAG) style C125BN

100% biodegradable coconut fiber mat or approved equal. Deliver fabric in roll widths as specified. The fabric shall meet or exceed the following criteria:

Parameter	Test Method	Requirement
Thickness	ASTM D6525	0.28 inches
Dry Tensile Strength	ASTM D4632	20.7 lbs
Elongation	ASTM D4632	6.6%
Wet Tensile Strength	ASTM D4632	22.2 lbs
Elongation	ASTM D4632	14.1%
Weight	ASTM D3776	10.7 oz./yd
Open Area	Measured	7%
Roll Width	Measured	6.67 feet
Roll Length	Measured	108 feet

- Woven Coir Fabric: Furnish Woven Coir Fabric for the outer, exposed layer of matting fabric that meets the following: Rolanka BioDMat 70, Bon Terra CF-7, DeKoWe 700, Nedia KoirMat 700, or approved equal. The woven coir fabric shall be a high strength 700 Weight (100% coconut fiber), continuously woven mat (i.e., without seams) with the following minimum average roll properties:

Parameter	Test Method	Requirement
Thickness	ASTM D1777	0.35 inches
Tensile Strength	ASTM D4595	100 lb/in x 70 lb/in
Weight	ASTM D3776	20 oz./yd
Open Area	Measured	50%, maximum
Roll Width	Measured	13.1 ft
Roll Length	Measured	83 ft

- Wood Stakes shall be used to anchor all matting at the locations shown. Metal staples shown in the Oregon Standard Drawings are not allowed, unless otherwise approved by the Engineer during construction. Wood stakes shall be 18” in length from solid material and free of knots or defects. Stake manufacture includes cutting a standard grade fir 2” X 4” lumber lengthwise along the diagonal to create wedge shaped stakes, or other similar method resulting in a stake of dimensions approved by the Owner’s Representative. Stakes shall not be constructed from pressure or chemically treated wood.
- Seeding and Mulch: Furnish Native Riparian Seed Mix and Mulch for placement underneath matting according to Section 01030.

Construction

01091.40 General - Do not begin the work of this Section until the requirements for diversion, dewatering, and relocation of stranded fish have been completed according to Section 00295. Prior to installing waterway enhancement, discuss construction sequencing and logistics with the Engineer to ensure that the streambed will function properly. Obtain all permits and perform Work in and around water according to Section 00290, Section 00245 and the following:

(a) General Excavation - Excavate the foundation for Engineered Streambed Material and adjacent stream channel slopes to the elevations and grades as shown, in accordance with Section 00330. Excavate scour holes in the approximate locations as shown, if directed by the Engineer. Owner's Representative will approve the finished sub-grade.

If directed, excavate Rock found in excavation to a depth of 12 inches below Subgrade or as directed. Backfill to subgrade elevation with SSM within the stream channel, or with topsoil on the stream channel slopes.

(b) Salvaged Streambed Materials - During excavation, select and stockpile the existing SSM as directed for re-use. Remove weed and weed seeds in SSM according to 01030.62(b)(3). Dispose unsuitable or excess material per Section 00330.41(a).

(c) Woven over Non-woven Coir Matting – Restore damaged stream banks to a natural slope and profile suitable for establishment of seeding. Disturbed stream bank regrading is incidental to general excavation within this section.

Install seeding in accordance with Section 01030. Prepare area for application of seeding underneath the matting in accordance with Method 'B' of Section 01030.41. Furnish required amendments and cultivate existing ground to a depth of 4 to 6 inches, achieving a loose and friable condition suitable for fine grading. Remove all vegetation, rocks larger than 2 inch diameter, clods, roots, sticks, debris, and other material detrimental to the growth of seeding. All seeded areas shall be Weed Free before application operations begin. Identify, kill, and remove existing plants according to 01030.62(b)(3).

Apply seed and mulch at the rate as shown on plans to soil uniformly with mechanical spreaders at the rates shown on the plans. Apply seed and mulch to soil prior to folding back and staking coir fabrics as shown.

Stabilize streambanks and channel using woven over non-woven coir matting constructed with Streambed Gravels, seeding, mulch, matting, and wooden stakes. Place materials as shown or as directed, while adhering to the following requirements:

- Each roll of coir fabric shall be packaged individually in a suitable sheet, wrapper, or container to protect the fabric from damage to ultraviolet light, moisture, and mud during normal storage and handling.
- Identify each roll of coir fabric with a tag or label securely affixed to the outside of the roll on one end. The label shall include the manufacturer or supplier, the style number, and the roll and lot numbers.
- Store all coir fabrics elevated off the ground and ensure that they are adequately covered to protect the material from damage. Protect coir fabrics from sharp objects which may damage the fabric.
- Coir fabrics damaged during transport, storage or placement shall be replaced at no additional cost.
- The Owner's Representative will randomly select and obtain samples from rolls of coir fabric after arrival on the site and prior to installation to compare with previously submitted samples.

Place non-woven coir fabric in direct contact with the soil. Place woven coir fabric over the non-woven coir fabric. The coir fabrics shall be placed, stretched tightly, and anchored using wood stakes through both layers. Do not anchor the nonwoven and woven fabrics individually. Secure matting to hold fabric firmly to underlying soil. Wood stakes shall be placed between the fibers of the woven coir fabric. Do not cut the coir fabrics to facilitate installation.

When fabric folds are required around channel bends, the fold shall be in the direction of flow and the fabric will be staked at the folds. Overlap coir fabric such that upstream pieces of fabric overlap the downstream piece of fabric a minimum of 1 foot. Stake coir fabric at the center of the overlap with stakes placed 2 feet on-center.

Install coir anchor trenches at the limits of the woven over non-woven coir matting installation as shown or indicated.

Damaged coir fabric shall be repaired or replaced. If damaged coir fabric has a tear of 6 inches or less, scrap fabric may be placed beneath damaged woven coir fabric such that it extends 24 inches beyond the damaged area in all directions. Stake around the tear with 4 wooden stakes on 12-inch centers. Coir fabric with tears greater than 6 inches shall be replaced at no additional expense to Owner.

Install coir streambank fabrics stretched taught and staked to have firm contact with underlying soil. Install additional wooden stakes, as directed, to tighten up loosely staked coir fabrics. Extend woven over non-woven coir matting to the top of bank grading limits, and install anchor trenches along the edges of the coir sheet, as shown or directed. Stake every 2 feet along grade breaks, such as at the top of bank, to maintain contact between the coir fabric and soil at the grade break. Terminate coir matting at riprap interface by extending fabric a minimum of three feet under the riprap where applicable.

(d) Vegetated Riprap - Place vegetated riprap material along the stream channel as shown or as directed. Prepare riprap foundation and filter blanket (if applicable) to create suitable area for plant cuttings according to Section 00390.13 through Section 00390.43.

Furnish Salvaged Streambed Material and mix with the specified class of riprap prior to placement to form a homogenous mass suitable for planting. Furnish Streambed Sediment in lieu of Salvaged Streambed Material if it is unavailable in sufficient quantity or is unsuitable.

Place riprap according to Section 00390.44. Collect, store, and plant stock in accordance with Section 01040.50(g). Install plant cuttings between successive lifts of riprap as shown, at the rate of 3 to 5 plant cuttings per bundle every 10 sq ft during the approved planting period.

(e) Engineered Streambed Material - Place engineered streambed material in the prepared stream channel as shown or directed. Install woven over non-woven coir matting to the bottom and sides of excavated channel as shown.

Thoroughly blend SSM, Streambed Sediment, and Streambed Cobbles before placement in the prepared channel. Do not premix sand before placement. Acceptance of the Engineered Streambed Material will be based upon visual inspection by the Engineer. Place materials after approval as shown, generally consisting of two equal lifts separated by layers of Streambed Sand.

Pressure apply water to each placed layer to facilitate filling the interstitial voids of the streambed Materials with Streambed Sand. The voids are satisfactorily filled when water equivalent to the flow rate of the stream does not go subsurface and there is visual acceptance by the Engineer. If water is not present in the stream, apply water to the stream channel for visual acceptance by the Engineer. Use dechlorinated water for water jetting activities. In the event of turbidity requirement exceedance, fill voids in stages rather than concurrently. Construct streambed Material to ensure that low stream flows are ultimately conveyed above the finished channel.

(f) Large Woody Material – Place LWM as shown or as directed. Place LWM with the rootwad end projecting into the water with the trunk placed at a 45 degree horizontal angle to the bank. Bury the trunk end approximately two-thirds the total length into the embankment.

(g) Fish Rocks – Place Fish Rocks as shown or as directed.

(h) Boulder Weirs – Install Grade Control Terminals and Baffles to create boulder weirs as shown or directed. Arch boulder weirs into the stream channel as shown. Seal weirs with Engineered Streambed Material as shown or directed. Acceptance will be based on water flowing over the boulder weirs and the flowline specified, and not below the flowline between the fish rocks.

Plant Establishment

At the end of the Work, stabilize all disturbed soils, including temporary access routes, level all unlevel and uneven areas at the staging-access area and impacted areas during construction. Restore streambanks to a natural slope, pattern, and profile suitable for establishment of permanent woody vegetation and seeding or as directed by the Owner's Representative. The Contractor is responsible for the survival of seeding and plant cuttings in accordance with Section 01040.70 through 01040.79.

Measurement

01091.80 Measurement - No measurement of quantities will be made for Work performed under this Section.

The estimated quantities of Materials required for Streambed Enhancement are:

Item	Quantity
General Excavation	520 cu. yd.
Extra for Selected SSM	75 cu. yd.
Engineered Streambed Material	320 cu. yd.
Loose Riprap, Class 100	55 cu. yd.
Plant Cuttings.....	425 each
Fish Rocks, Type 1.....	19 each
Fish Rocks, Type 2.....	53 each
Fish Rocks, Type 3.....	15 each
Woven over Non-Woven Coir Matting	770 sq. yd.
Large Woody Material	9 each

The quantity of Engineered Streambed Material listed assumes no reduction for Extra for Selected SSM. Any salvage and reuse of Extra for Selected SSM will reduce the quantity of Engineered Streambed Material at the ratio specified.

Measurement for Seeding, Topsoil and Mulch is done in accordance with Sections 01030 and 01040, respectively.

Payment

01091.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract lump sum amount for the item "Streambed Enhancement".

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.

Payment for Seeding, Topsoil and Mulch is done in accordance with Sections 01030 and 01040, respectively.

Payment for Engineered Streambed Material within the Structural Plate Arch is included in the item "Streambed Enhancement", however payment for Structure Excavation to prepare the foundation for Engineered Streambed Material within the Structural Plate Arch and associated Retaining Walls is included in Section 00510.

SECTION 02001 - CONCRETE

Comply with Section 02001 of the Standard Specifications modified as follows:

02001.02 Abbreviations and Definitions:

Add the following definition:

Lightweight Concrete - Structural concrete having a specified density using lightweight Aggregates.

Replace the sentence that begins "**Pozzolans** - Fly ash, silica fume…" with the following sentence:

Pozzolans - Fly ash, natural Pozzolans, silica fume, and high-reactivity Pozzolans.

Replace the sentence that begins "**Supplementary Cementitious Materials** - Fly ash, silica fume…" with the following sentence:

Supplementary Cementitious Materials - Pozzolans and ground granulated blast furnace slag.

02001.15(a) Current Mix Designs - Replace this subsection, except for the subsection number and title, with the following:

Mix designs that meet the requirements for the specified class of concrete and are currently being used or have been used within the past 24 months on any project, public or private, may be submitted for review. Provide individual test results that comprise the average if more than one data point exists. For paving designs the flexural strength testing must be from within the last two years. For HPC designs the length change and permeability tests must be from within the last two years.

02001.15(b)(1) Trial Batch Plastic Properties - Replace this subsection, except for the subsection number and title, with the following:

For each trial batch, test according to the following test methods:

Test	Test Method
Sampling Fresh Concrete	WAQTC TM 2
Concrete Temperature	AASHTO T 309
Slump	AASHTO T 119 [1]
Air Content	AASHTO T 152 or T 196 [2]
Density	AASHTO T 121
Yield	AASHTO T 121
Molding Concrete Specimens	AASHTO T 23 or R 39 [3]
Water Cement Ratio	[4]

1 For drilled shaft concrete test the slump retention by subsequent tests at 60 minute intervals for the duration of the estimated drilled shaft placement. Report in table or graphical format.
2 Use AASHTO T 196 for lightweight concrete.
3 Cast cylinders in single use plastic molds.
4 Use ODOT's Field Operating Procedure for AASHTO T 121 in the MFTP.

02001.15(c)(10) Plastic Concrete Tests – Replace the bullet that begins “Initial slump test result and subsequent….”

- Initial slump test results and subsequent results at 60-minute intervals, verifying a minimum slump of 4 inches is maintained for the total time estimated for drilled shaft placement, including temporary casing extraction. Report data in a table or graph format.

02001.15(c)(12) Strength Analysis - Replace this subsection, with the following subsection:

02001.15(c)(12) Documentation of Average Compressive Strength - Provide an analysis, showing applicable data and calculations for documentation of average compressive strength according to ACI 301.

02001.20(a) Strength - Replace Table 2001-1 with the following Table 2001-1:

Table 02001-1

Concrete Strength and Water/Cementitious Material (w/cm) Ratio

Type of Concrete	Strength f'_c (psi)	Maximum w/cm Ratio
Structural	3300	0.50
	3300 (Seal)	0.45
	4000	0.48
	4000 (Drilled Shaft)	
	HPC4500	0.40
	HPC(IC)4500	
	5000 +	
Paving	4000	0.44
PPCM's (with cast-in-place decks and no entrained air)	5000	0.48
	5500	0.44
	6000 +	0.42

02001.20(a)(1) Required Average Compressive Strength (f'_{cr}) - Replace this subsection, except for the subsection number and title, with the following:

Except for PPCM designs, provide the required average compressive strength according to ACI 301 for mix design approval.

02001.30(e)(1) HPC Coarse Aggregate Content - Delete the paragraph that begins "Two or more Aggregate products or sources…"

Add the following subsection:

02001.50(d) Concrete Strength Testing Technician (CSTT):

- Receive concrete test cylinders
- Record data
- Strip cylinders
- Store cylinders
- Test cylinders
- Record test data
- Report test data

SECTION 02030 – SUPPLEMENTARY CEMENTITIOUS MATERIALS

Comply with Section 02030, of the Standard Specifications modified as follows:

02030.00 Scope - Replace this subsection, except for the subsection number and title, with the following:

This Section includes the requirements for fly ash, natural pozzolans, silica fume, ground granulated blast furnace slag and high reactivity pozzolans used in portland cement concrete.

02030.10 Fly Ash - Replace this subsection, except for the subsection number and title, with the following:

Furnish Class C and Class F fly ash from the QPL and conforming to AASHTO M 295 (ASTM C618).

Add the following subsection:

02030.15 Natural Pozzolans - Furnish Class N natural pozzolans from the QPL and conforming to AASHTO M 295 (ASTM C618).

02030.50 Metakaolin - Replace this subsection with the following:

02030.50 High Reactivity Pozzolans - Furnish high-reactivity pozzolans from the QPL and conforming to AASHTO M 321.

SECTION 02050 - CURING MATERIALS

Comply with Section 02050 of the Standard Specifications modified as follows:

02050.10 Liquid Compounds - Replace the paragraph that begins “Furnish liquid membrane-forming curing…“ with the following paragraph:

Furnish liquid membrane-forming curing compounds from the QPL and meeting the requirements of ASTM C309. Before use, submit a one quart sample from each lot for testing. Samples will be tested according to ODOT TM 721. Samples are not required for curing compounds used on Commercial Grade Concrete.

SECTION 02320 - GEOSYNTHETICS

Comply with Section 02320 of the Standard Specifications modified as follows:

02320.10(a)(1) Geotextiles - Add the following bullet to the beginning of the bullet list:

- QPL approved for the intended application.

02320.10(b) Acceptance Requirements - Replace this subsection with the following subsection:

02320.10(b) Identification - Identify geotextiles by the product name printed directly on the geotextile by the Manufacturer. For all other geosynthetics and when geotextiles are not marked with a product name, identify geosynthetics by the product label attached to the original packaging or the geosynthetic itself by the Manufacturer.

Allow the Engineer to visually verify geosynthetic products before installation. Open packaged geosynthetics before use in the presence of the Engineer to confirm the correct product. Geotextile rolls without the product name printed on the geotextile or the product label affixed to the geotextile or roll core by the Manufacturer will be rejected. Any other geosynthetics that are unwrapped, missing original packaging or previously opened may not be used unless approved by the Engineer.

02320.10(c)(1) Geotextiles - Replace this subsection, except for the subsection number and title, with the following:

Geotextile products listed in the QPL that are identified as “NTPEP listed” in the remarks column have been approved based on participation in the AASHTO National Transportation Product Evaluation Program (NTPEP) and test data from the program. Manufacturer’s test certification is not required for NTPEP listed geotextiles from the QPL. For other geotextiles, include the following unless directed otherwise:

- QPL product category and proposed project application.
- Product name printed directly on the geotextile by the Manufacturer. For geotextiles that are not marked with a product name, provide geotextile with product label attached to the geotextile or original packaging by the Manufacturer.
- Manufacturer’s name, lot number, roll number, production facility address, and full product information (style, brand, name, etc.).
- Chemical composition of filaments and yarns, including polymer(s) used.
- Minimum average roll values for each of the specified properties from the same lot of geotextiles as the delivered material.

SECTION 02415 - PLASTIC PIPE

Comply with Section 02415 of the Standard Specifications modified as follows:

02415.40 Polypropylene Pipe - Replace the sentence that begins "Dual wall polypropylene pipe …" with the following sentence:

Dual wall polypropylene pipe and fittings ..... ASTM F2764

SECTION 02510 - REINFORCEMENT

Comply with Section 02510 of the Standard Specifications modified as follows:

02510.11(c) Coated Reinforcement Ties and Supports - Replace this subsection, except for the subsection number and title, with the following:

Ties and supports for coated reinforcement, including ties for coated to uncoated reinforcement connections, shall be nonmetallic coated.

SECTION 02560 - FASTENERS

Comply with Section 02560 of the Standard Specifications modified as follows:

02560.30(b) High Strength Tie Rods, Anchor Bolts and Anchor Rods - Add the following paragraph to the end of this subsection:

End stamp all ASTM F1554, Grade 105 according to ASTM F1554 Supplementary Requirements S2 and S3. If the end of the bolt is to be embedded in concrete, the projecting end from the concrete shall be the marked end.

SECTION 02690 - PCC AGGREGATES

Comply with Section 02690 of the Standard Specifications modified as follows:

02690.20(a) Harmful Substances - In the paragraph that begins “Material passing No. 200 sieve…”, replace the words “T 11” with the words “T 27 / T 11”.

02690.20(e) Grading and Separation by Sizes for Prestressed Concrete - Replace this subsection with the following subsection:

02690.20(e) Grading and Separation by Sizes - Sampling shall be according to AASHTO R 90. Sieve analysis shall be according to AASHTO T 27 and AASHTO T 11. Provide aggregates meeting the gradation requirements of Table 02690-1 for structural concrete. Provide a CAgT to perform sampling and testing when required.

Table 02690-1
Gradation of Coarse Aggregates
Percent passing (by Weight)

Size Number	Nominal Size Square Openings	Sieve Size											
		(2½ in.)	(2 in.)	(1½ in.)	(1 in.)	(¾ in.)	(½ in.)	(⅜ in.)	(No. 4)	(No. 8)	(No. 16)	(No. 50)	(No. 200)
3	(2 to 1 in.)	100	90 to 100	35 to 70	0 to 15	—	0 to 5	—	—	—	—	—	**
357*	(2 in. to No. 4)	100	95 to 100	—	35 to 70	—	10 to 30	—	0 to 5	—	—	—	**
4	(1½ to ¾ in.)	—	100	90 to 100	20 to 55	0 to 15	—	0 to 5	—	—	—	—	**
467*	(1½ to No. 4)	—	100	95 to 100	—	35 to 70	—	10 to 30	0 to 5	—	—	—	**
5	(1 to ½ in.)	—	—	100	90 to 100	20 to 55	0 to 10	0 to 5	—	—	—	—	**
56	(1 to ⅜ in.)	—	—	100	90 to 100	40 to 85	10 to 40	0 to 15	0 to 5	—	—	—	**
57	(1 to No. 4)	—	—	100	95 to 100	—	25 to 60	—	0 to 10	0 to 5	—	—	**
6	(¾ to ⅜ in.)	—	—	—	100	90 to 100	20 to 55	0 to 15	0 to 5	—	—	—	**
67	(¾ to No. 4)	—	—	—	100	90 to 100	—	20 to 55	0 to 10	0 to 5	—	—	**
68	(¾ to No. 8)	—	—	—	100	90 to 100	—	30 to 65	5 to 25	0 to 10	0 to 5	—	**
7	(½ to No. 4)	—	—	—	—	100	90 to 100	40 to 70	0 to 15	0 to 5	—	—	**
78	(½ to No. 8)	—	—	—	—	100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5	—	**
8	(⅜ to No. 8)	—	—	—	—	—	100	85 to 100	10 to 30	0 to 10	0 to 5	—	**
89	(⅜ to No. 16)	—	—	—	—	—	100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5	**

* Use two or more seperated sizes which when combined meet these gradation limits.

** See 02690.20(a). Do Not evaluate material passing the No. 200 sieve according to 00165.40.

02690.20(f) Grading and Separation by Sizes for Other Concrete - Delete this subsection.

02690.30(b) Harmful Substances - In the paragraph that begins “Material passing No. 200 sieve…”, replace the words “T 11” with the words “T 27 / T 11”.

02690.30(g) Grading - In the paragraph that begins “Sampling shall be according to…”, replace the words “AASHTO T 2” with the words “AASHTO R 90”.

SECTION 02830 - METAL HANDRAIL

Section 02830, which is not a Standard Specification, is included in this Project by Special Provision.

Description

02830.00 Scope - This Section includes the requirements for the steel in handrail for stairways and pedestrian facilities.

Materials

02830.10 Shapes, Plates, and Bars - Shapes, plates, and bars shall conform to ASTM A36.

Punch anchor plate bolt holes at the locations shown before fabrication.

02830.20 Steel Pipe - Steel pipe shall conform to ASTM A500, seamless, Grade B.

02830.21 Steel Tube - Steel tube shall conform to ASTM A500, seamless, Grade B.

02830.22 Fasteners - Fasteners shall meet the requirements of Section 02560. Machine screws shall be SAE 18 8 stainless steel.

02830.30 Galvanizing - Hot-dip galvanize all handrail components according to AASHTO M 111 (ASTM A123) after shop fabrication.

02830.31 Repair of Hot-Dip Galvanizing - Repair damaged hot-dip galvanizing according to ASTM A780 and ASTM A123. Minimum zinc content for Method A2 is 94 percent on the dry film.

02830.40 Incidentals - Plates, caps, and miscellaneous pieces necessary to complete the rail shall be as shown.

02830.50 Acceptance - Acceptance of handrail Materials will be according to 00165.35 and this Section.

SECTION 02910 - SIGN MATERIALS

Comply with Section 02910 of the Standard Specifications modified as follows:

02910.33(a) General - Replace this subsection, except for the subsection number and title, with the following:

Permanent legends consist of white retroreflective screened, red retroreflective screened, black screened or cut-out white retroreflective sheeting. The letters and numerals of all permanent legends shall conform to the design of the FHWA Standard Rounded Capital Letter Alphabets.

Add following subsection:

02910.50 Digitally Printed Signs, Temporary - Temporary traffic control signs may use digitally printed signs from an integrated engineered match component system on the QPL and applied to furnished substrate according to 00222.10(b).

SECTION 02926 - HIGHWAY ILLUMINATION MATERIALS

Comply with Section 02926 of the Standard Specifications modified as follows:

Add following subsection:

02926.41(f) Electrical Splice Materials - Furnish electrical splice materials meeting the following requirements:

- **Split bolt** Made of silicon bronze to securely join the wires both mechanically and electrically.
- **Heat-shrink tubing** Split-resistant and adhesive-lined tube made of polyolefin complying with UL 224 or UL 486D, temperature range -67 °F to 230 °F, with 600 V rated inner melting wall or liner to provide void-free encapsulated insulation.
- **Insulating rubber tape** Electrical grade, nondrying, rubber based, elastic type complying with ASTM D4388.
- **Insulating vinyl plastic tape** Low temperature (0 °F) resistant, vinyl chloride plastic, electrical insulating tape with pressure-sensitive adhesive. Comply with ASTM D3005.

SECTION 03020 – EROSION MATERIALS

Section 03020, which is not a Standard Specification, is included in this Project by Special Provision.

Description

03020.00 Scope - This Section includes the requirements for erosion control Materials.

Materials

03020.10 Material - Commercially Manufactured Compost - Furnish commercially manufactured compost that:

- Is processed through thermophilic composting meeting the EPA's definition of "Process to Further Reduce Pathogens".
- Is from a commercial compost facility that holds a current DEQ composting permit or is registered with DEQ as a composting facility.
- Meets the requirements of the US Composting Council (USCC) and its Seal of Testing Assurance (STA) program.
- Contains a minimum 65 percent by volume of the following recycled plant waste:
    - Source-separated yard and garden wastes
    - Wood wastes
    - Agricultural crop residues
    - Wax-coated cardboard
    - Preconsumer vegetative food wastes
    - Other similar source-separated materials that the DEQ has determined to have a comparable low level of risk in hazardous substances, human pathogens, and physical contaminants.
    - Manure or biosolids based composts when approved.
- Meets the following compost particle size and media parameters:

Compost Particle Size

Sieve Size	Compost Type		
	Fine*	**Medium***	**Coarse***
	Percent Passing (By Dry Weight)		
3"	100	100	100
1"	99-100	95-100	90-100
3/4"	99-100	95-100	70-100
5/8"	95-100	90-100	70-100
1/2"	80-100	70-100	60-100
1/4"	75-100	70-90	30-60
* maximum 3 inch particle length ** maximum 6 inch particle length			

Media Parameters

Test	Test Method	Requirement		
Physical Contaminants*	TMECC** 03.08-A	Less than 1.0%		
Organic Matter	TMECC** 05.07-A	35% (Minimum)		
pH	TMECC** 04.11-A	6.0 to 8.5		
Soluble Salt Concentration	TMECC** 04.10-A	5 dS/m (Maximum)		
Total Carbon Total Nitrogen	TMECC** 04.02-D TMECC** 04.02-D	Carbon/Nitrogen Ratio		
		Fine	Medium	Coarse
		<25:1	<30:1	<35:1
Stability	TMECC** 05.08-B	≤8		
Maturity	TMECC** 05.05-A	80% or Greater		
Moisture Content	TMECC** 03.09-A	35-60% (Wet Weight)		
* Man-made Inert ** Test Methods for Evaluation of Compost and Composting				

03020.90 Acceptance - Acceptance of commercially manufactured compost Material will be the following:

- Copies of STA lab analysis.
- Copy of DEQ permit or registration of the compost producer.

CLACKAMAS COUNTY
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

PLANS FOR THE WIDENING AND INTERSECTION
IMPROVEMENTS ON STAFFORD ROAD

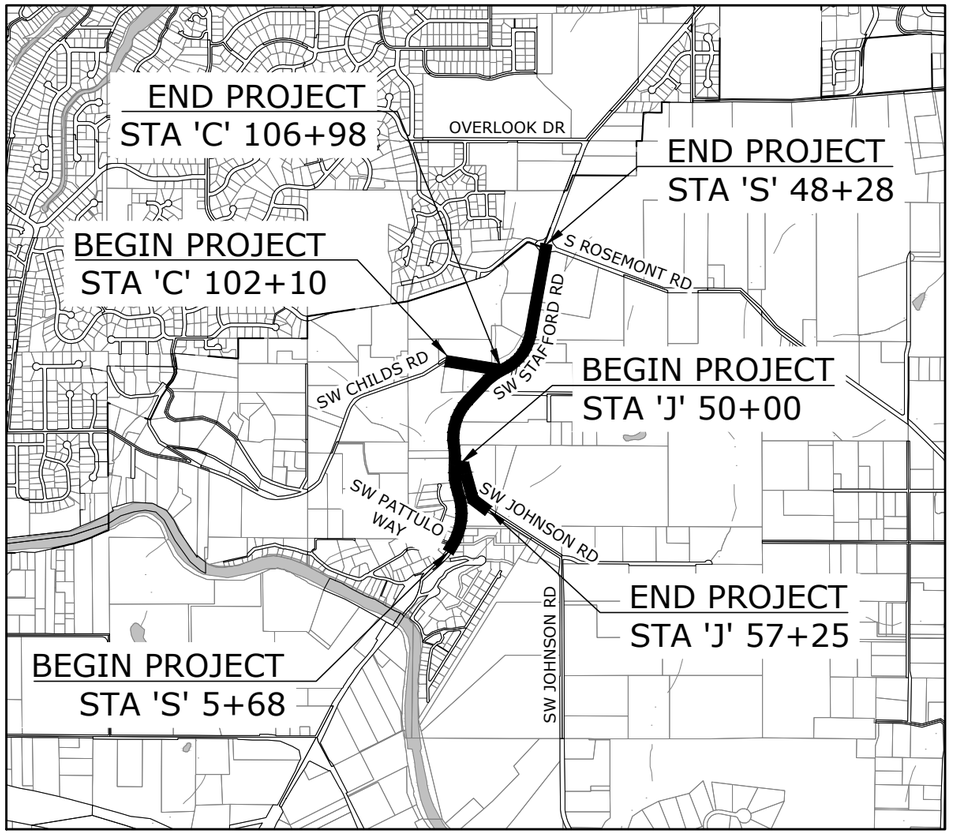
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

CLACKAMAS COUNTY
OREGON

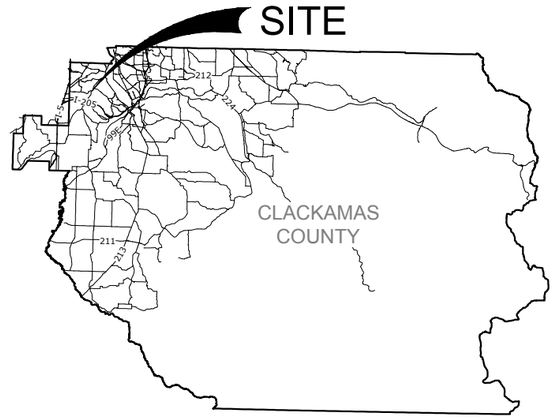
REGISTERED PROFESSIONAL ENGINEER
76605PE
OREGON
JUNE 2,2010
WILLIAM RAY ADAMS
RENEWS 12–31–25

INDEX OF SHEETS	
G01	TITLE SHEET
G02	INDEX OF DRAWINGS
G03	STANDARD DETAILS
G04	LEGENDS AND ABBREVIATIONS

INDEX OF SHEETS CONTINUED ON SHEET G02



VICINITY MAP



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

NOTES:

PROJECT VERTICAL DATUM FOR THIS SURVEY IS NAVD88 (ORGN).
THE BASIS OF BEARINGS FOR THIS SURVEY IS BASED ON OBSERVATIONS USING THE OREGON REAL-TIME GNSS NETWORK (ORGN)
HORIZONTAL DATUM: OREGON COORDINATE REFERENCE SYSTEM (ORCS) PORTLAND, NAD 83 2011. EPOCH 2010. INTERNATIONAL FEET. SEE SURVEY NOTES.

ATTENTION !

OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0100. YOU MAY OBTAIN COPIES OF THE RULES FROM THE CENTER OR ANSWERS TO QUESTIONS ABOUT THE RULES BY CALLING (503) 232-1987.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TITLE SHEET
STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD
DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
G01

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-G.dwg G01 10/31/2024 9:15 AM RILEY.WIGGINS 24.1s (LMS Tech)

INDEX OF SHEETS, CONTINUED

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

INDEX OF DRAWINGS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
G02

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-G.dwg G02 10/31/2024 9:15 AM RILEY.WIGGINS 24.1s (LMS Tech)

STANDARD DWG. REFERENCE

OREGON DEPARTMENT OF TRANSPORTATION (ODOT) STANDARD DWG. NO. & DESCRIPTION

ODOT BRIDGE SECTION

BR705 - STANDARD RETAINING WALL CAST-IN-PLACE SEMI-GRAVITY FRONT FACE BATTER
BR708 - STANDARD RETAINING WALL REINFORCEMENT DETAILS CASE III: 2H:1V INCLINED BACKFILL
BR709 - STANDARD RETAINING WALL CAST-IN-PLACE SEMI GRAVITY JOINTS AND DETAILS

ODOT ROADWAY SECTION

RD100 - MAILBOX SUPPORT
RD101 - MAILBOX INSTALLATION
RD115 - MONUMENT BOX
RD120 - CONCRETE STAIRWAY
RD140 - ROADWAY CROSS SLOPES SUPERELEVATED SECTIONS
RD300 - TRENCH BACKFILL, BEDDING, PIPE ZONE AND MULTIPLE INSTALLATIONS
RD306 - CONCRETE ENCASEMENT, CRADLE, AND CAP DETAILS
RD312 - SUBSURFACE DRAIN
RD335 - STANDARD STORM SEWER MANHOLE
RD336 - STANDARD MANHOLE DETAILS
RD339 - PIPE TO STRUCTURE CONNECTIONS
RD340 - STORM SEWER POLLUTION CONTROL MANHOLE
RD342 - SHALLOW MANHOLES
RD344 - STANDARD MANHOLE BASE SECTION
RD345 - PIPE TO MANHOLE CONNECTIONS
RD356 - MANHOLE COVERS & FRAMES
RD360 - MANHOLE FRAME ADJUSTMENT
RD364 - CONCRETE INLETS TYPE G-1, G-2, G-2MA
RD365 - FRAMES & GRATES FOR CONCRETE INLETS
RD366 - CONCRETE INLETS TYPE CG-1, CG-2
RD368 - CONCRETE INLETS TYPE M-E, M-O, B & B-SL
RD370 - DITCH INLET TYPE D
RD374 - AREA DRAINAGE BASIN OR FIELD INLET
RD402 - MIDWEST GUARDRAIL SYSTEM TYPES
RD403 - MIDWEST GUARDRAIL SYSTEM WOOD POST & BLOCK
RD406 - PLACEMENT OF GUARDRAILS ON SLOPES
RD407 - MIDWEST GUARDRAIL SYSTEM (W-BEAM)
RD416 - MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS & MISC)
RD417 - MIDWEST GUARDRAIL SYSTEM END SECTIONS
RD419 - MIDWEST GUARDRAIL SYSTEM GRADING FOR TERMINALS
RD420 - MIDWEST GUARDRAIL SYSTEM NON-FLARED ENERGY-ABSORBING TERMINAL
RD450 - GUARDRAIL ANCHORS (STEEL)
RD451 - WOOD BREAKAWAY POSTS
RD610 - ASPHALT CONCRETE PAVEMENT (ACP) DETAILS
RD615 - SURFACE EDGE DETAILS
RD701 - DRAINAGE CURBS
RD705 - ISLANDS
RD707 - ISLAND NOSE TREATMENTS
RD710 - ACCESSIBLE ROUTE ISLANDS
RD722 - SIDEWALK JOINTS & TRANSITION PANELS
RD770 - METAL HANDRAIL
RD771 - METAL HANDRAIL DETAILS
RD815 - CHAIN LINK FENCE
RD902 - DETECTABLE WARNING SURFACE DETAILS
RD906 - DETECTABLE WARNING SURFACE PLACEMENT FOR ACCESSIBLE ROUTE ISLAND
RD909 - DETECTABLE GUIDE STRIP PLACED AT BIKE RAMPS
RD910 - PERPENDICULAR CURB RAMP
RD916 - PERPENDICULAR CURB RAMP SINGLE RAMP
RD1000 - CONSTRUCTION ENTRANCES
RD1005 - CHECK DAMS TYPE 1, 3 AND 4
RD1006 - CHECK DAMS TYPE 2 AND 6
RD1010 - INLET PROTECTION TYPE 2, 3, 6, 7, 10 AND 11
RD1033 - SEDIMENT BARRIER TYPE 9
RD1040 - SEDIMENT FENCE
RD1045 - TEMPORARY SLOPE DRAIN WITH ENERGY DISSIPATOR
RD1050 - TEMPORARY SCOUR BASIN/ENERGY DISSIPATOR
RD1055 - SLOPE AND CHANNEL MATTING
RD1060 - TIRE WASH FACILITY TYPE 1 AND 2
RD1070 - CONCRETE TRUCK WASH OUT

ODOT TRAFFIC SECTION

TM240 - CROSSWALK CLOSURE DETAIL
TM457 - PEDESTAL FOUNDATION AND TRAFFIC SIGNAL ASSEMBLY
TM472 - TRAFFIC SIGNAL JUNCTION BOXES/HAND HOLES
TM500 - PAVEMENT MARKING STANDARD DETAIL BLOCKS
TM501 - PAVEMENT MARKING STANDARD DETAIL BLOCKS
TM503 - PAVEMENT MARKING STANDARD DETAIL BLOCKS
TM530 - INTERSECTION PAVEMENT MARKINGS (CROSSWALK, STOP BAR & BIKE LANE STENCIL)
TM531 - TURN ARROW MARKING DETAILS
TM560 - ALIGNMENT LAYOUT: GENERAL
TM570 - TRAFFIC DELINEATORS
TM677 - SIGN MOUNTS
TM687 - PERFORATED STEEL SQUARE TUBE (PSST) ANCHOR FOUNDATION
TM688 - PERFORATED STEEL SQUARE TUBE (PSST) SLIP BASE FOUNDATION
TM800 - TABLES, ABRUPT EDGE, AND PCMS DETAILS
TM810 - TEMPORARY PAVEMENT MARKINGS
TM821 - TEMPORARY SIGN SUPPORTS
TM822 - TEMPORARY SIGN SUPPORTS
TM840 - CLOSURE DETAILS
TM844 - TEMPORARY PEDESTRIAN ACCESSIBLE ROUTES
TM855 - 2-LANE, 2-WAY ROADWAYS

ODOT TECHNICAL DETAILS TRAFFIC SECTION

DET4456 - GREEN SHEETS UNINTEGRATED SPEED FEEDBACK ASSEMBLY (LARGE OR SMALL)

ODOT STANDARD DRAWING REFERENCE: https://www.oregon.gov/odot/engineering/pages/standards.aspx

CLACKAMAS COUNTY STD DWG. NO. & DESCRIPTION

DTD ROADWAY STANDARD DETAILS

D250 - TYPICAL PLAN FOR DRIVEWAY CULVERT INSTALLATION
D650 - STANDARD DRIVEWAY TO CURBED COUNTY ROAD WITH LANDSCAPE STRIP
D700 - DRIVEWAY WATER BAR (BERM) CONSTRUCTION
M150 - MONUMENT BOX GREATER THAN 35 MPH
N100 - STANDARD NOTES GENERAL
N200 - STANDARD NOTES GENERAL (CONT) & GRADING
N300 - STANDARD NOTES - STREET, STORM & UTILITY
S100 - STANDARD TYPE C VERTICAL CURB & CURB DETAILS
S150 - STANDARD CURB AND GUTTER
S180 - MOUNTABLE CURB
S960 - STANDARD SIDEWALK AND CURB RAMP NOTES & DETAILS
T100 - STREET NAME SIGNS & DETAILS
T130 - STREET NAME SIGNS AND DETAILS (CONTINUED)
T150 - SIGN MOUNTING AND ATTACHMENTS
T250 - SIGN INSTALLATIONS
U200 - STANDARD TRENCH AND BACKFILL

CLACKAMAS COUNTY STANDARD DETAIL REFERENCE: https://www.clackamas.us/engineering/roadway.html

WATER ENVIRONMENTAL SERVICES STANDARD DETAILS

SAN - 005 - MANHOLE-OUTSIDE DROP
SWM - 06 - SWALE
SWM - 10 - DETENTION POND
SWM - 11 - DETENTION POND FLOW CONTROL STRUCTURE
SWM - 33 - MANHOLE STANDARD
SWM - 45 - OUTFALL RIP RAP

WES STANDARD DETAIL REFERENCE: https://www.clackamas.us/wes/forms#stormwater.html

STANDARD DRAWINGS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR | DRAFTED BY: JSD | CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No. G03

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-G.dwg G03 10/31/2024 9:15 AM RILEY.WIGGINS 24.1s (LMS Tech)

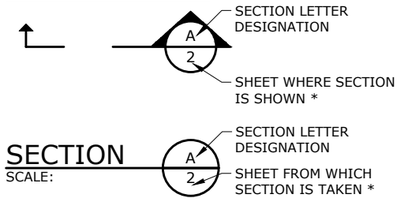
TOPOGRAPHIC LEGEND

	EXISTING	PROPOSED
WATERLINE	W	
ELECTRICITY	E or P	
GAS	GAS	
TELEPHONE/TELEMETRY	T	
FIBER OPTIC	FO	
CABLE TELEVISION	CATV	
OVERHEAD UTILITY	OVHD	
SANITARY SEWER LINE	SS	
HIGH PRESSURE GAS	HPG	
STORM DRAIN	SD	
CULVERT		
ABANDON PIPE		
DRAINAGE DITCH		
FENCE		
HANDRAIL		
WOOD FENCE		
FENCE TO BE REMOVED		
GUARDRAIL		
GUARDRAIL TO BE REMOVED		
TREE/BUSH LINE		
CENTERLINE		
EASEMENT		
PROPERTY LINE		
RIGHT-OF-WAY		
EDGE OF PAVEMENT/AC		
TEMPORARY CONSTRUCTION EASEMENT		
SLOPE & PUBLIC UTILITY EASEMENT		
CONSERVATION EASEMENT		
CUT LIMITS		C C C
FILL LIMITS		F F F
SAW CUT		
EDGE OF GRAVEL		
CURB		
SIDEWALK	S/W	S/W
CONCRETE		
STRUCTURE OR FACILITY		
CONTOUR MINOR		
CONTOUR MAJOR	200	200
EXISTING WETLAND		
ORDINARY HIGH WATER MARK		

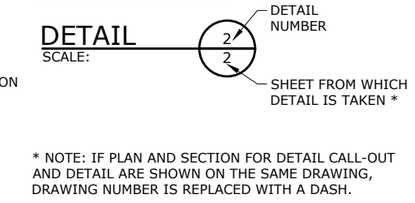
	EXISTING	PROPOSED
MANHOLE		
CLEAN-OUT		
CATCH BASIN/CURB INLET		
FIRE HYDRANT ASSEMBLY		
WATER METER		
WELL		
PULL BOX/JUNCTION BOX		
UTILITY POLE		
GUY WIRE		
ELECTRICAL METER		
COMMUNICATIONS RISER		
GAS VALVE		
LIGHT POST		
MAILBOX		
BOLLARD/POST		
ROADSIDE SIGN		
UNDERGROUND UTILITY SIGN		
BENCHMARK		
MONUMENT		
TREE DECIDUOUS		
TREE CONIFEROUS		
TREE TO BE REMOVED		
RETAINING WALL		
SURFACE ELEVATION	176.63	176.63
BORE LOCATION		
WETLAND FLAG		
SURVEY CONTROL	# NO.	
ROCK WALL		

SECTION AND DETAIL DESIGNATIONS

SECTION DESIGNATIONS



DETAIL DESIGNATIONS



* NOTE: IF PLAN AND SECTION FOR DETAIL CALL-OUT AND DETAIL ARE SHOWN ON THE SAME DRAWING, DRAWING NUMBER IS REPLACED WITH A DASH.

ABBREVIATIONS

@	AT
AASHTO	AMERICAN ASSOCIATION OF STATE AND HIGHWAY TRANSPORTATION OFFICIALS
ABAN (D)	ABANDON (ED)
ABS	ACRYLONITRILE BUTADIENE STYRENE
AC	ASPHALTIC CONCRETE
ACP	ASPHALTIC CONCRETE PAVEMENT
ADA	AMERICANS WITH DISABILITIES ACT
ADJ	ADJACENT
APPROX	APPROXIMATE
APPVD	APPROVED
APWA	AMERICAN PUBLIC WORKS ASSOCIATION
ASTM	AMERICAN SOCIETY FOR TESTING & MATERIALS
AVE	AVENUE
AVG	AVERAGE
BC	BOTTOM OF CURB
BCR	BEGIN CURB RETURN
BFILL	BACK FILL
BLDG	BUILDING
BLVD	BOULEVARD
BMP	BEST MANAGEMENT PRACTICE
BNDY	BOUNDARY
BP	BEGIN POINT
BSMT	BASEMENT
C	CUT (SLOPE LIMITS)
CB	CATCH BASIN
CC	CLACKAMAS COUNTY
CDF	CONTROL DENSITY FILL
CI	CAST IRON
C/L or CL	CENTERLINE
CLSM	CONTROLLED LOW STRENGTH MATERIAL
CO	CLEANOUT
COM	COMMUNICATIONS
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCT / CONSTRUCTION
CSP	CONCRETE SEWER PIPE
CTB	CEMENT TREATED BASE
CY	CUBIC YARDS
DETS	DETAILS
DI	DUCTILE IRON
DIA	DIAMETER
DTD	DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
DWG	DRAWING
DWY	DRIVEWAY
EA	EACH
ECR	END CURB RETURN
EG	EXISTING GRADE
EL	ELEVATION
EOP	EDGE OF PAVEMENT
EP	END POINT
ESMT	EASEMENT
EXIST	EXISTING
EXIST GR	EXISTING GRADE
EXT	EXTENSION
FC	FLOW CONTROL
FG	FINISHED GRADE
FH	FIRE HYDRANT
FIN	FINISHED
FL	FLOWLINE
FT	FEET / FOOT
G	GAS
GF	GUTTER FLOWLINE
GR	GRADE
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HWY	HIGHWAY
HYD	HYDRANT
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCH
INV	INVERT
L	LENGTH
LAT	LATERAL
LF	LINEAR FOOT
LN	LANE
LT	LEFT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
NO / NO.	NORMALLY OPEN / NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
ODOT	OREGON DEPARTMENT OF TRANSPORTATION
OVHD	OVERHEAD WIRES
OHW	ORDINARY HIGH WATER MARK
OLWSD	OAK LODGE WATER SERVICES DISTRICT
ORS	OREGON REVISED STATUTE
OSHD	OREGON STATE HIGHWAY DEPARTMENT
PC	POINT OF CURVE
PCC	POINT OF COMPOUND CURVE
PGE	PORTLAND GENERAL ELECTRIC
PI	POINT OF INTERSECTION
PL or P/L	PROPERTY LINE / PLATE / PLASTIC
PRC	POINT OF REVERSE CURVATURE
PROF	PROFILE
PROP	PROPOSED
PRVT	PRIVATE
PSUE	PERMANENT SLOPE AND UTILITY EASEMENT
PT	POINT OF TANGENCY
PUB	PUBLIC
PVC	POLYVINYL CHLORIDE/POINT OF CURVATURE ON VERTICAL CURVE
PVI	POINT OF INTERSECTION ON VERTICAL CURVE
PVMT	PAVEMENT
PVT	POINT OF TANGENCY ON VERTICAL CURVE
QTY	QUANTITY
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RET	RETAINING
R/W or ROW	RIGHT OF WAY
RRFB	RECTANGULAR RAPID FLASHING BEACON
RT	RIGHT
SAN	SANITARY
SD	STORM DRAIN/STORM SEWER
SDL	SADDLE
SHT	SHEET
S	SLOPE
SPEC (S)	SPECIFICATION (S)
SS	SANITARY SEWER
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
S/W	SIDEWALK
T or TEL	TELEPHONE
TEMP	TEMPORARY
TC	TOP OF CURB
TCE	TEMPORARY CONSTRUCTION EASEMENT
THKN	THICK / THICKNESS
TWMF	TEMPORARY WATER MANAGEMENT FLOW
TYP	TYPICAL
UTIL	UTILITIES
UV	ULTRAVIOLET
VAR	VARIES
VC	VERTICAL CURVE
VERT	VERTICAL
W	WATER
W/	WITH
W/O	WITHOUT
WQ	WATER QUALITY

PROJECT CONTACTS

OWNER:
CLACKAMAS COUNTY DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD, ROOM 320
OREGON CITY, OR 97045
TEL: 971-804-2825
CONTACT: JONATHAN HANGARTNER

CIVIL ENGINEER:
CONSOR NORTH AMERICA, INC
ONE SW COLUMBIA STREET, SUITE 1700
PORTLAND, OR 97204
TEL: 503-225-9010
CONTACT: WILLIAM (BILLY) ADAMS, PE

SEWER, STORM:
CLACKAMAS COUNTY
SEE CONTACT INFORMATION ABOVE

WATER:
MOSSY BRAE WATER DISTRICT
CONTACT: RON KINDER
EMAIL: RKINDER@HEVANET.COM

SHADOW WOOD WATER SERVICE
(OWNED BY HYLAND WATER CORP)
CONTACT: MEL OLSON
TEL: 503-312-9206

CITY OF LAKE OSWEGO - WATER
STEFAN BROADUS
EMAIL: SBROADUS@CI.OSWEGO.OR.US
TEL: 503-635-0267

GAS:
NW NATURAL (NWN)
220 NW 2ND AVENUE
PORTLAND, OR 97209
CONTACT: RYAN WINFREE
EMAIL: RYAN.WINFREE@NWNATURAL.COM
TEL: 503-610-7744

COMMUNICATIONS:
COMCAST
7900 NE KILLINGSWORTH STREET
PORTLAND, OR 97218
CONTACT: MATTHEW BRAVO
EMAIL: MATTHEW_BRAVO@COMCAST.NET
TEL: 971-801-5787

CLACKAMAS BROADBAND EXCHANGE
121 LIBRARY COURT
OREGON CITY, OREGON 97045
CONTACT: DUKE DEXTER
EMAIL: DDEXTER@CLACKAMAS.US
TEL: 503-722-6663

LUMEN LOCAL NETWORK
8021 SW CAPITOL HILL ROAD
PORTLAND, OR 97219
CONTACT: GORDON BATES
EMAIL: GBATES@TERRATECHLLC.COM
TEL: 541-410-4936

LUMEN NATIONAL NETWORK
CONTACT: ALIYA SKARO
EMAIL: ALIYA.SKARO@LUMEN.COM

ZAYO GROUP
18110 SE 34TH STREET, BUILDING ONE, SUITE 100
VANCOUVER, WA 98683
CONTACT: BRIAN DAVIDSON
EMAIL: BRIAN.DAVIDSON@ZAYO.COM
TEL: 360-558-4215

ZIPLY FIBER
4155 SW CEDAR HILLS BLVD
BEAVERTON, OR 97005
CONTACT: SCOTT BINNEY
EMAIL: SCOTT.BINNEY@ZIPLY.COM
TEL: 503-643-0371

POWER:
PORTLAND GENERAL ELECTRIC (PGE)
CONTACT: ANDY BREWER
EMAIL: ANDY.BREWER@PGN.COM
TEL: 503-915-9441
WORK ORDER NO. M2975321

WASTE:
REPUBLIC SERVICES
503-682-3900

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12–31–25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

LEGENDS AND ABBREVIATIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
G04

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-G.dwg G04 10/31/2024 9:15 AM RILEY.WIGGINS 24.1s (LMS Tech)

SURVEY CONTROL POINT TABLE

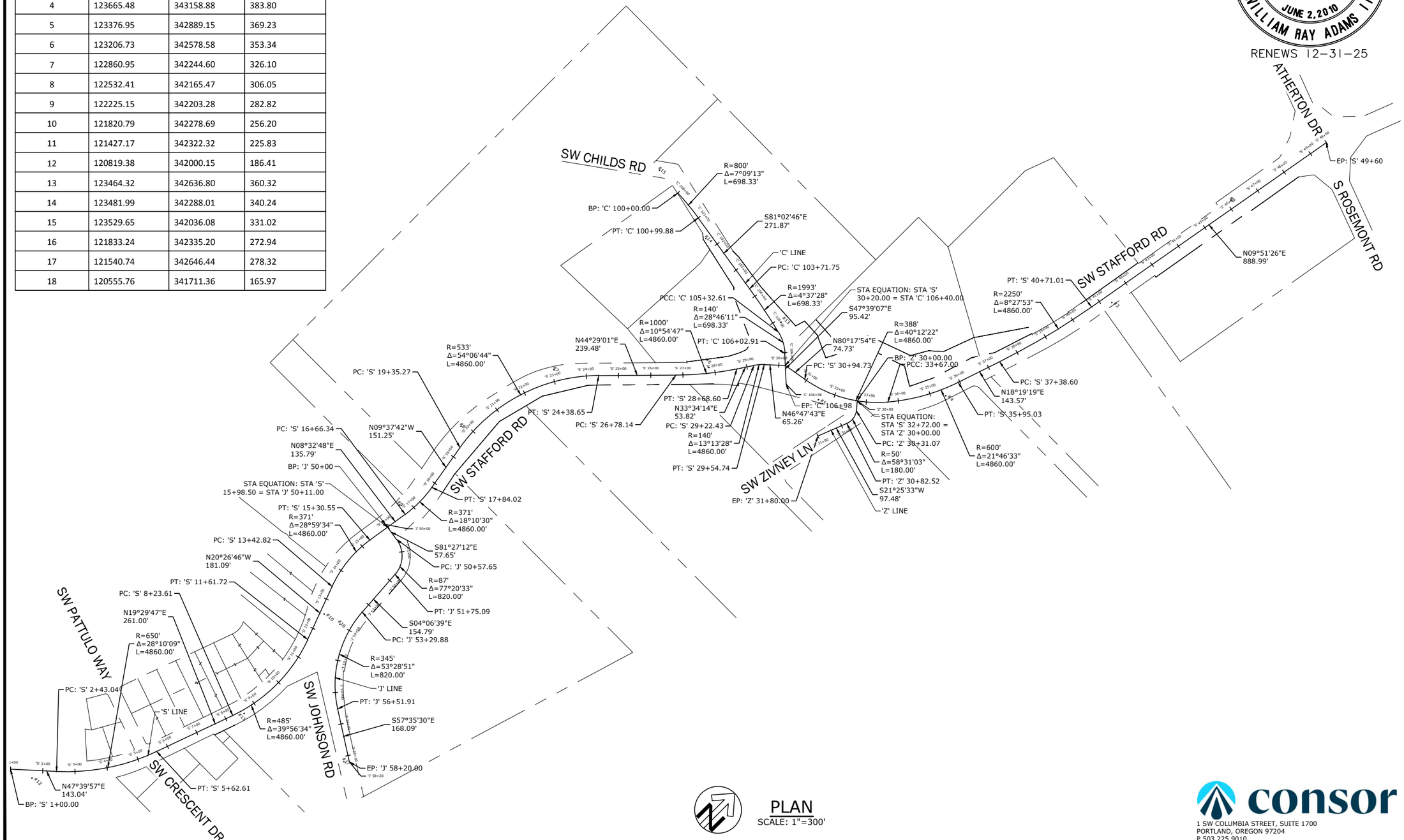
POINT #	NORTHING	EASTING	ELEVATION
1	124969.66	343559.13	432.38
2	124720.42	343353.24	429.79
3	124234.53	343317.27	419.04
4	123665.48	343158.88	383.80
5	123376.95	342889.15	369.23
6	123206.73	342578.58	353.34
7	122860.95	342244.60	326.10
8	122532.41	342165.47	306.05
9	122225.15	342203.28	282.82
10	121820.79	342278.69	256.20
11	121427.17	342322.32	225.83
12	120819.38	342000.15	186.41
13	123464.32	342636.80	360.32
14	123481.99	342288.01	340.24
15	123529.65	342036.08	331.02
16	121833.24	342335.20	272.94
17	121540.74	342646.44	278.32
18	120555.76	341711.36	165.97

SURVEY CONTROL AND ALIGNMENT MAP

SURVEY NOTES:

1) HORIZONTAL DATUM: NAD 83, 2011.2010
2) OCRS (PORTLAND)
3) VERTICAL DATUM: NAVD 88

UNITS IN US SURVEY FEET.



PLAN
SCALE: 1"=300'

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

HORIZONTAL CONTROL

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RPW/AJR	JSD	WRA

REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
HC01

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-H-CONTROL.dwg HC01 2/2/2024 2:04 PM RILEY.WIGGINS 24.1s (LMS Tech)

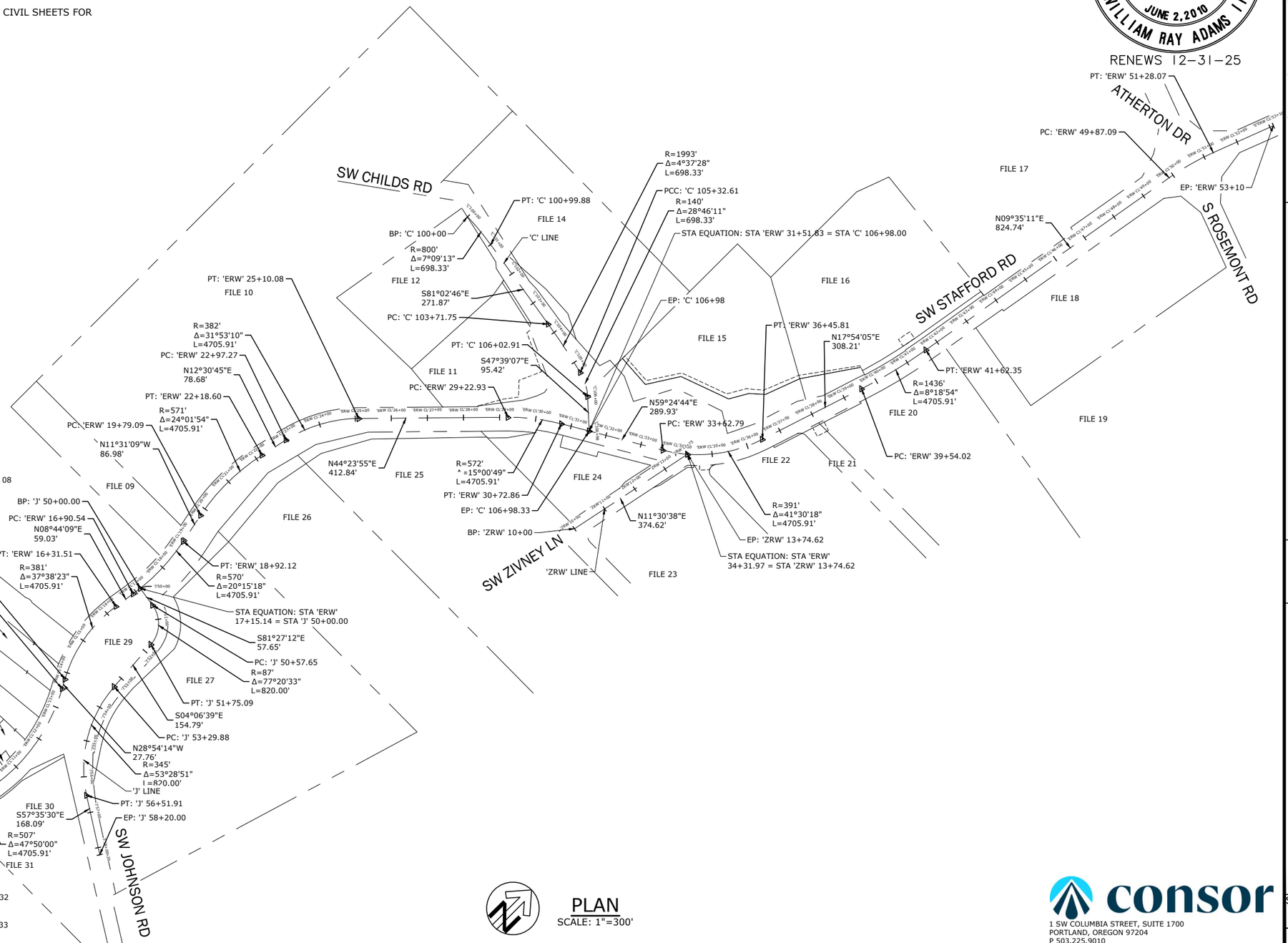
SURVEY CONTROL AND ALIGNMENT MAP

SURVEY NOTES:

1) HORIZONTAL DATUM: NAD 83, 2011.2010
2) OCRS (PORTLAND)
3) VERTICAL DATUM: NAVD 88

UNITS IN US SURVEY FEET.

△ INSTALL MONUMENT BOXES WHERE SHOWN. SEE CIVIL SHEETS FOR DETAILS.



PLAN
SCALE: 1"=300'

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS
RENEWS 12-31-25

RIGHT-OF-WAY CONTROL

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

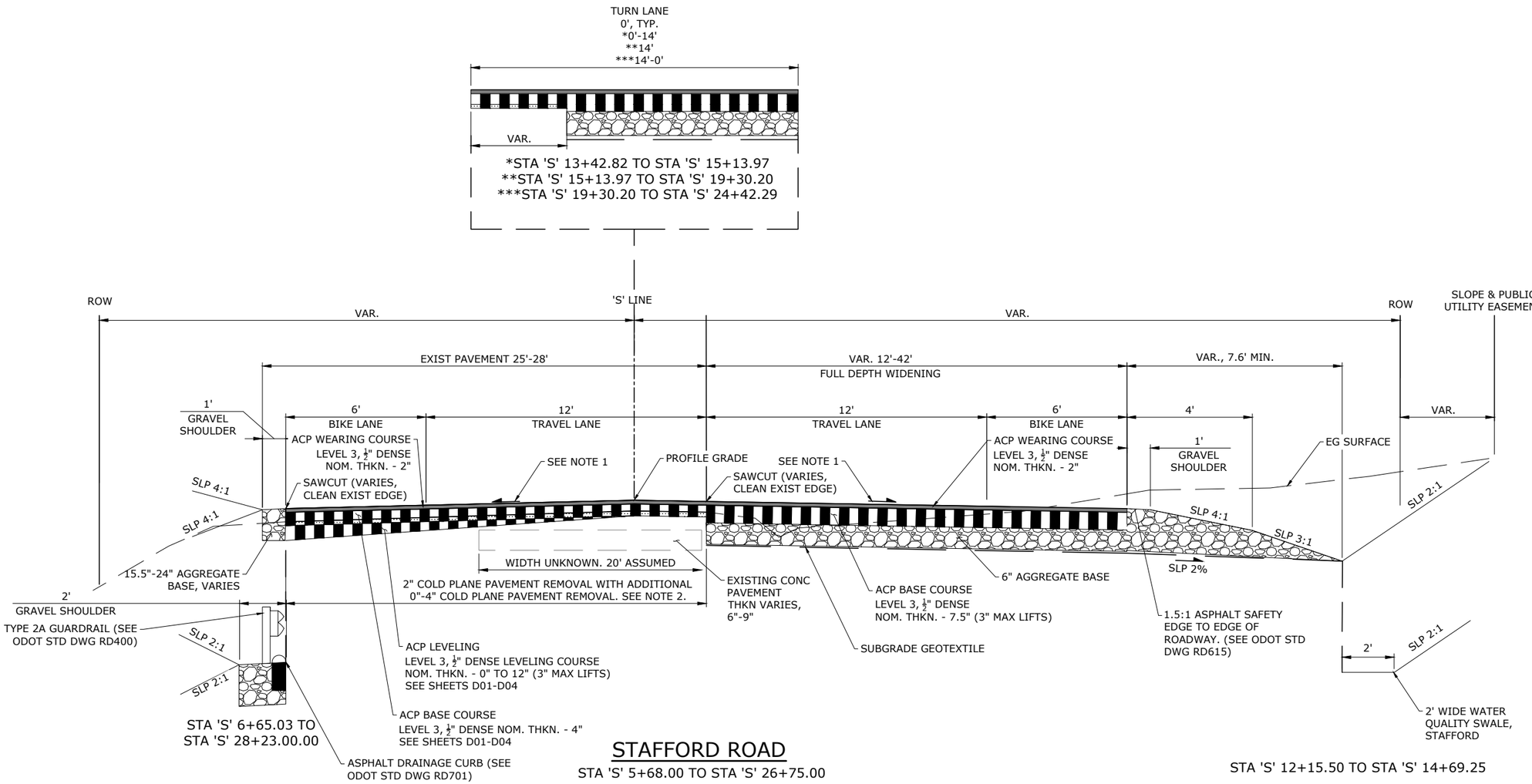
NO.	DATE:

Sheet No.
HC02

6 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\2012965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-H-CONTROL-2.dwg HC02 12/21/2023 6:50 AM RILEY.WIGGINS 24.1s (LMS Tech)



STA 'S' 6+65.03 TO STA 'S' 28+23.00.00

STA 'S' 16+00.00 TO STA 'S' 19+00.00
STA 'S' 24+90.00 TO STA 'S' 28+34.00

STAFFORD ROAD

STA 'S' 5+68.00 TO STA 'S' 26+75.00

STA 'S' 12+15.50 TO STA 'S' 14+69.25

NOTES:

1. FOR SUPERELEVATION, SEE ROADWAY PLAN AND PROFILE SHEETS.
2. FOR PAVEMENT LEVELING PLANS, SEE SHEETS D01 THROUGH D04.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TYPICAL SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

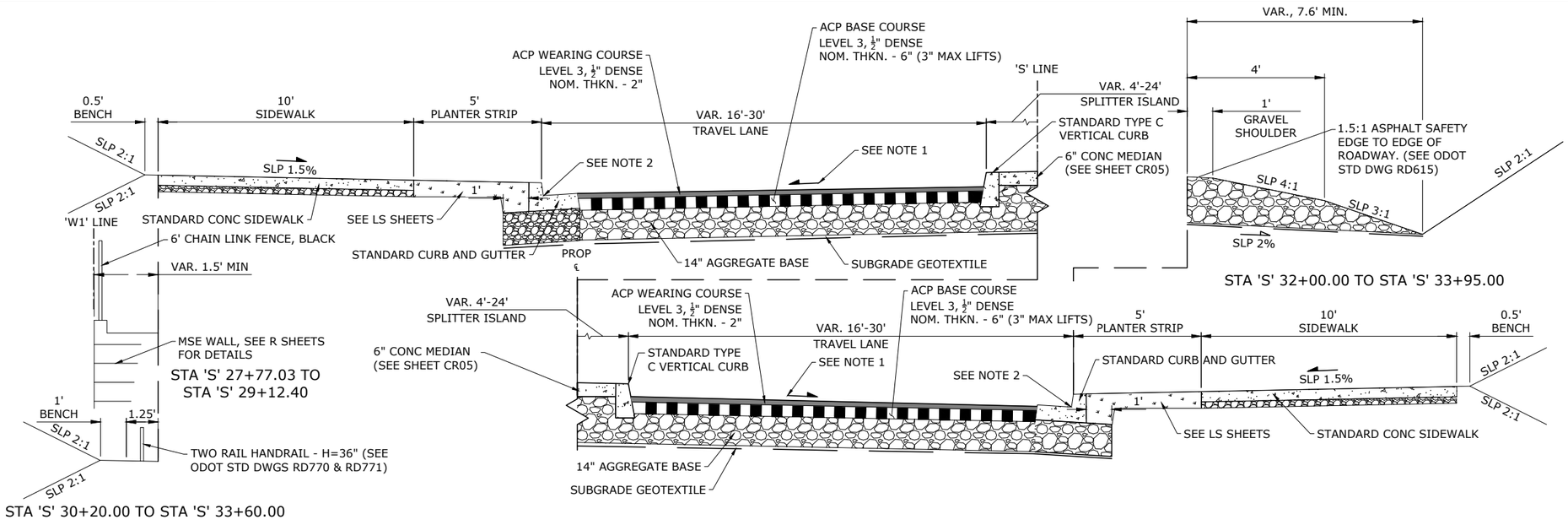
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

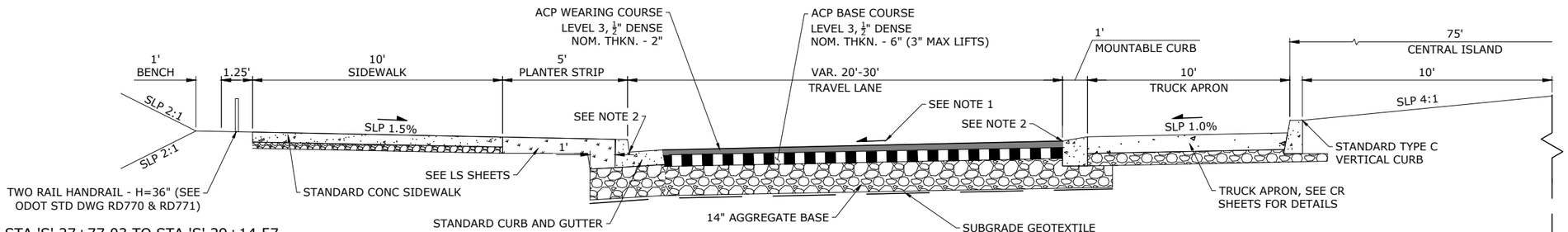
Sheet No.
T01

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-T-SECTIONS.dwg T01 10/8/2024 7:36 PM RILEY.WIGGINS 24.1s (LMS Tech)



STAFFORD ROAD

STA 'S' 26+75.00 TO STA 'S' 29+47.60
STA 'S' 30+95.14 TO STA 'S' 33+95.00



STAFFORD ROAD: ROUNDABOUT

STA 'S' 29+47.60 TO STA 'S' 30+95.14

CHILDS ROAD: ROUNDABOUT

STA 'C' 105+66.53 TO STA 'C' 106+40.00

NOTES:

1. FOR SUPERELEVATION, SEE ROADWAY PLAN AND PROFILE SHEETS.
2. SEE CR SHEETS FOR ROUNDABOUT CURB PLAN AND PROFILE
3. EXISTING CONC PAVEMENT, THKN VARIES, 6"-9" CONTINUES UNDER EXISTING ROADWAY ALONG STAFFORD ROAD BETWEEN STA 'S' 26+75.00 TO STA 'S' 33+95.00

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

TYPICAL SECTIONS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

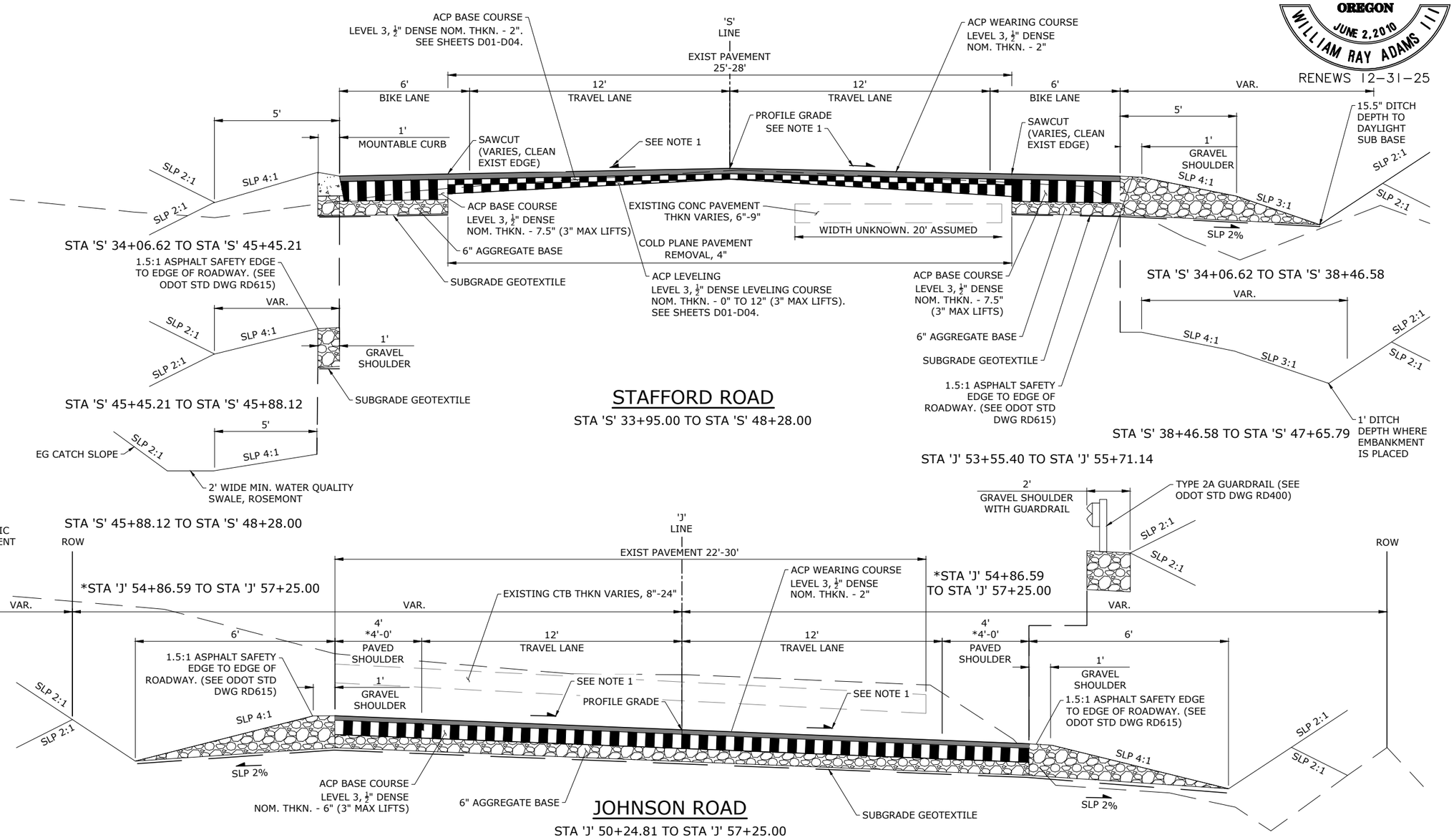
NO.	DATE:

Sheet No. T02

8 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-T-SECTIONS.dwg T02 10/8/2024 7:36 PM RILEY.WIGGINS 24.1s (LMS Tech)



REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TYPICAL SECTIONS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

NOTES:

1. FOR SUPERELEVATION, SEE ROADWAY PLAN AND PROFILE SHEETS.
2. SEE SHEET D06 FOR PAVING & EMBANKMENT DETAILS.

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

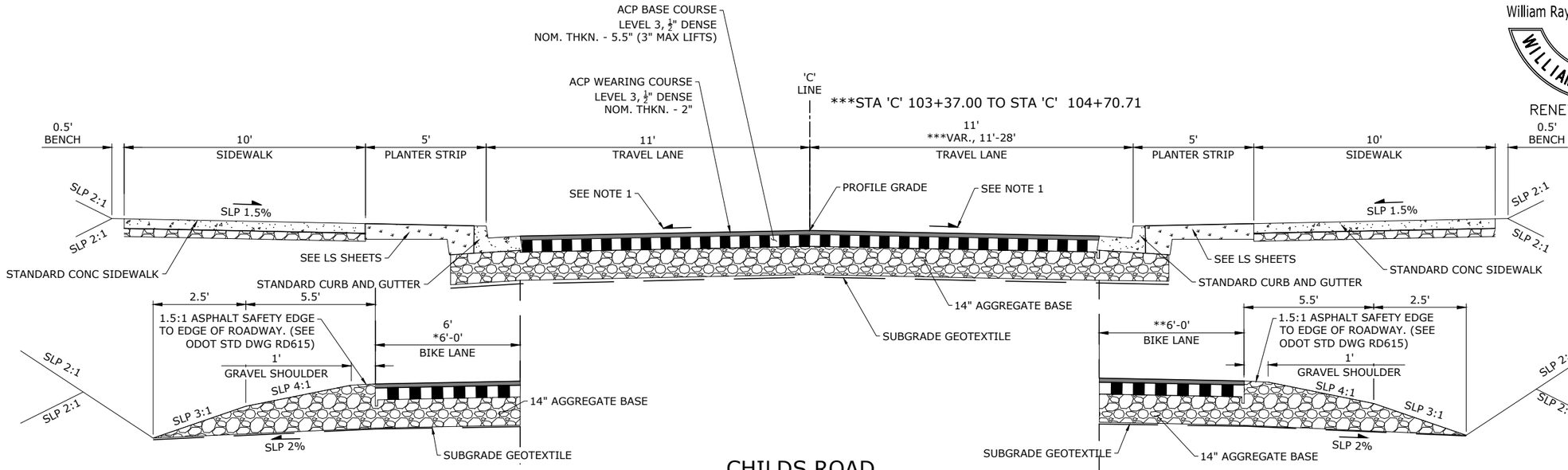
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No. T03

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-T-SECTIONS.dwg T03 10/8/2024 7:36 PM RILEY.WIGGINS 24.1s (LMS Tech)



NOTES:

1. FOR SUPERELEVATION, SEE ROADWAY PLAN AND PROFILE SHEETS.
2. SEE CR SHEETS FOR ROUNDABOUT CURB PLAN AND PROFILE
3. SEE SHEET D06 FOR PAVING & EMBANKMENT DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TYPICAL SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

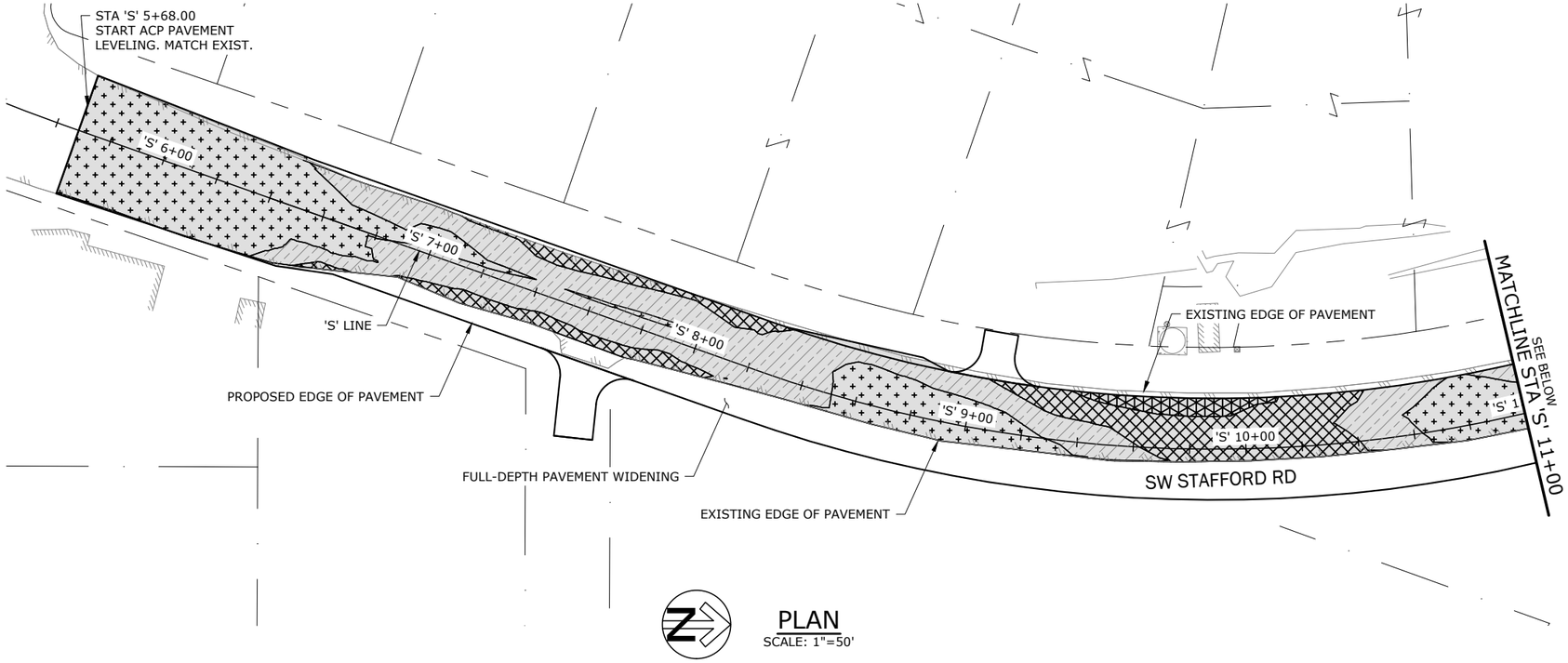
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

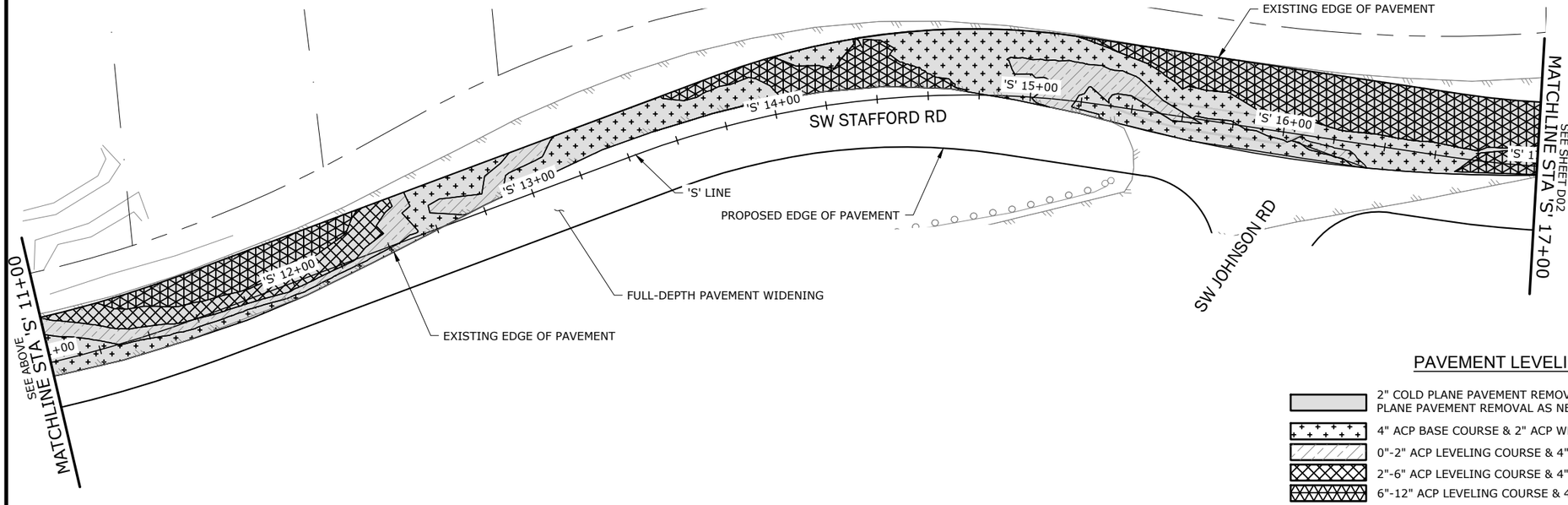
NO.	DATE:

Sheet No.
T04

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-T-SECTIONS.dwg T04 10/8/2024 7:36 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

PAVEMENT LEVELING SEQUENCING:

1. 2" COLD PLANE PAVEMENT REMOVAL, WITH ADDITIONAL VARIABLE DEPTH COLD PLANE PAVEMENT REMOVAL TO APPROPRIATE DEPTH. 6" MAX TOTAL.
2. ACP PAVEMENT LEVELING COURSE(S), AS NEEDED.
3. 4" ACP BASE COURSE.
4. 2" WEARING COURSE.

GENERAL NOTES:

1. PAVING LIMITS SHOWN REPRESENT THE PAVEMENT LEVELING ACTIVITIES TO OCCUR WITHIN THE EXISTING ROADWAY.
2. SAWCUT LONGITUDINAL EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR REMOVAL OR WIDENING.
3. THE FINAL 4" OF ACP BASE COURSE AND 2" ACP WEARING COURSE SHALL BE PLACED CONCURRENTLY WITH THE FULL WIDENED ROADWAY ACP BASE AND WEARING COURSES.
4. SEE TYPICAL SECTION SHEETS T01-T04 FOR ADDITIONAL INFORMATION.
5. ELECTRONIC SURFACE FILES WILL BE PROVIDED BY THE ENGINEER.

PAVEMENT LEVELING LEGEND

- 2" COLD PLANE PAVEMENT REMOVAL, WITH ADDITIONAL 0"-4" COLD PLANE PAVEMENT REMOVAL AS NEEDED. 6" MAX TOTAL. SEE NOTE 3.
- 4" ACP BASE COURSE & 2" ACP WEARING COURSE (3" MAX LIFTS)
- 0"-2" ACP LEVELING COURSE & 4" ACP BASE COURSE & 2" ACP WEARING COURSE
- 2"-6" ACP LEVELING COURSE & 4" ACP BASE COURSE & 2" ACP WEARING COURSE
- 6"-12" ACP LEVELING COURSE & 4" ACP BASE COURSE 2" ACP WEARING COURSE

25 12.5 0 25 50
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

PAVEMENT LEVELING PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

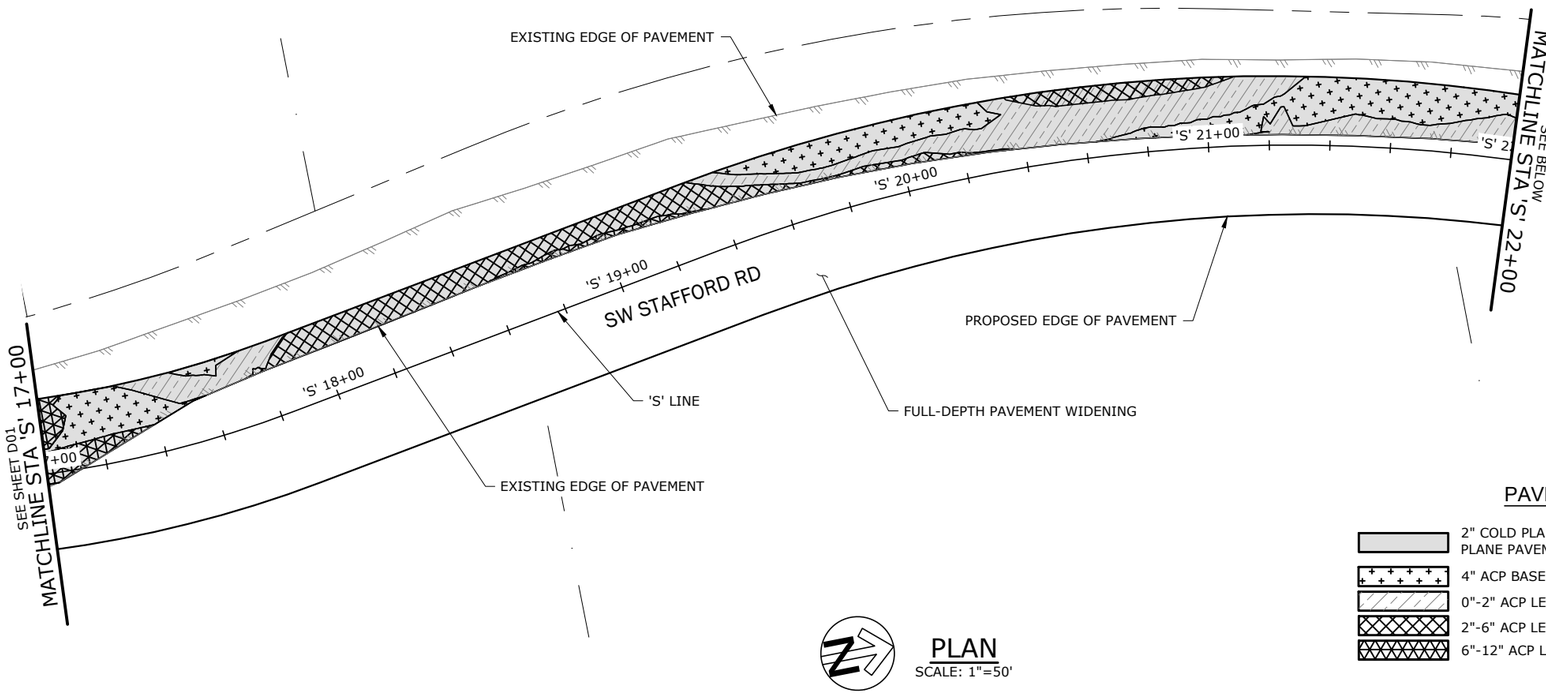
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

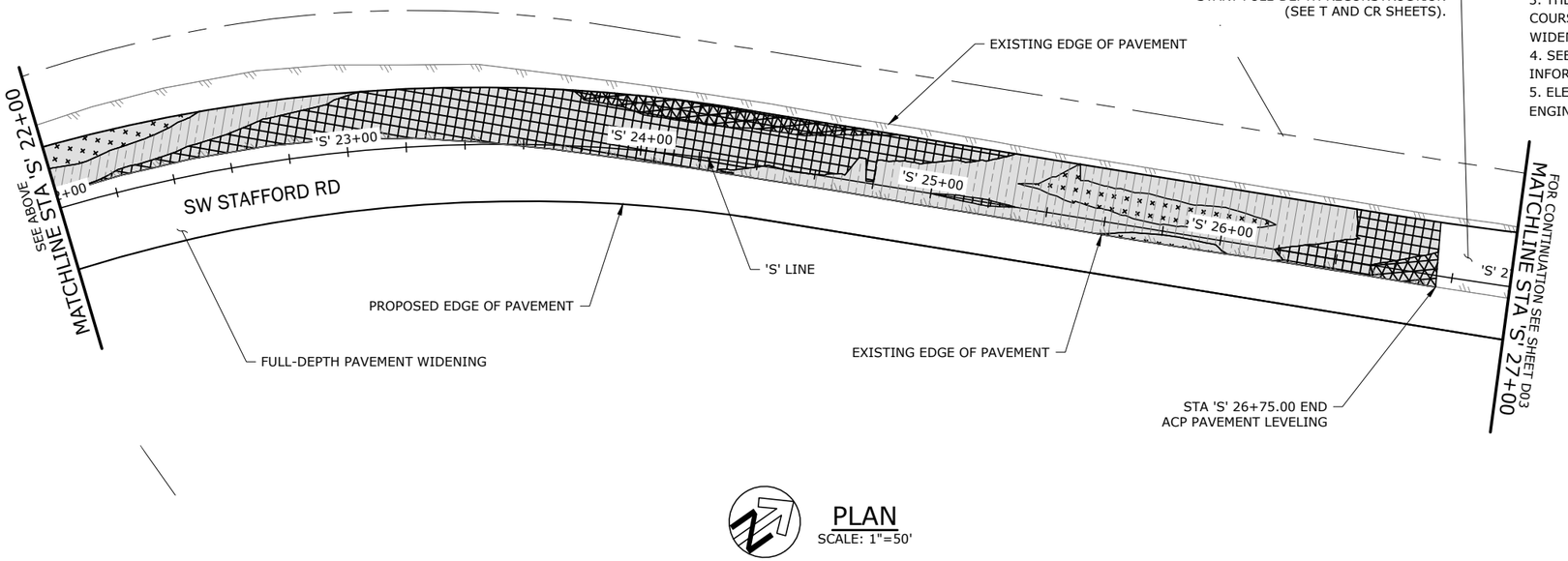
NO.	DATE:

Sheet No.
D01

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET.dwg D01 10/8/2024 7:41 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

PAVEMENT LEVELING SEQUENCING:

1. 2" COLD PLANE PAVEMENT REMOVAL, WITH ADDITIONAL VARIABLE DEPTH COLD PLANE PAVEMENT REMOVAL TO APPROPRIATE DEPTH. 6" MAX TOTAL.
2. ACP PAVEMENT LEVELING COURSE(S), AS NEEDED.
3. 4" ACP BASE COURSE.
4. 2" WEARING COURSE.

PAVEMENT LEVELING LEGEND

- 2" COLD PLANE PAVEMENT REMOVAL, WITH ADDITIONAL 0"-4" COLD PLANE PAVEMENT REMOVAL AS NEEDED. 6" MAX TOTAL. SEE NOTE 3.
- 4" ACP BASE COURSE & 2" ACP WEARING COURSE (3" MAX LIFTS)
- 0"-2" ACP LEVELING COURSE & 4" ACP BASE COURSE & 2" ACP WEARING COURSE
- 2"-6" ACP LEVELING COURSE & 4" ACP BASE COURSE & 2" ACP WEARING COURSE
- 6"-12" ACP LEVELING COURSE & 4" ACP BASE COURSE 2" ACP WEARING COURSE

GENERAL NOTES:

1. PAVING LIMITS SHOWN REPRESENT THE PAVEMENT LEVELING ACTIVITIES TO OCCUR WITHIN THE EXISTING ROADWAY.
2. SAWCUT LONGITUDINAL EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR REMOVAL OR WIDENING.
3. THE FINAL 4" OF ACP BASE COURSE AND 2" ACP WEARING COURSE SHALL BE PLACED CONCURRENTLY WITH THE FULL WIDENED ROADWAY ACP BASE AND WEARING COURSES.
4. SEE TYPICAL SECTION SHEETS T01-T04 FOR ADDITIONAL INFORMATION.
5. ELECTRONIC SURFACE FILES WILL BE PROVIDED BY THE ENGINEER.

PAVEMENT LEVELING PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

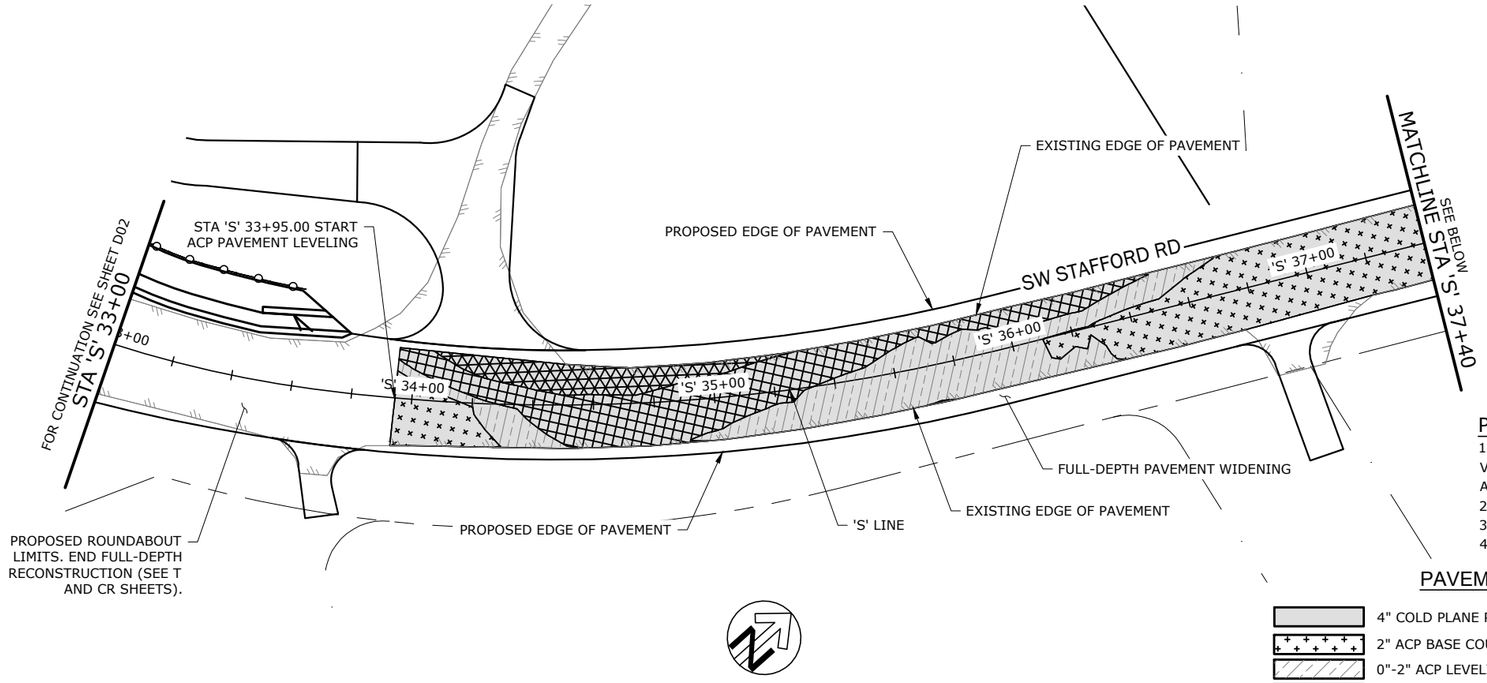
NO.	DATE:

Sheet No.
D02

12 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET.dwg D02 10/8/2024 7:41 PM RILEY.WIGGINS 24.1s (LMS Tech)

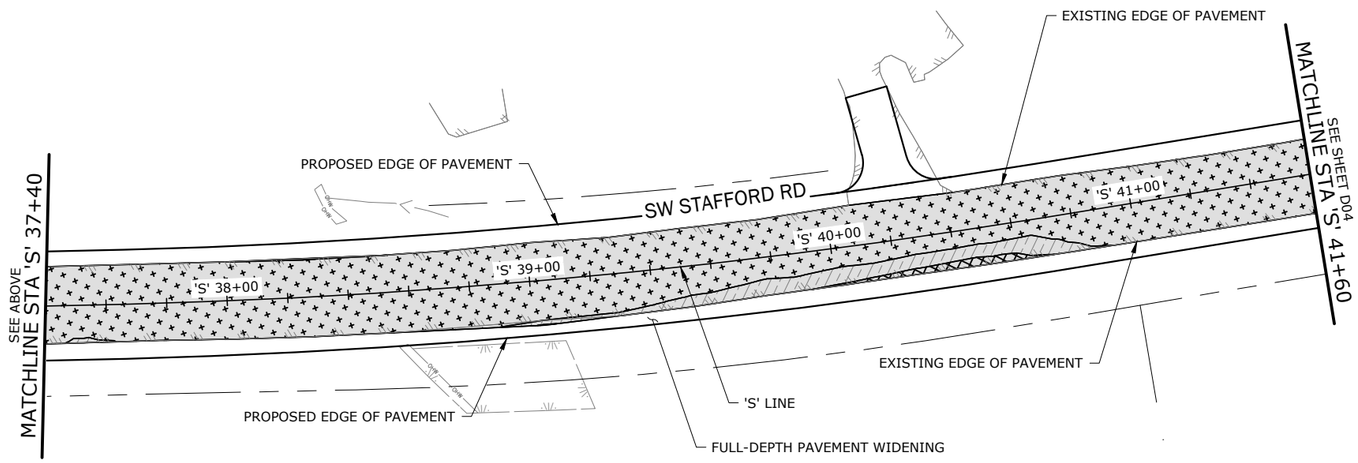


PAVEMENT LEVELING SEQUENCING:

1. 4" COLD PLANE PAVEMENT REMOVAL, WITH ADDITIONAL VARIABLE DEPTH COLD PLANE PAVEMENT REMOVAL TO APPROPRIATE DEPTH. 6" MAX TOTAL.
2. ACP PAVEMENT LEVELING COURSE(S), AS NEEDED.
3. 4" ACP BASE COURSE.
4. 2" WEARING COURSE.

PAVEMENT LEVELING LEGEND

- 4" COLD PLANE PAVEMENT REMOVAL. SEE NOTE 3.
- 2" ACP BASE COURSE AND 2" ACP WEARING COURSE (3" MAX LIFTS)
- 0"-2" ACP LEVELING COURSE & 2" ACP BASE COURSE & 2" ACP WEARING COURSE
- 2"-6" ACP LEVELING COURSE & 2" ACP BASE COURSE & 2" ACP WEARING COURSE
- 6"-12" ACP LEVELING COURSE & 2" ACP BASE COURSE & 2" ACP WEARING COURSE



GENERAL NOTES:

1. PAVING LIMITS SHOWN REPRESENT THE PAVEMENT LEVELING ACTIVITIES TO OCCUR WITHIN THE EXISTING ROADWAY.
2. SAWCUT LONGITUDINAL EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR REMOVAL OR WIDENING.
3. THE FINAL 2" OF ACP BASE COURSE AND 2" ACP WEARING COURSE SHALL BE PLACED CONCURRENTLY WITH THE FULL WIDENED ROADWAY ACP BASE AND WEARING COURSES.
4. SEE TYPICAL SECTION SHEETS T01-T04 FOR ADDITIONAL INFORMATION.
5. ELECTRONIC SURFACE FILES WILL BE PROVIDED BY THE ENGINEER.

PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

PAVEMENT LEVELING PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

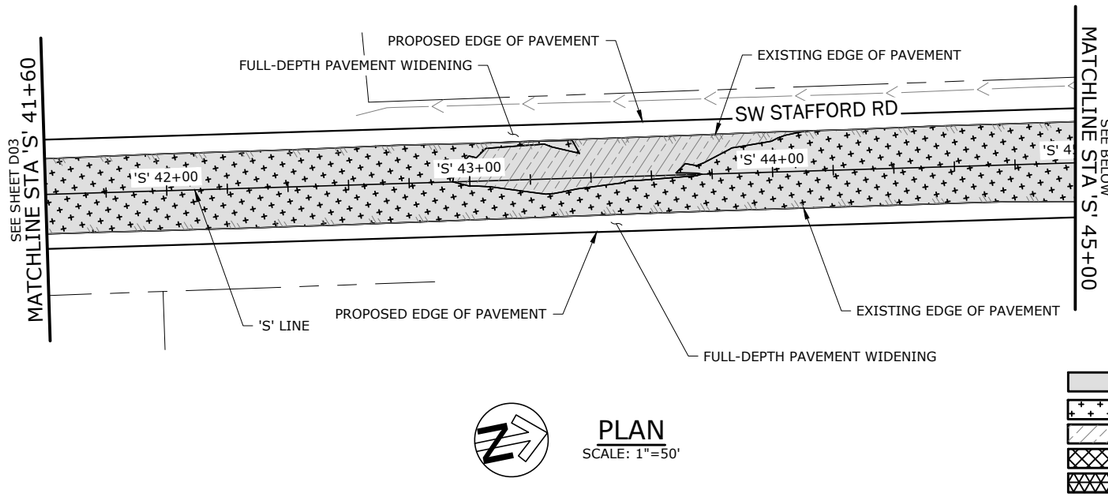
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

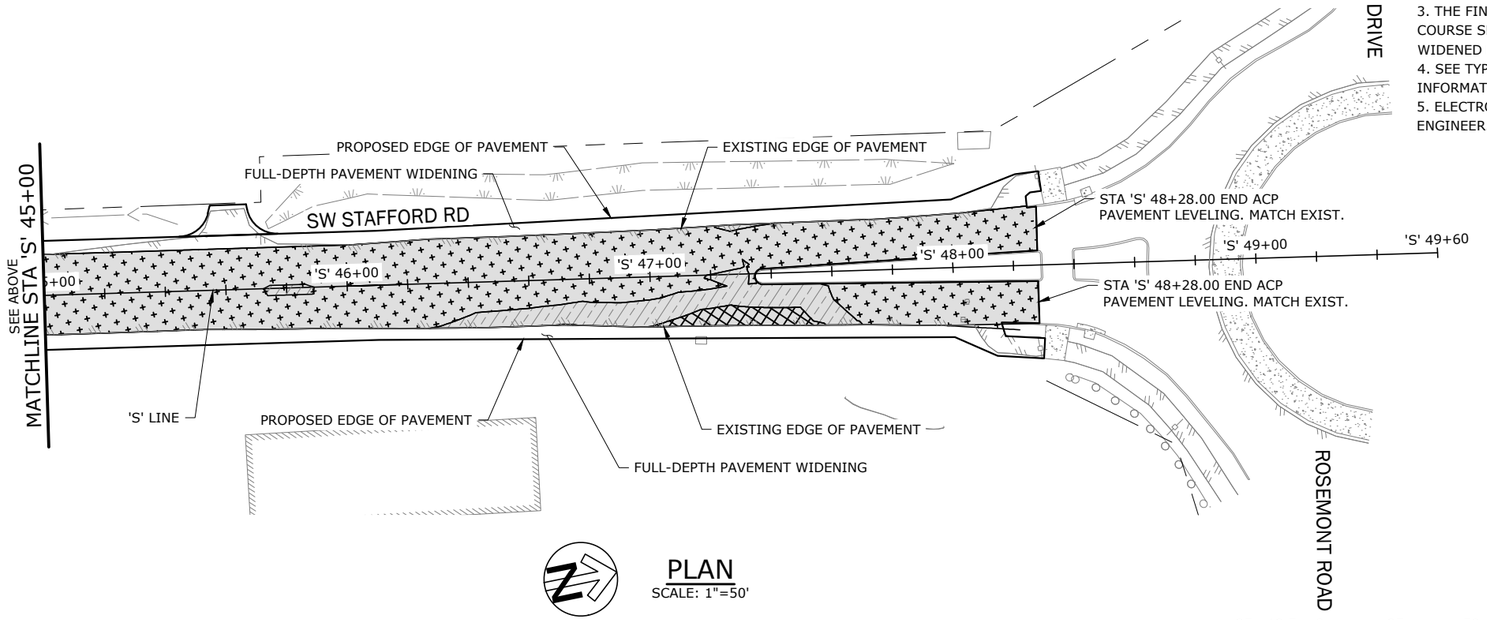
NO.	DATE:

Sheet No.
D03

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET.dwg D03 10/8/2024 7:41 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

PAVEMENT LEVELING SEQUENCING:

1. 4" COLD PLANE PAVEMENT REMOVAL, WITH ADDITIONAL VARIABLE DEPTH COLD PLANE PAVEMENT REMOVAL TO APPROPRIATE DEPTH. 6" MAX TOTAL.
2. ACP PAVEMENT LEVELING COURSE(S), AS NEEDED.
3. 4" ACP BASE COURSE.
4. 2" WEARING COURSE.

PAVEMENT LEVELING LEGEND

- 4" COLD PLANE PAVEMENT REMOVAL. SEE NOTE 3.
- 2" ACP BASE COURSE AND 2" ACP WEARING COURSE (3" MAX LIFTS)
- 0"-2" ACP LEVELING COURSE & 2" ACP BASE COURSE & 2" ACP WEARING COURSE
- 2"-6" ACP LEVELING COURSE & 2" ACP BASE COURSE & 2" ACP WEARING COURSE
- 6"-12" ACP LEVELING COURSE & 2" ACP BASE COURSE & 2" ACP WEARING COURSE

GENERAL NOTES:

1. PAVING LIMITS SHOWN REPRESENT THE PAVEMENT LEVELING ACTIVITIES TO OCCUR WITHIN THE EXISTING ROADWAY.
2. SAWCUT LONGITUDINAL EDGE OF PAVEMENT TO CREATE CLEAN EDGE FOR REMOVAL OR WIDENING.
3. THE FINAL 2" OF ACP BASE COURSE AND 2" ACP WEARING COURSE SHALL BE PLACED CONCURRENTLY WITH THE FULL WIDENED ROADWAY ACP BASE AND WEARING COURSES.
4. SEE TYPICAL SECTION SHEETS T01-T04 FOR ADDITIONAL INFORMATION.
5. ELECTRONIC SURFACE FILES WILL BE PROVIDED BY THE ENGINEER.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

PAVEMENT LEVELING PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
D04

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET.dwg D04 10/8/2024 7:41 PM RILEY.WIGGINS 24.1s (LMS Tech)

STA 'S' 16+08.57, 5.00' LT
FG ELEV=281.12'
TOC ELEV=281.62'

R=2.00'

STA 'S' 16+09.53, 1.25' LT
FG ELEV=281.23'
TOC ELEV=281.73'

STA 'S' 16+00.85, 4.56' RT
FG ELEV=280.56'
TOC ELEV=281.06'

R=2.00'

STA 'S' 15+99.60, 5.00' RT
FG ELEV=280.44'
TOC ELEV=280.94'

'J' 50+00

'S' 16+00

'J' LINE

SW JOHNSON RD

ROW

SW STAFFORD RD

STA 'S' 15+67.62, 5.00' RT
FG ELEV=277.93'
TOC ELEV=278.43'

'S' LINE

R=150.00'

STA 'S' 15+33.57, 5.00' LT
FG ELEV=275.48'
TOC ELEV=275.98'

STA 'S' 15+32.87, 0.92' RT
FG ELEV=275.31'
TOC ELEV=275.81'

R=3.00'

1 C05 STAFFORD ROAD TRAFFIC ISLAND PLAN

SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

NOTES:

1. SEE SHEET C05 FOR CONSTRUCTION NOTE.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TRAFFIC ISLAND DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

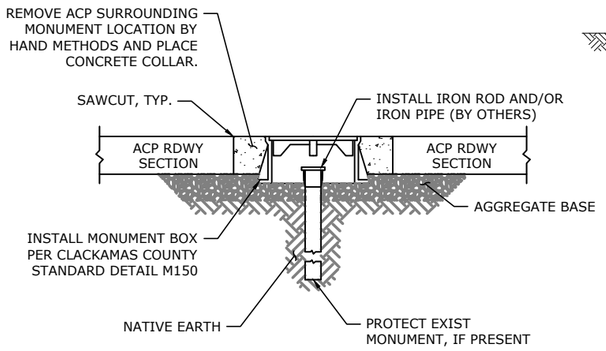
Sheet No.
D05

15 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D05 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)

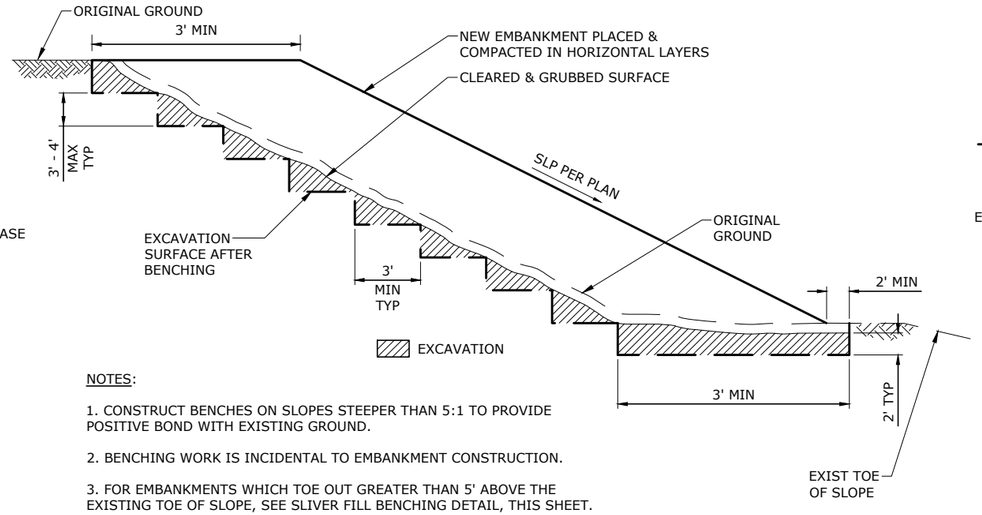
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D06 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)



MONUMENT BOX INSTALLATION

SCALE: NTS

1 / HC02



NOTES:

1. CONSTRUCT BENCHES ON SLOPES STEEPER THAN 5:1 TO PROVIDE POSITIVE BOND WITH EXISTING GROUND.

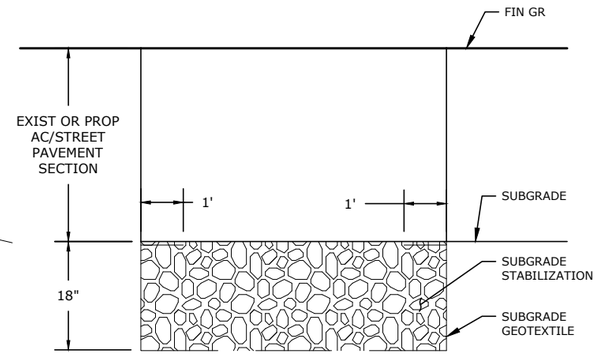
2. BENCHING WORK IS INCIDENTAL TO EMBANKMENT CONSTRUCTION.

3. FOR EMBANKMENTS WHICH TOE OUT GREATER THAN 5' ABOVE THE EXISTING TOE OF SLOPE, SEE SLIVER FILL BENCHING DETAIL, THIS SHEET.

STANDARD EMBANKMENT CONSTRUCTION

SCALE: NTS

2 / T01



NOTES:

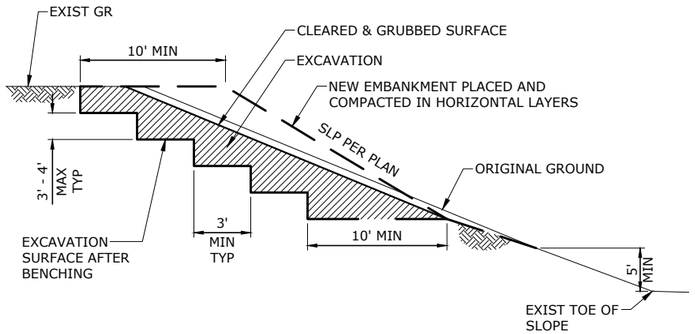
1. SUBGRADE STABILIZATION AREAS TO BE COMPLETED AS DIRECTED BY THE ENGINEER.

2. TO BE USED WHEN PREVIOUS PAVEMENT ACTIVITIES REVEAL POOR SUBGRADE CONDITIONS OR AS DIRECTED BY THE ENGINEER.

18" SUBGRADE STABILIZATION

SCALE: NTS

4 / -



NOTES:

1. CONSTRUCT BENCHES ON SLOPES STEEPER THAN 5:1 TO PROVIDE POSITIVE BOND WITH EXISTING GROUND.

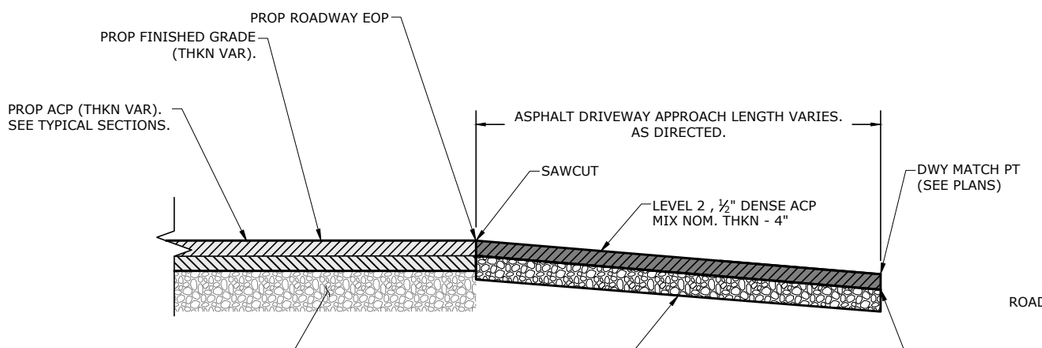
2. BENCHING WORK IS INCIDENTAL TO EMBANKMENT CONSTRUCTION.

3. FOR EMBANKMENTS WHICH TOE OUT AT A HEIGHT OF 5' OR LESS ABOVE THE EXISTING TOE OF SLOPE, SEE STANDARD EMBANKMENT DETAIL, THIS SHEET.

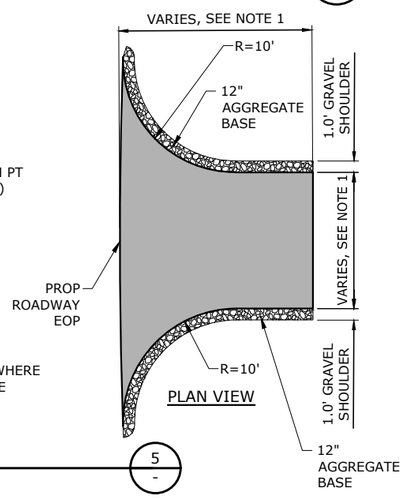
SLIVER FILL BENCHING

SCALE: NTS

3 / T01



SECTION VIEW



PLAN VIEW

TYPICAL ASPHALT DRIVEWAY APPROACH

SCALE: NTS

5 / -

NOTES:

1. SEE DRIVEWAY DETAIL SHEETS D07-D13.

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

CIVIL DETAILS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

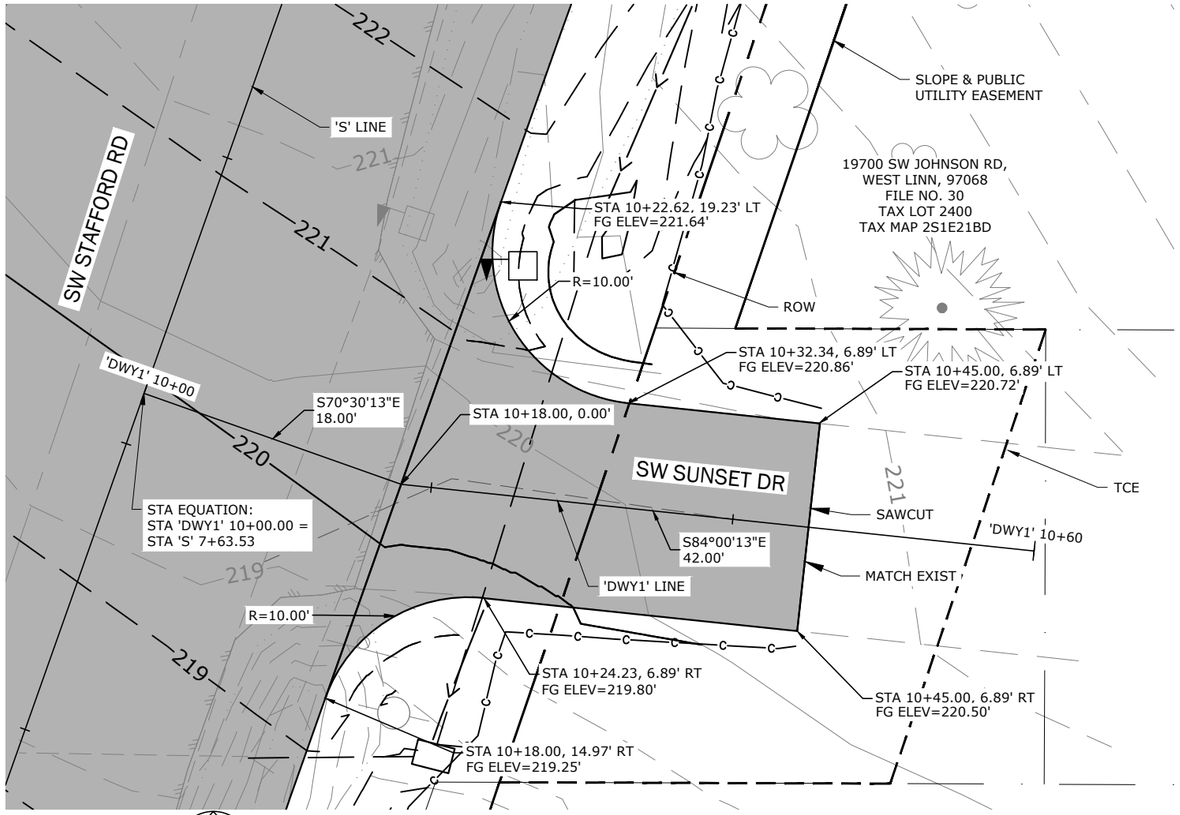
REVISIONS

NO.	DATE:

Sheet No. D06

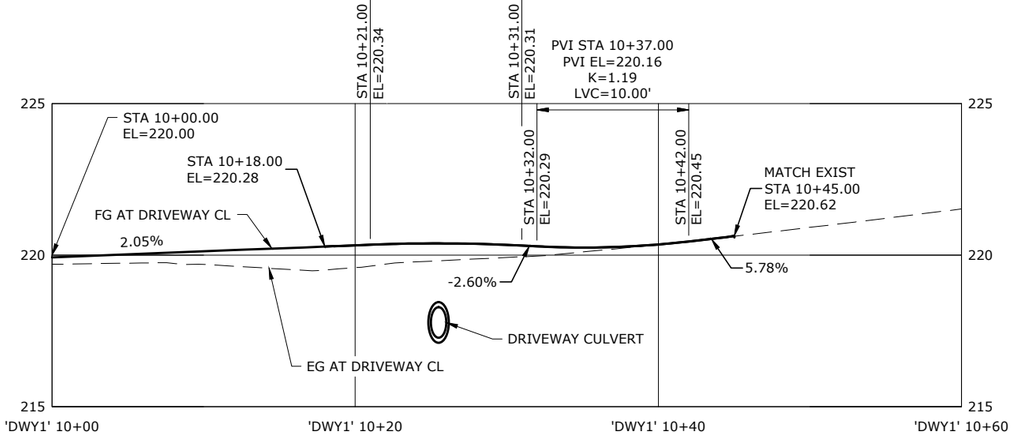
16 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

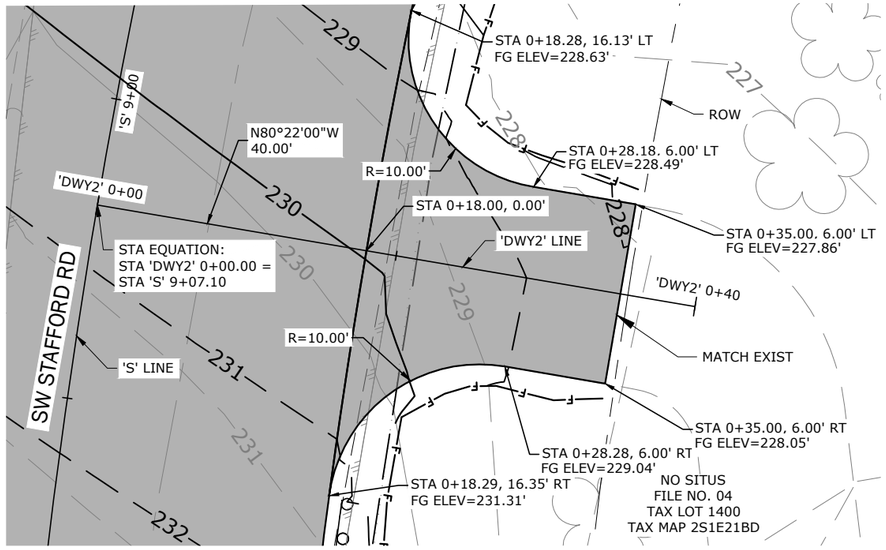


PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

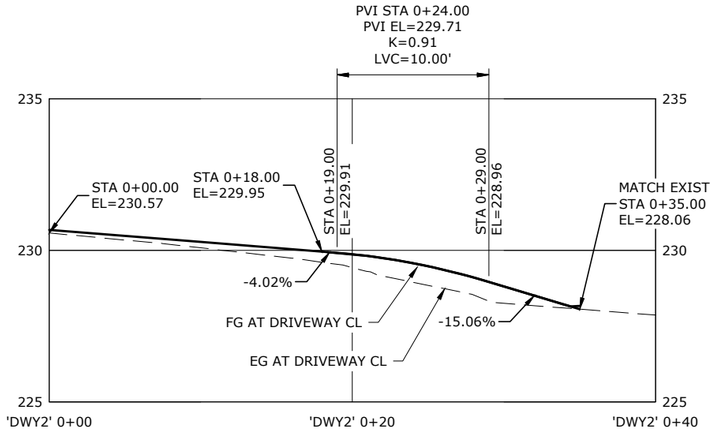


PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT



PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET



PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT

NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

DRIVEWAY DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

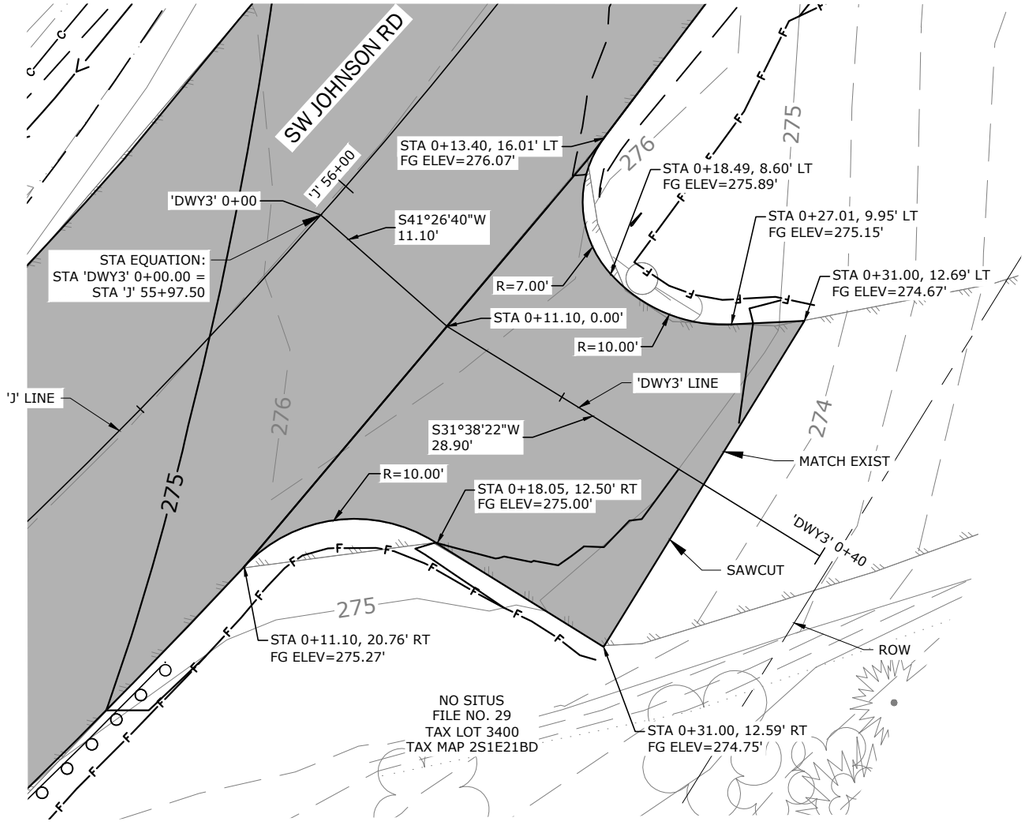
REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

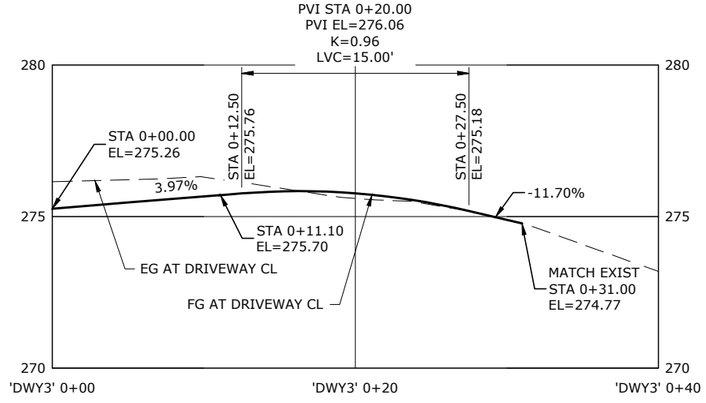
Sheet No.
D07

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D07 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET



PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT

NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

DRIVEWAY DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

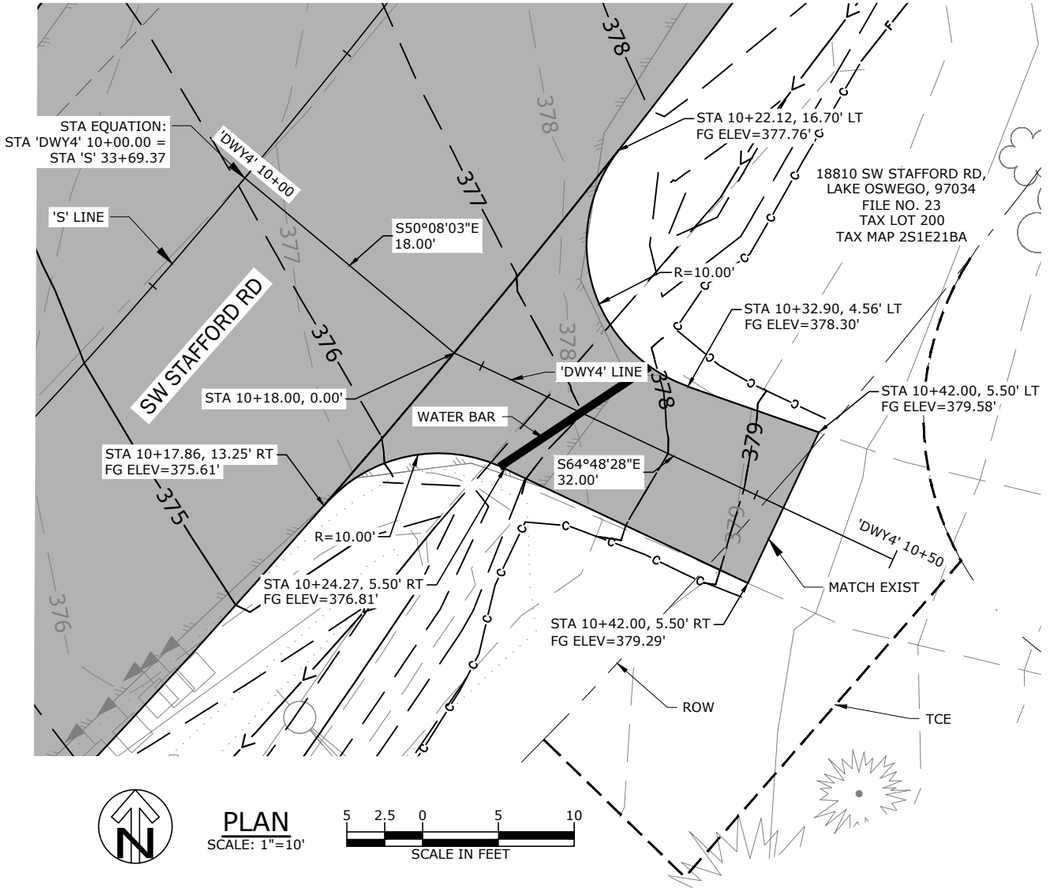
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

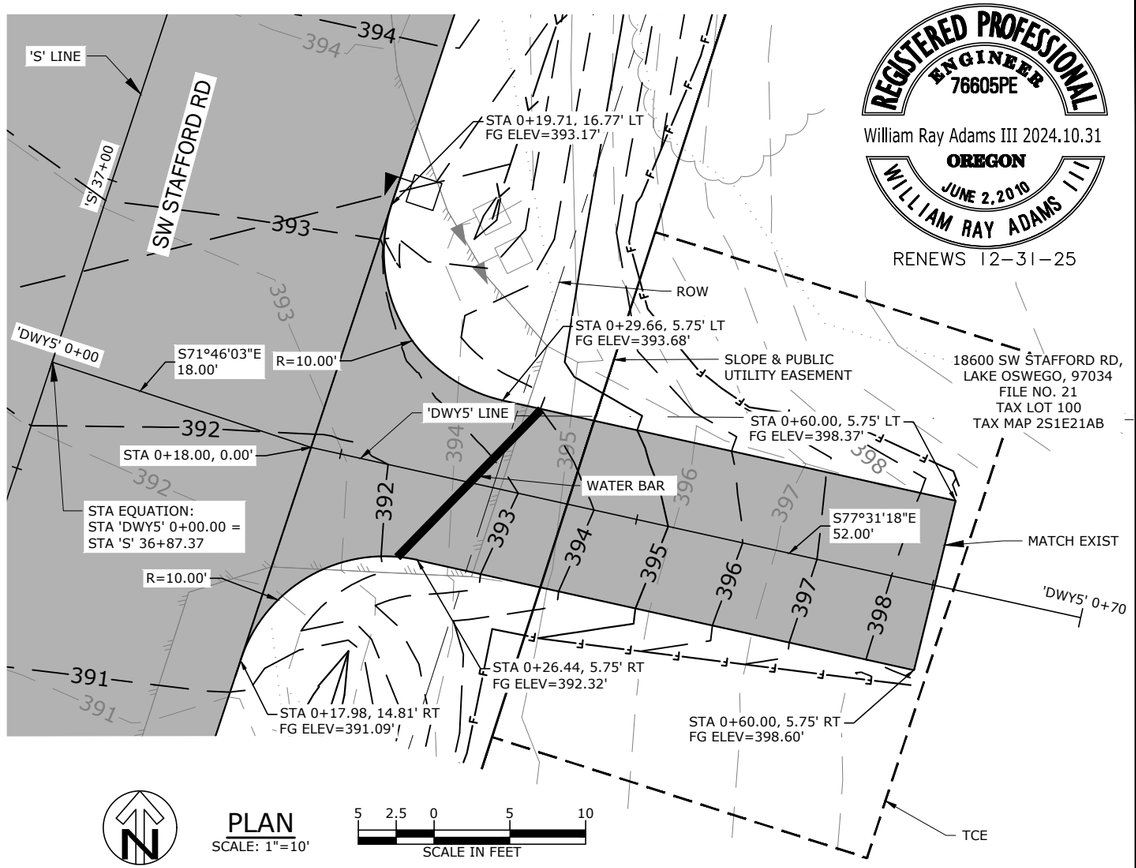
REVISIONS

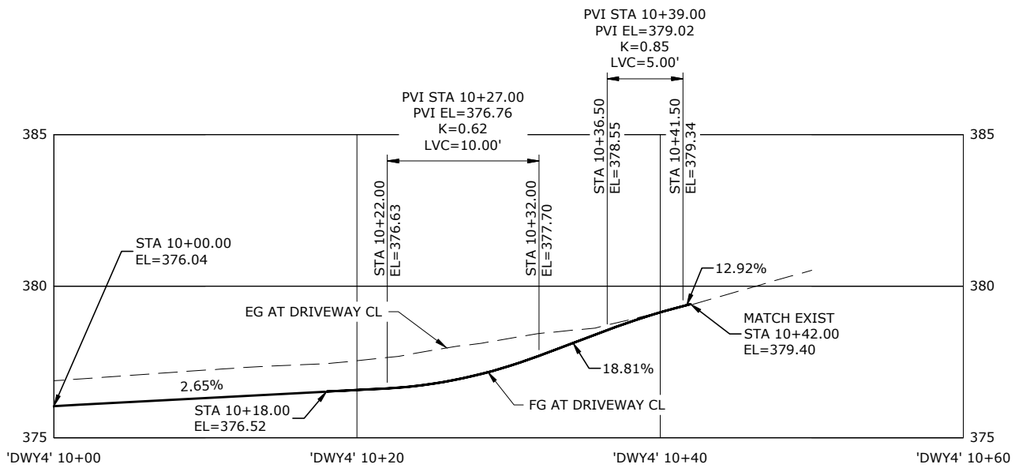
NO.	DATE:

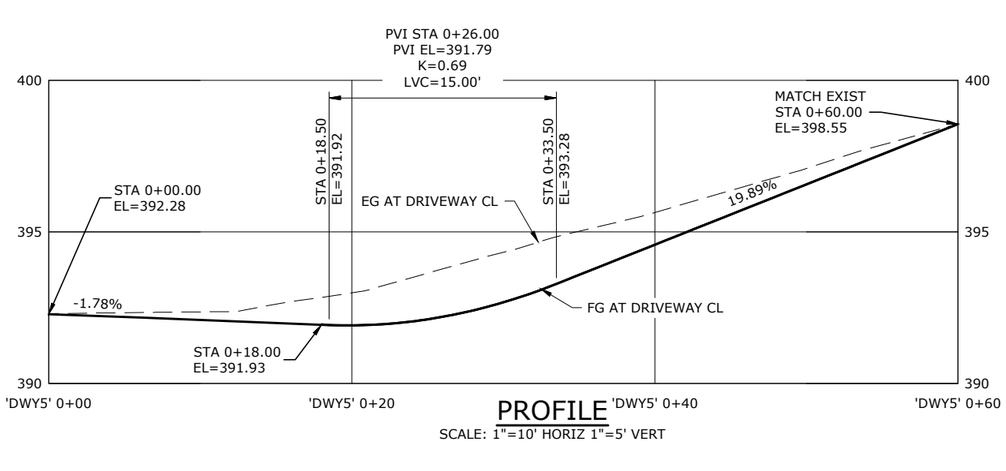
Sheet No.
D08

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D08 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)









NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

DRIVEWAY DETAILS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

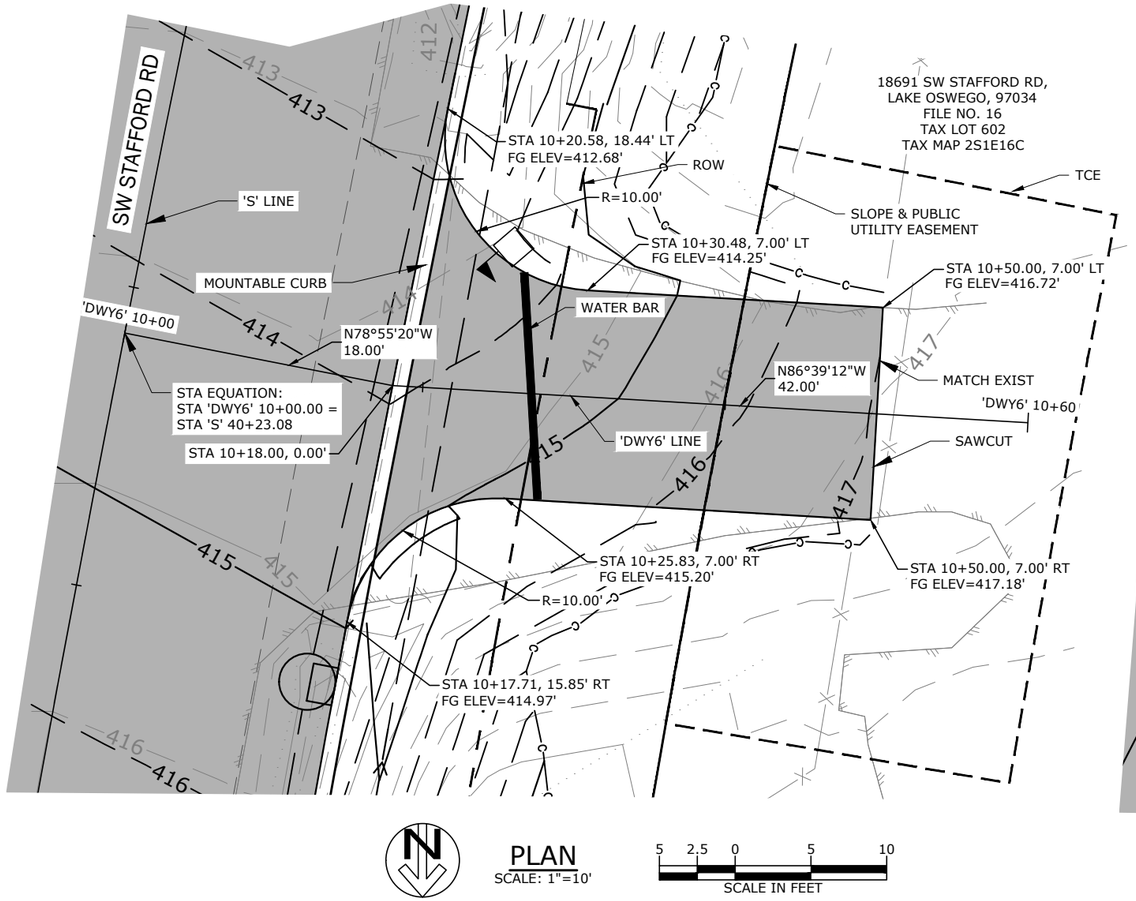
NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
D09

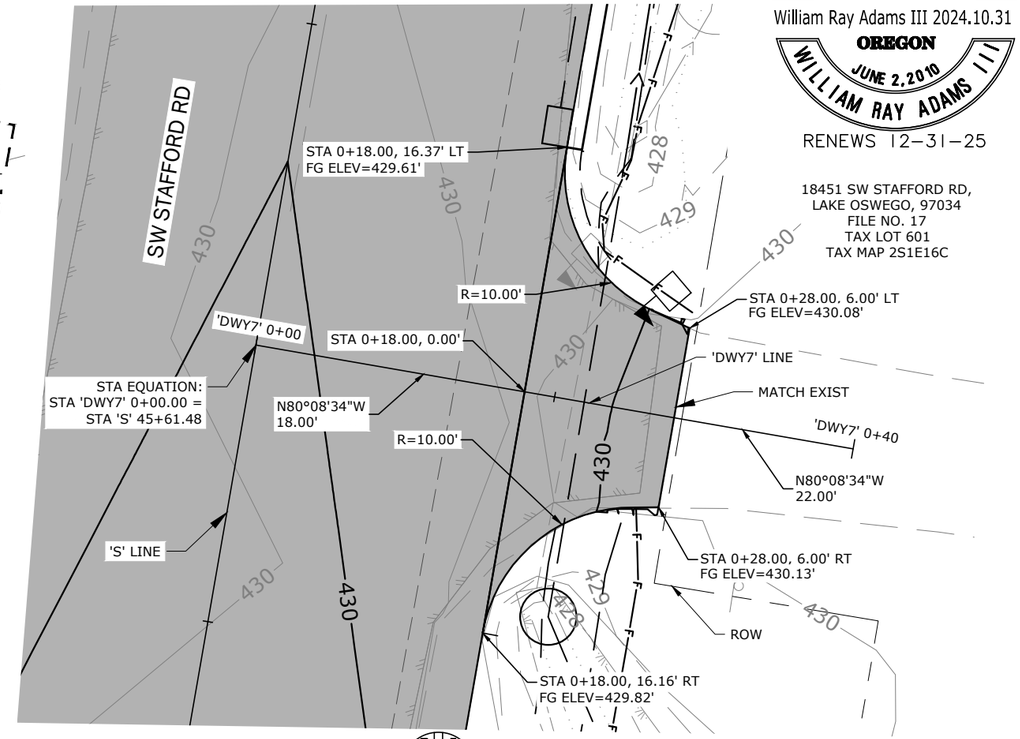
19 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D09 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)



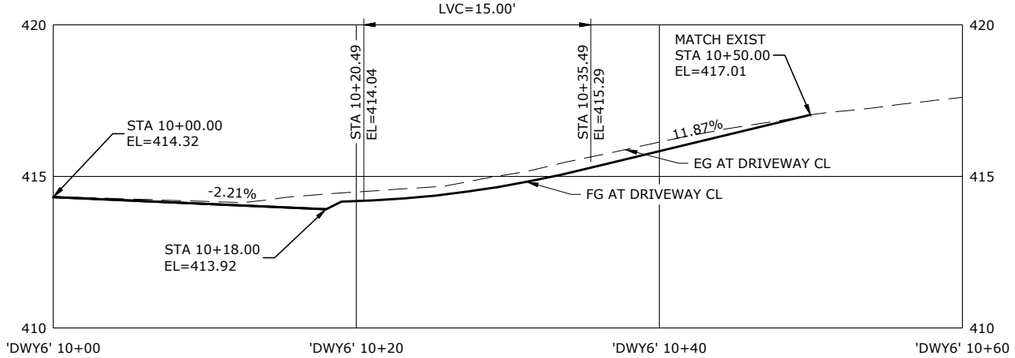
PLAN
SCALE: 1"=10'

SCALE IN FEET

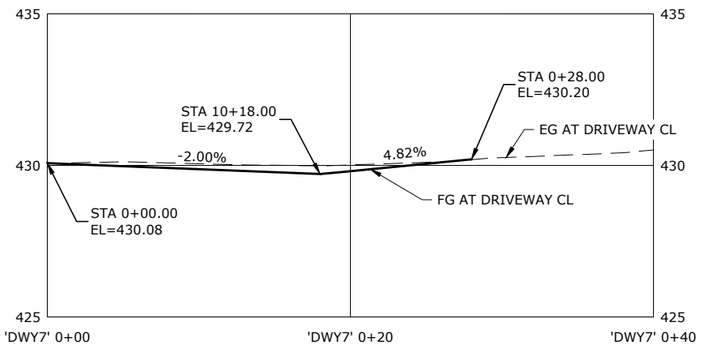


PLAN
SCALE: 1"=10'

SCALE IN FEET



PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT



PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT

NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

DRIVEWAY DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

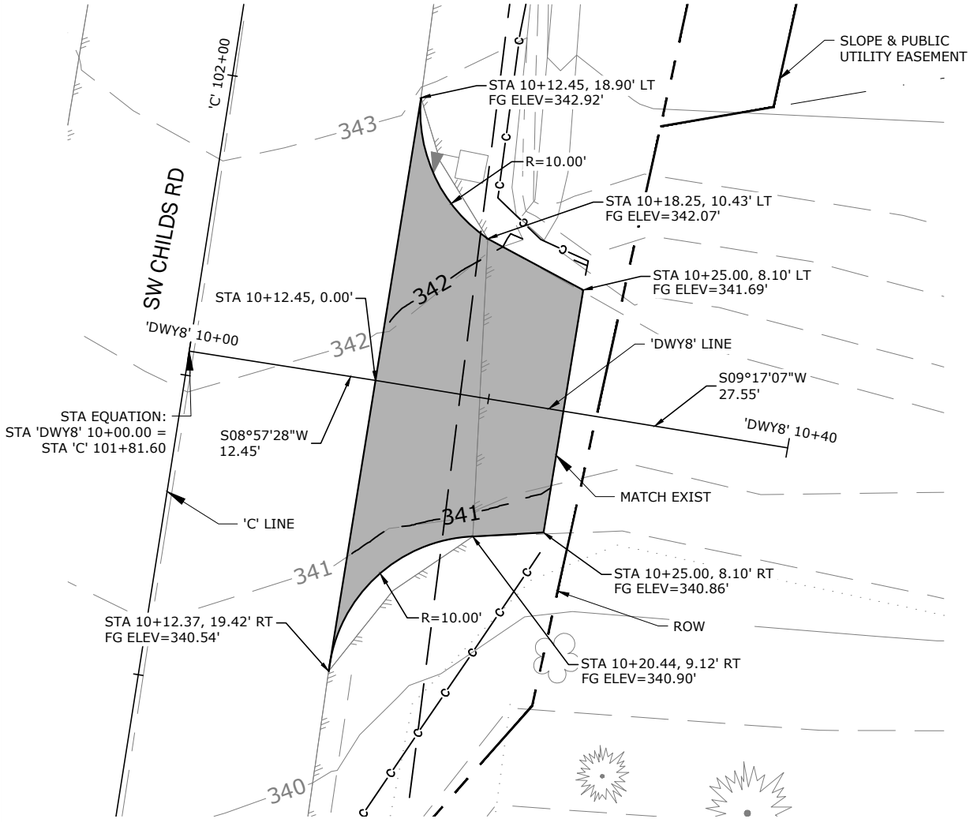
NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
D10

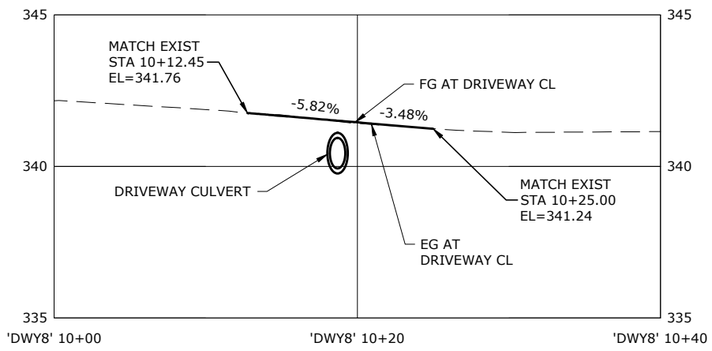
20 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D10 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)

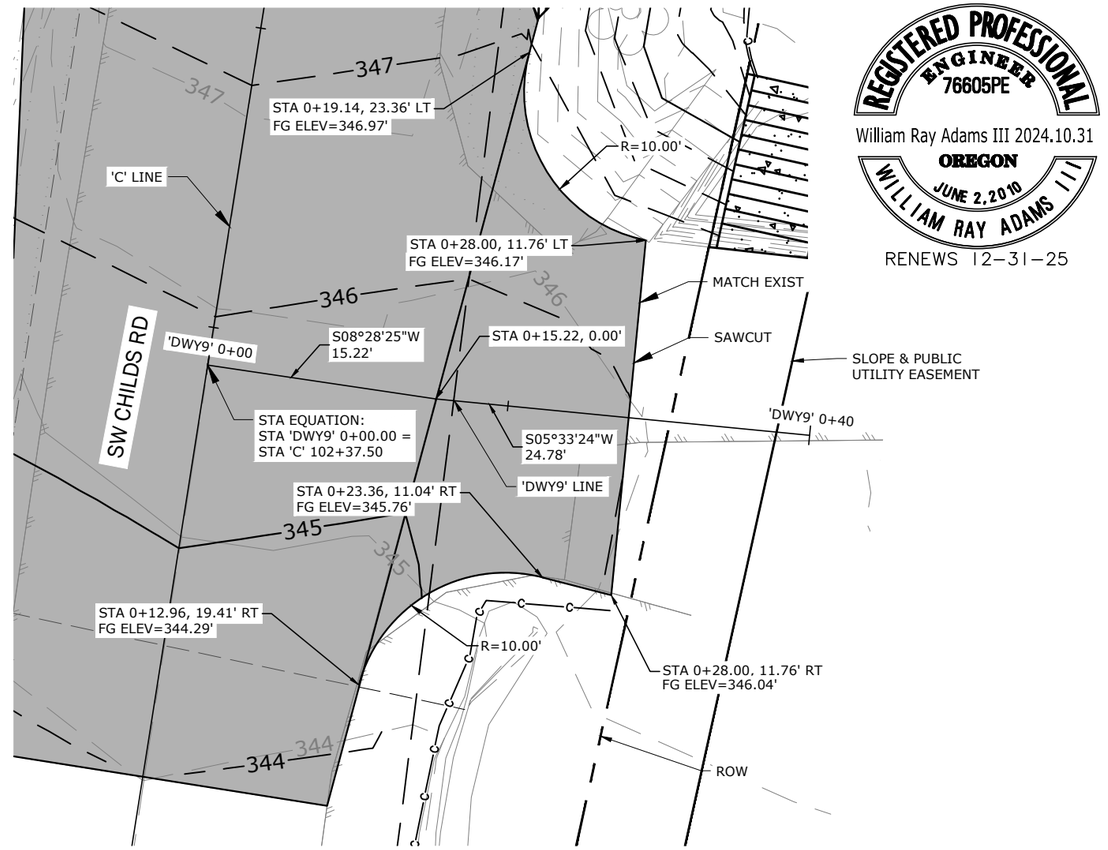


PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

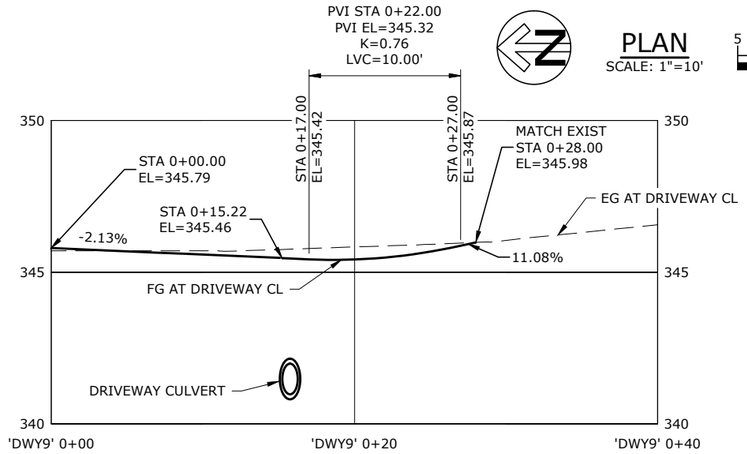


PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT



PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET



PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT

NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

DRIVEWAY DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

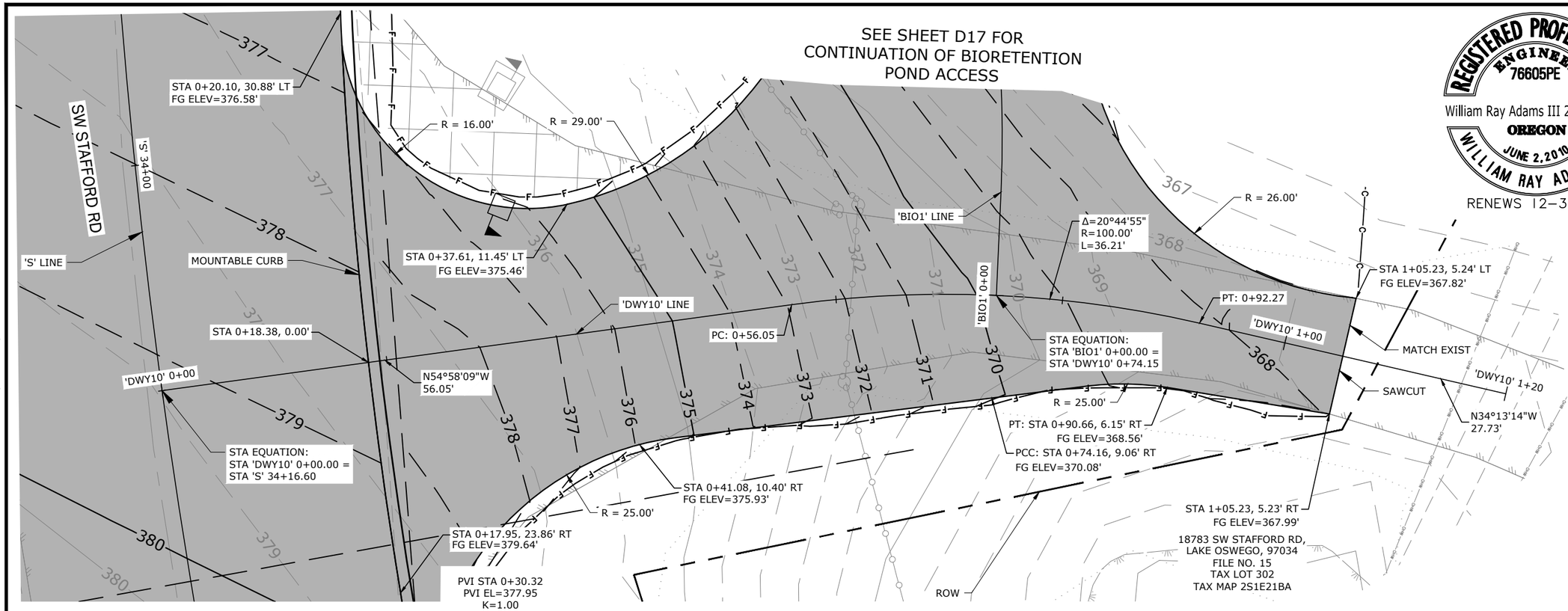
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
D11

21 of 162

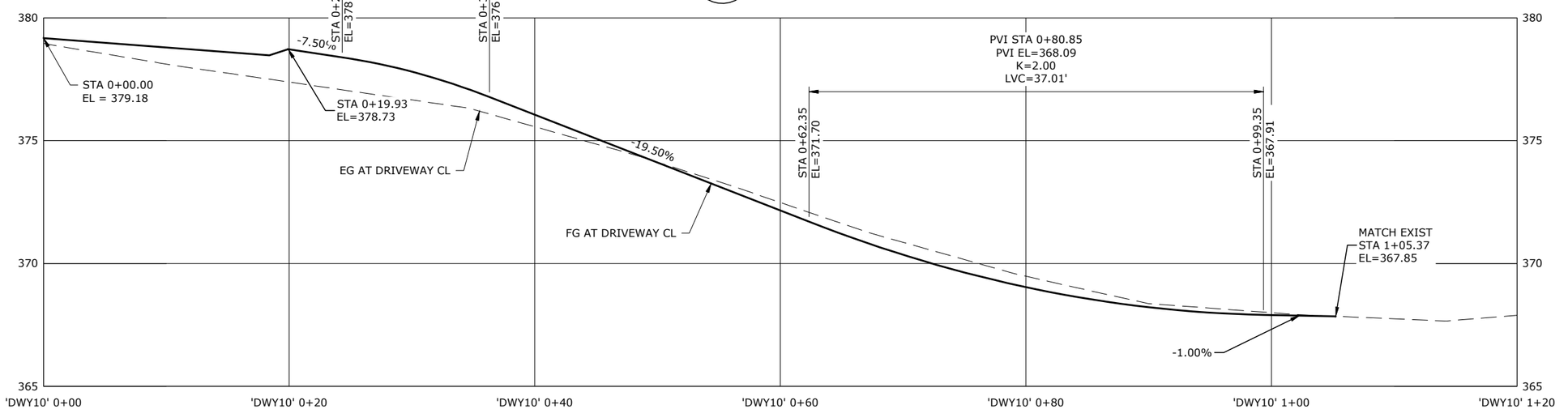
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D11 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)

SEE SHEET D17 FOR
CONTINUATION OF BIORETENTION
POND ACCESS



PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET



PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT

NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

DRIVEWAY DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

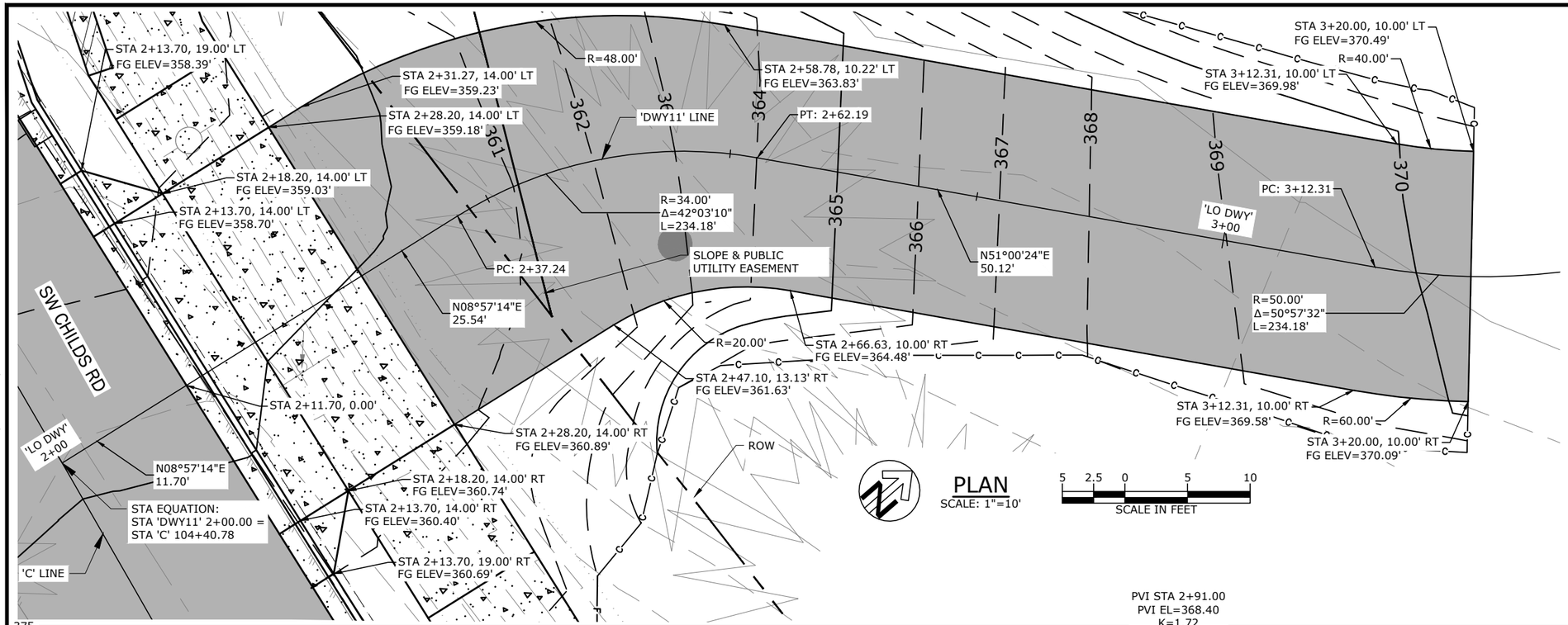
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

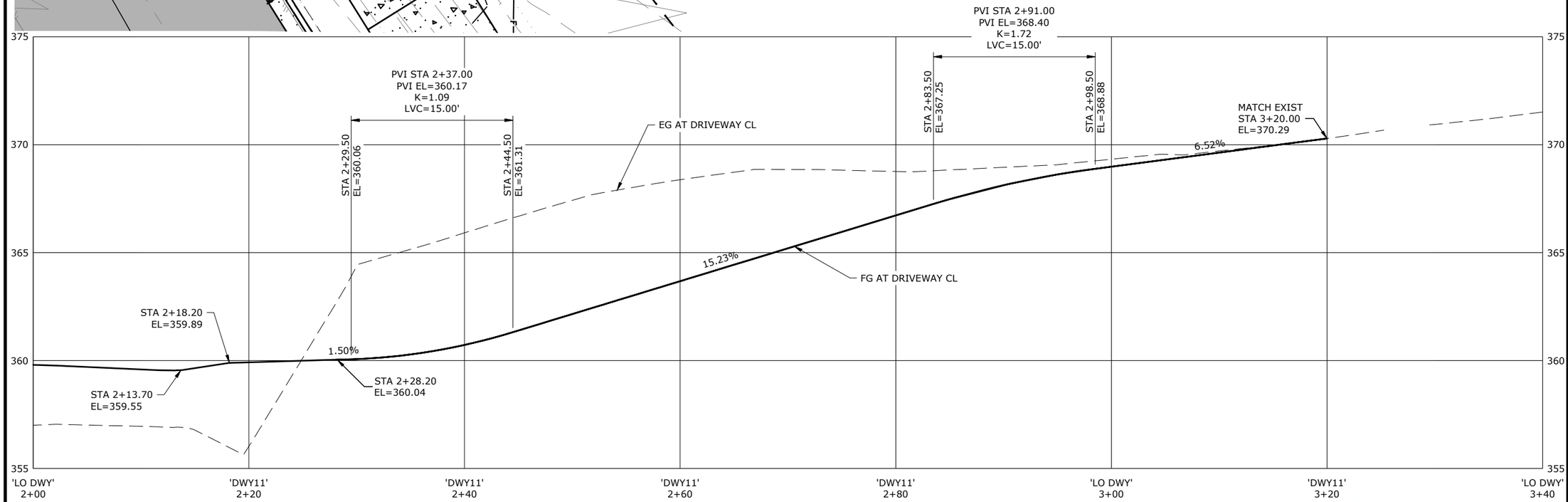
REVISIONS

NO.	DATE:

Sheet No.
D12

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D12 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)





PROFILE
SCALE: 1"=10' HORIZ 1"=5' VERT

NOTES:

1. FOR DRIVEWAY DETAILS, SEE SHEET D06.
2. ALL ELEVATIONS ARE AT FINISHED PAVEMENT ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

DRIVEWAY DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

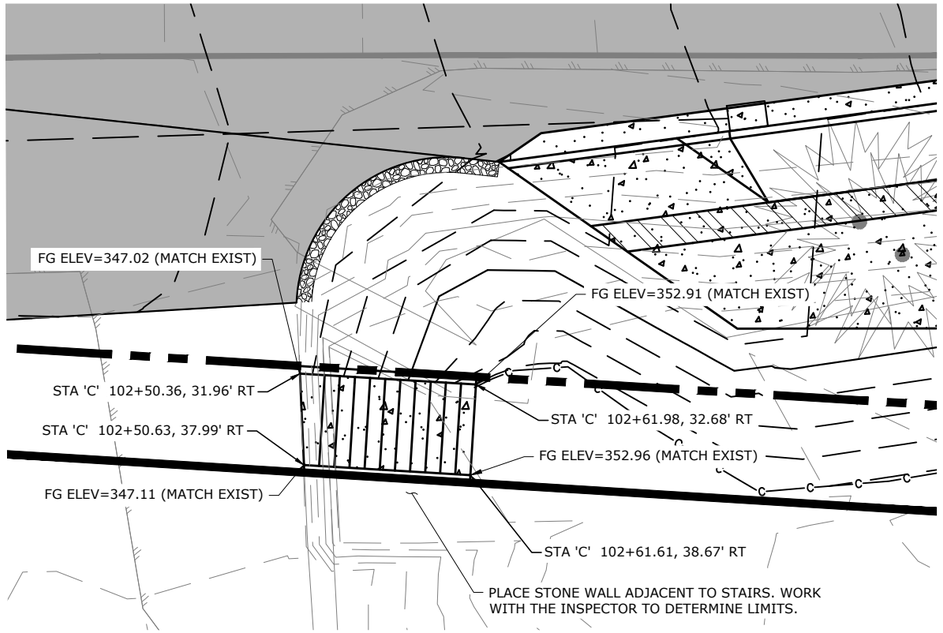
REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
D13

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET2.dwg D13 10/9/2024 3:44 PM RILEY.WIGGINS 24.1s (LMS Tech)



CONCRETE STAIRS PLAN

SCALE: NTS

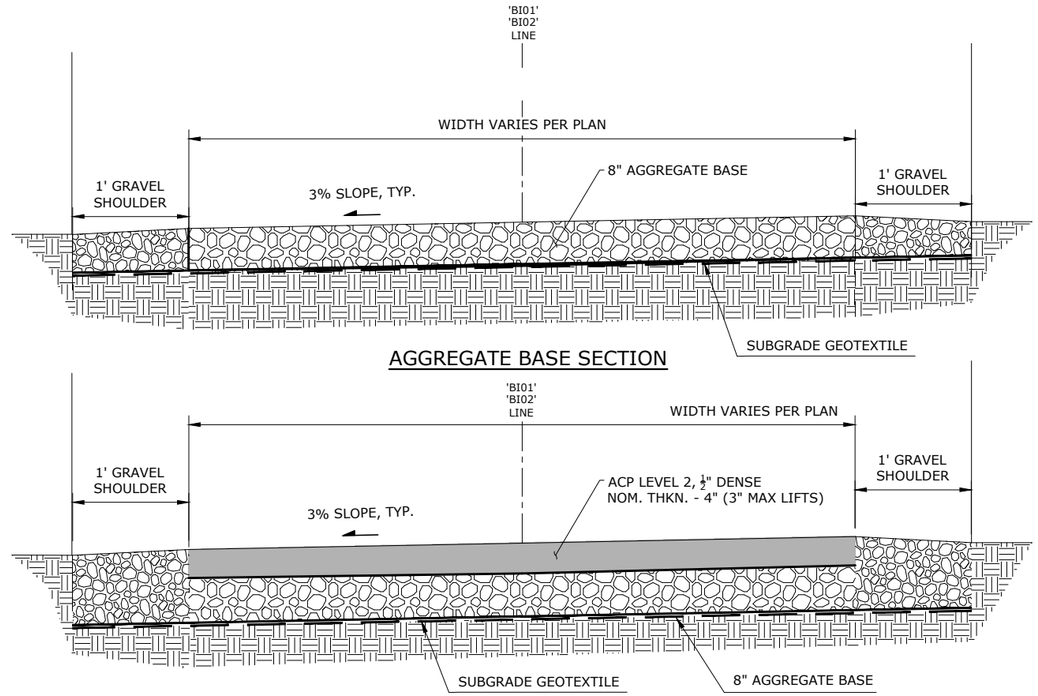
1 / C20

NOTES:

1. CONSTRUCTION ACCOMPANIED BY ODOT STD DWG RD120.

15 7.5 0 15 30

SCALE IN FEET



AGGREGATE BASE SECTION

AC PAVEMENT SECTION

ACCESS ROAD TYPICAL SECTION

SCALE: NTS

2 / D14

NOTES:

1. CONSTRUCTION ACCOMPANIED BY STANDARD NOTES PER CC STD DWG N100, N200 AND N300.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12–31–25

MISCELLANEOUS DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

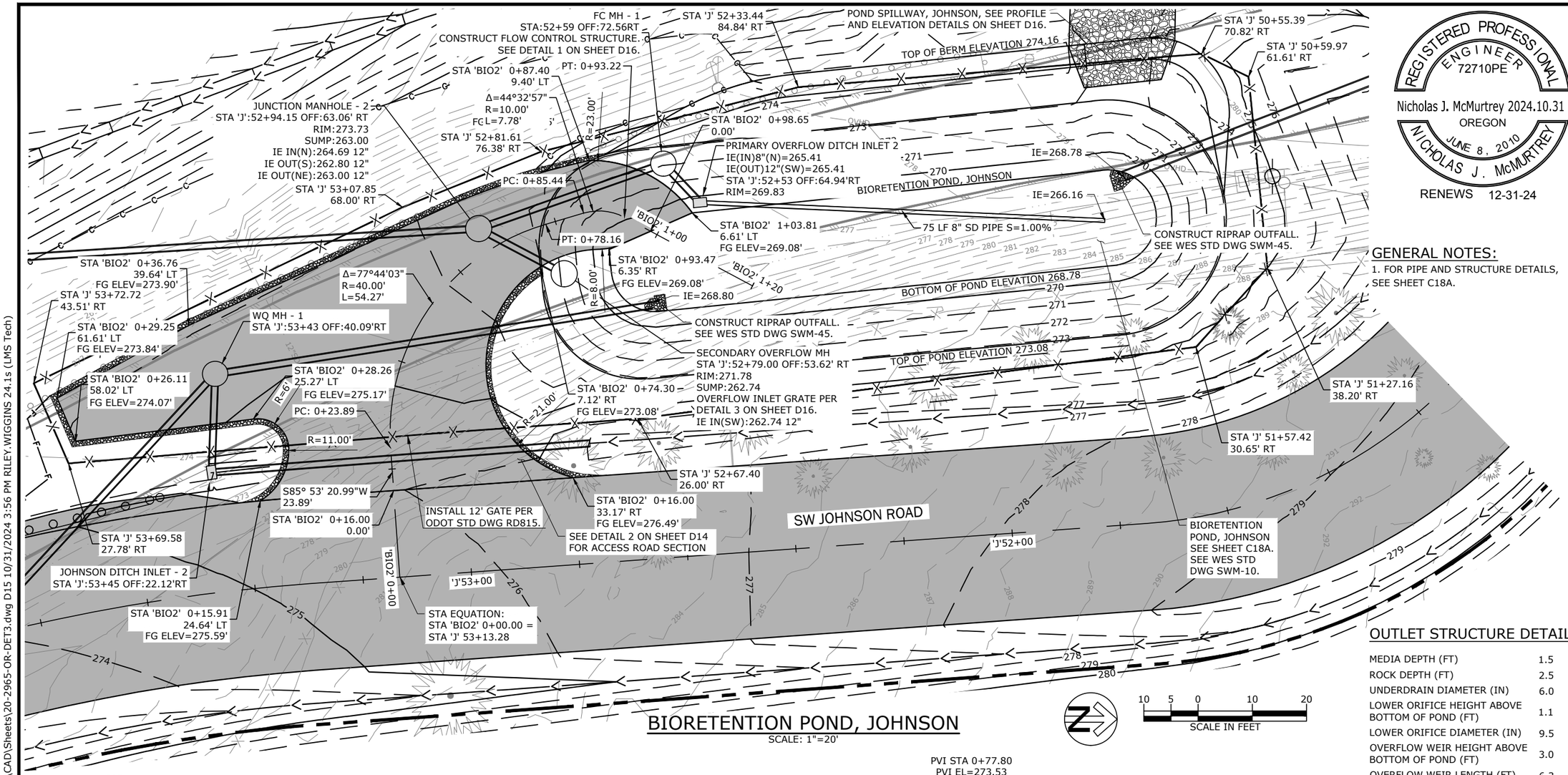
REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
D14

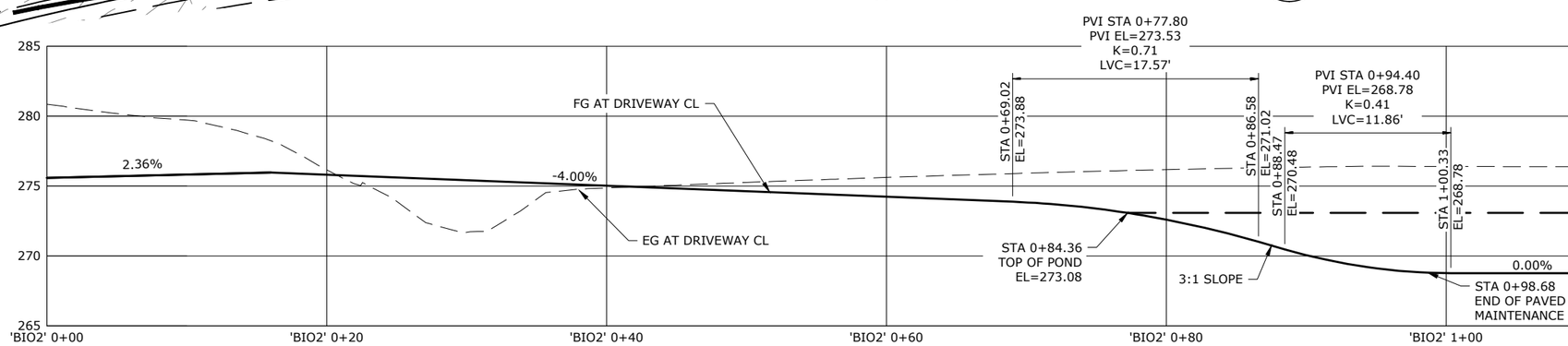
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET3.dwg D14 11/1/2024 2:11 PM RILEY.WIGGINS 24.1s (LMS Tech)



BIORETENTION POND, JOHNSON

SCALE: 1"=20'

SCALE IN FEET: 10 5 0 10 20



PROFILE

SCALE: 1"=10' HORIZ, 1"=10' VERT

SCALE IN FEET: 5 2.5 0 5 10

OUTLET STRUCTURE DETAILS

MEDIA DEPTH (FT)	1.5
ROCK DEPTH (FT)	2.5
UNDERDRAIN DIAMETER (IN)	6.0
LOWER ORIFICE HEIGHT ABOVE BOTTOM OF POND (FT)	1.1
LOWER ORIFICE DIAMETER (IN)	9.5
OVERFLOW WEIR HEIGHT ABOVE BOTTOM OF POND (FT)	3.0
OVERFLOW WEIR LENGTH (FT)	6.3
PONDING DEPTH (FT)	3.0
FREEBOARD (FT)	1.0

GENERAL NOTES:

1. FOR PIPE AND STRUCTURE DETAILS, SEE SHEET C18A.

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STORMWATER DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

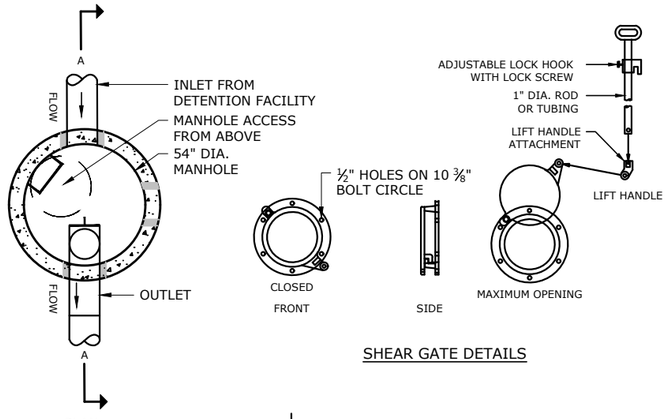
NO.	DATE:

Sheet No. D15

25 of 162

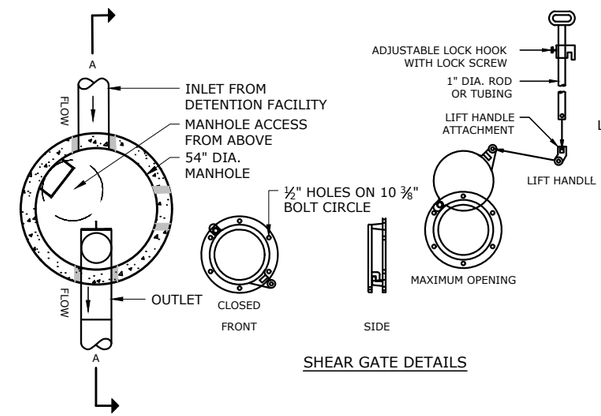
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET3.dwg D15 10/31/2024 3:56 PM RILEY.WIGGINS 24.1s (LMS Tech)



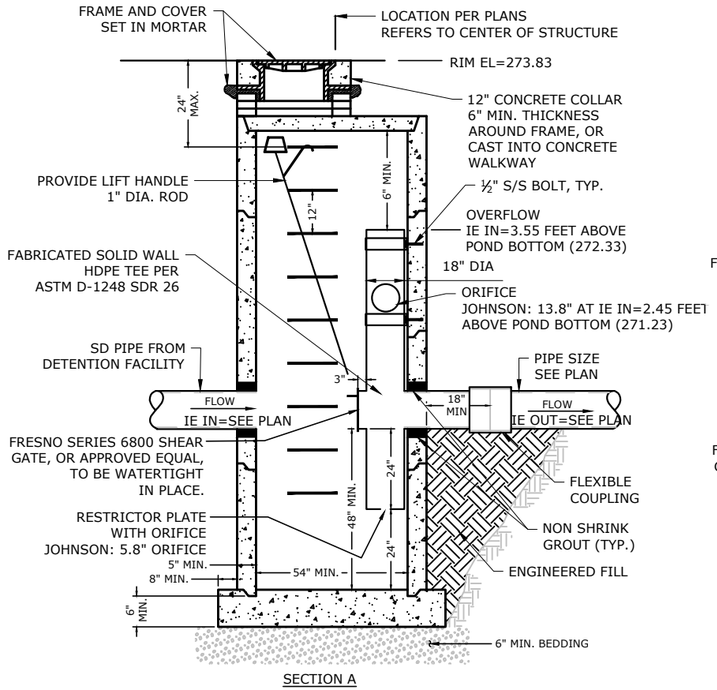
SHEAR GATE DETAILS

PLAN



SHEAR GATE DETAILS

PLAN

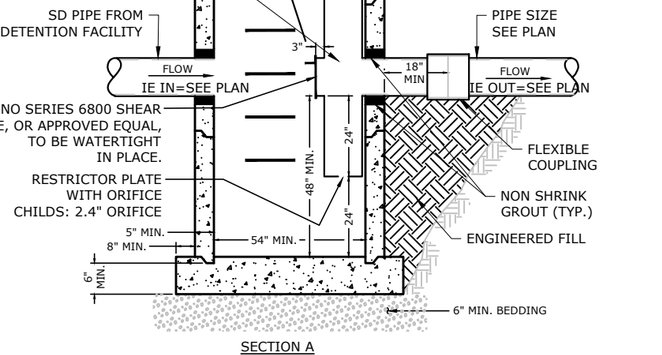


SECTION A

FLOW CONTROL MANHOLE - 1 DETAIL, JOHNSON

SCALE: NTS

1 C04A

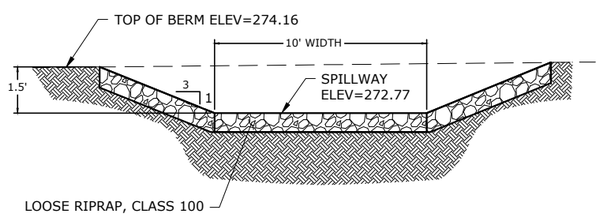


SECTION A

FLOW CONTROL MANHOLE - 2 DETAIL, CHILDS

SCALE: NTS

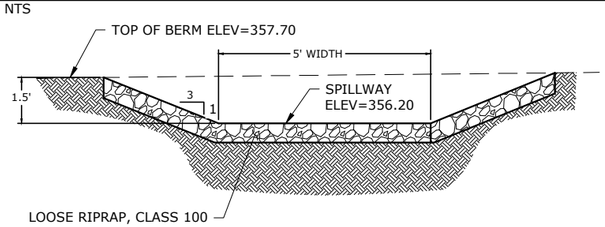
2 C10A



POND SPILLWAY DETAIL, JOHNSON

SCALE: NTS

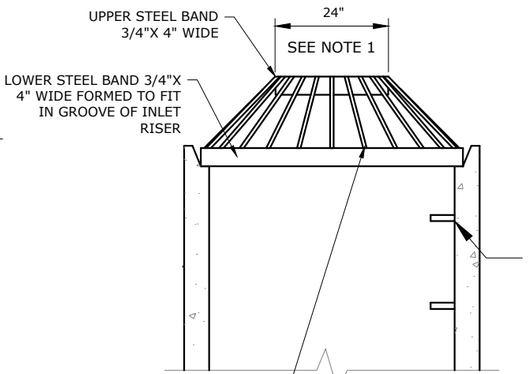
4 D15

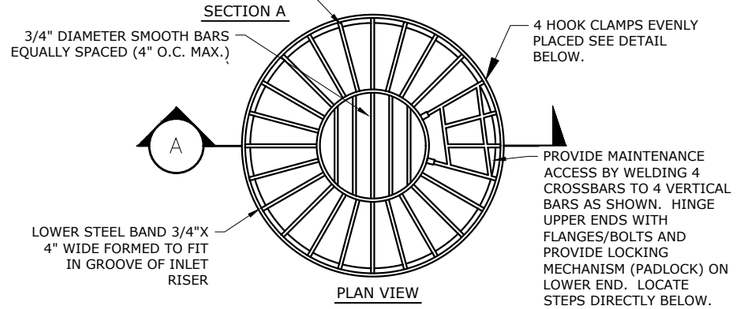


POND SPILLWAY DETAIL, CHILDS

SCALE: NTS

5 D17





OVERFLOW MANHOLE GRATE DETAIL

SCALE: NTS

3 D15

1. DIMENSIONS ARE FOR ILLUSTRATION ON 54 IN. DIAMETER INLET. FOR DIFFERENT DIAMETER INLETS, ADJUST TO MAINTAIN 45 DEGREE ANGLE ON "VERTICAL" BARS AND 7 IN. O.C. MAXIMUM SPACING OF BARS AROUND LOWER STEEL BAND.
2. METAL PARTS MUST BE CORROSION RESISTANT, STEEL BARS MUST BE GALVANIZED.
3. THIS DEBRIS BARRIER IS ALSO RECOMMENDED FOR USE ON THE INLET TO ROADWAY CROSS-CULVERTS WITH HEIGHT POTENTIAL FOR DEBRIS COLLECTION (EXCEPT ON TYPE 2 STREAMS)

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CIVIL DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No. D16

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET3.dwg D16 10/31/2024 3:56 PM RILEY.WIGGINS 24.1s (LMS Tech)

OUTLET STRUCTURE DETAILS

MEDIA DEPTH (FT)	1.5
ROCK DEPTH (FT)	2.5
UNDERDRAIN DIAMETER (IN)	6.0
LOWER ORIFICE HEIGHT ABOVE BOTTOM OF POND (FT)	1.5
LOWER ORIFICE DIAMETER (IN)	3.0
OVERFLOW WEIR HEIGHT ABOVE BOTTOM OF POND (FT)	3.0
OVERFLOW WEIR LENGTH (FT)	6.3
PONDING DEPTH (FT)	3.0
FREEBOARD (FT)	1.0

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

BIORETENTION POND, CHILDS
SEE SHEETS C04A AND C18A.
SEE WES STD DWG SWM-10.

POND SPILLWAY, CHILDS, SEE PROFILE AND ELEVATION DETAILS ON SHEET D16

SECONDARY OVERFLOW DITCH INLET
IE(IN)12"(NE)=350.70
IE(OUT)12"(SW)=350.70
STA 'S':31+92 OFF:114.94'LT
RIM=355.34

92 LF 12" SD PIPE SLP=1.50%

FC MH - 2
IE(IN)12"(NE)=349.83
IE(OUT)12"(W)=349.73
STA 'S':31+46 OFF:82.44'LT
RIM=357.10

78 LF 6" SD PIPE S=1.00%

10 LF 12" DRAIN PIPE S=0.00%

I.E. OUT=353.00

BOTTOM OF POND ELEVATION 353.00

PRIMARY OVERFLOW DITCH INLET
IE(IN)6"(NE)=349.92
IE(OUT)12"(SW)=350.70
STA 'S':32+03 OFF:120.60'LT
RIM=353.90

47 LF 12" SD PIPE S=1.84%

CONSTRUCT RIPRAP OUTFALL.
SEE WES STD DWG SWM-45.

I.E. OUT=353.00

TOP OF POND ELEVATION 357.00

48 LF 12" SD PIPE S=0.47%

CONSTRUCT AC ACCESS ROAD PER DETAIL 2 ON SHEET D14.

STA 'S' 32+58.32
168.00' LT

STA 'S' 34+07.41
120.00' LT

CONSTRUCT RIPRAP OUTFALL.
SEE WES STD DWG SWM-45.

'DWY10' LINE

'DWY10' 1+00

'BIO1' 0+00

'BIO1' LINE FOR DETAILS SEE SHEET D18

STA 'BIO1' 0+93.04
7.50' RT

STA 'BIO1' 1+17.88
7.50' RT

CONSTRUCT RIPRAP OUTFALL.
SEE WES STD DWG SWM-45.

I.E. OUT=371.00

89 LF 12" SD PIPE S=5.98%

STA 'S' 31+14.57
90.00' LT

STA 'BIO1' 2+25.56
7.50' RT

91 LF 12" SD PIPE S=0.50%

'BIO1' 2+40

'BIO1' 2+00

'BIO1' 1+00

STA 'S' 33+85.77
47.00' LT

CONSTRUCT FLOW CONTROL MH.
SEE WES STD DWG SWM-11.

WQ MH - 3- FLAT TOP
IE(IN)12"(W)=353.23
IE(OUT)12"(NE)=353.23
STA 'S':31+56 OFF:77.38'LT
RIM=358.16

98 LF 12" SD PIPE S=9.04%

STA 'S' 33+65.63
37.00' LT

STA 'S' 31+48.67
68.00' LT

STA 'BIO1' 2+25.56
7.50' LT

STA 'BIO1' 1+17.88
7.50' LT

STA 'BIO1' 0+93.04
7.50' LT

STA 'S' 33+27.59
40.00' LT

SEE DETAIL 2 ON SHEET D13 FOR ACCESS ROAD SECTION AND D18 FOR ACCESS ROAD PROFILE

STA 'S' 32+54.38
57.00' LT

SEE SHEET C11A FOR DRAINAGE INFORMATION NOT SHOWN, TYP.

SW STAFFORD ROAD

'S' 34+00

7 LF 12" SD PIPE S=5.00%

'S' 33+00

'S' 32+00

OVHD

CATV

PLAN
SCALE: 1"=20'

10 5 0 10 20
SCALE IN FEET

BIORETENTION POND, CHILDS
SCALE: 1"=20'

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

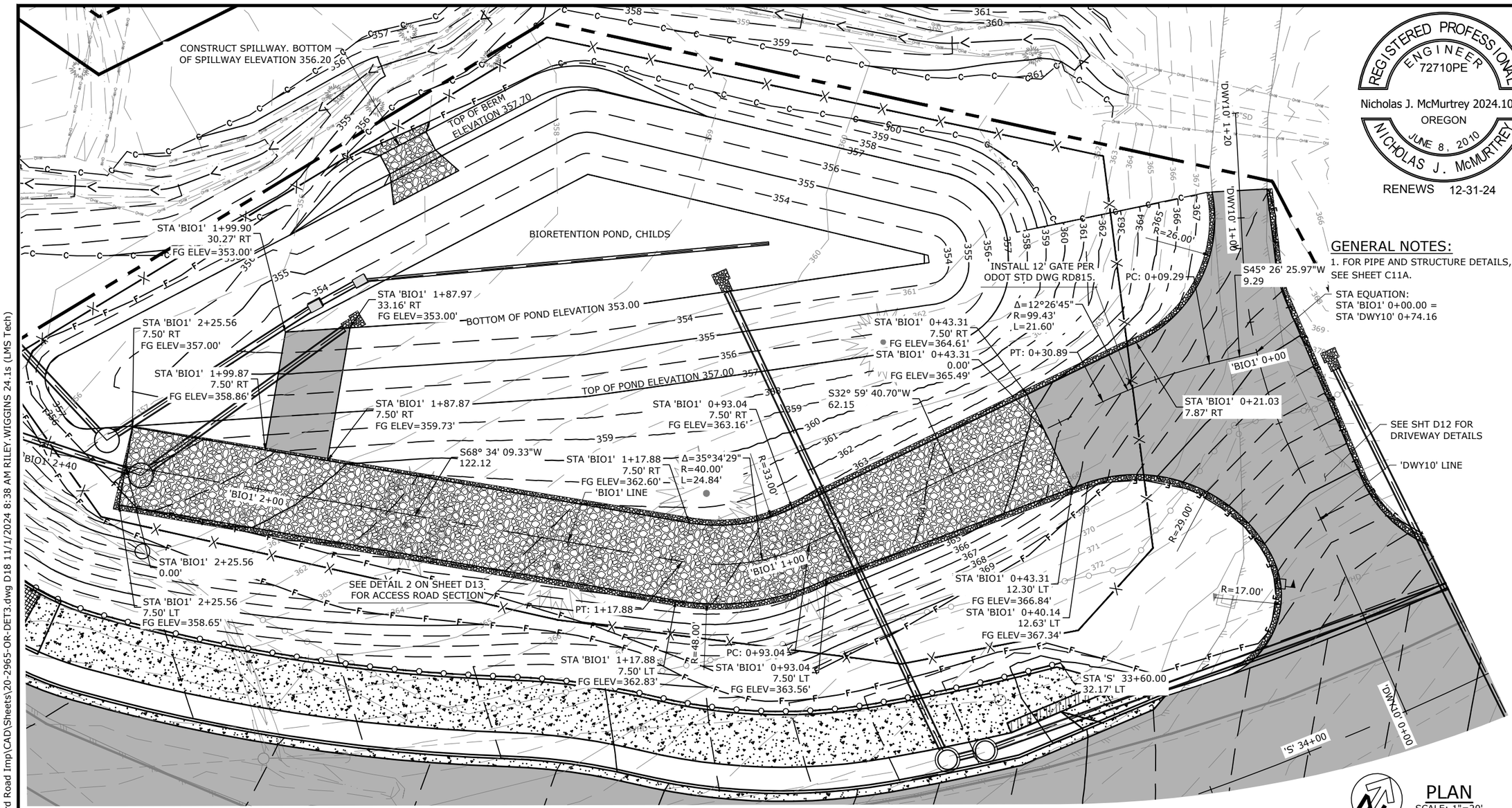
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

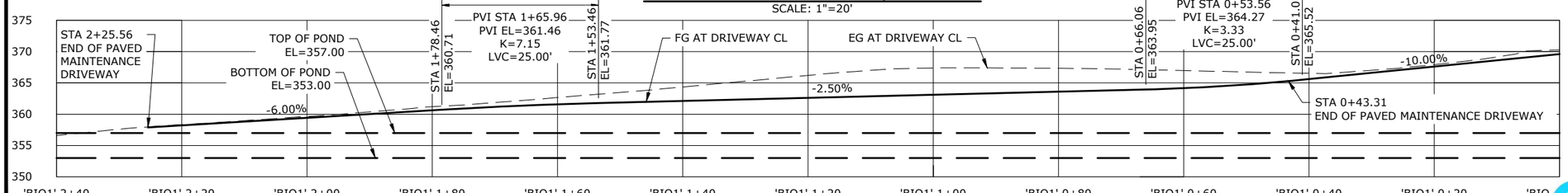
Sheet No.
D17

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET3.dwg D17 10/31/2024 3:56 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=20'

BIORETENTION POND, CHILDS
SCALE: 1"=20'



PROFILE
SCALE: 1"=20' HORIZ 1"=10' VERT

10 5 0 10 20
SCALE IN FEET

GENERAL NOTES:
1. FOR PIPE AND STRUCTURE DETAILS, SEE SHEET C11A.

STA EQUATION:
STA 'BIO1' 0+00.00 =
STA 'DWY10' 0+74.16

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STORMWATER DETAILS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

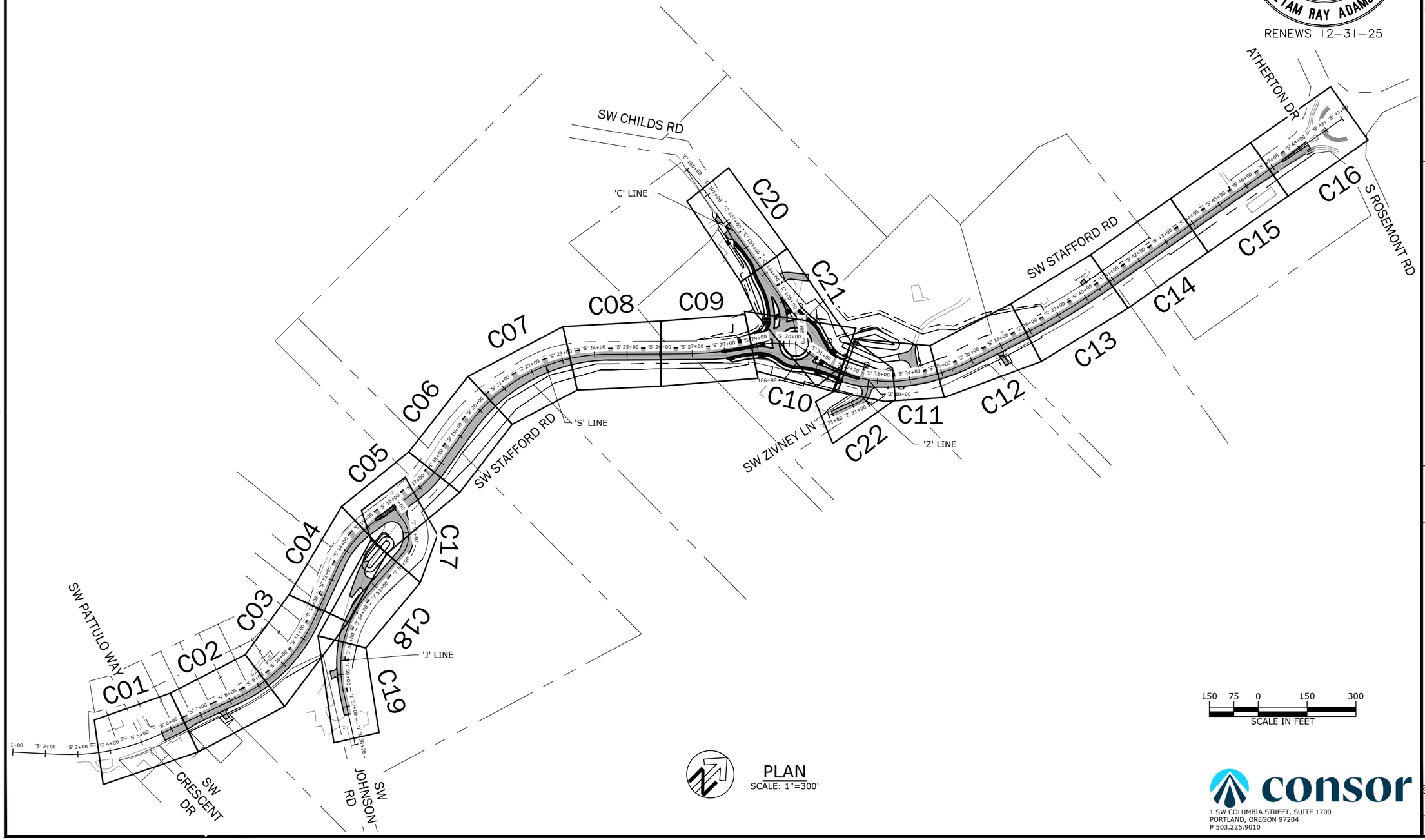
NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No. D18

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-DET3.dwg D18 11/1/2024 8:38 AM RILEY.WIGGINS 24.1s (LMS Tech)

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C00 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=300'

150 75 0 150 300
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

PLAN AND PROFILE KEY MAP

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

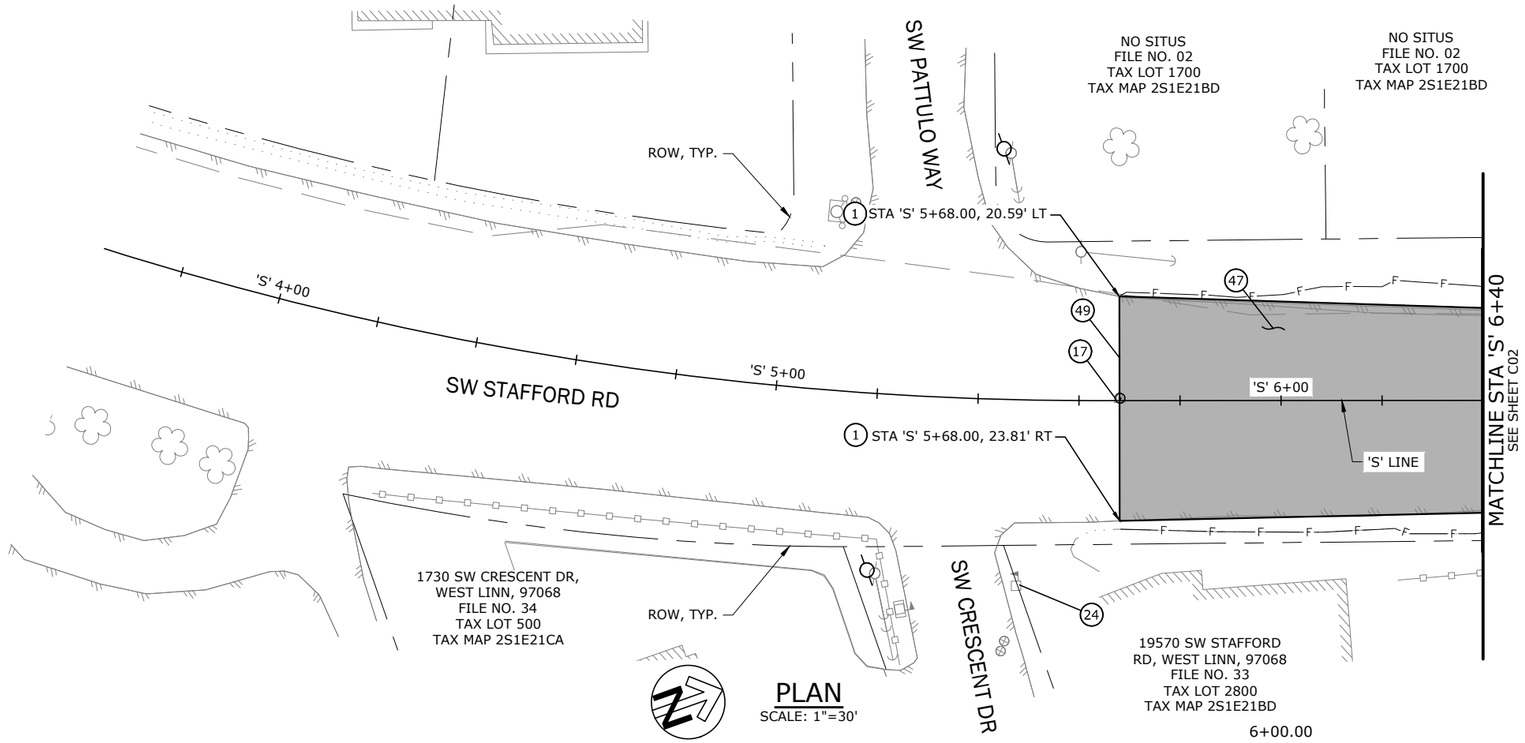
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

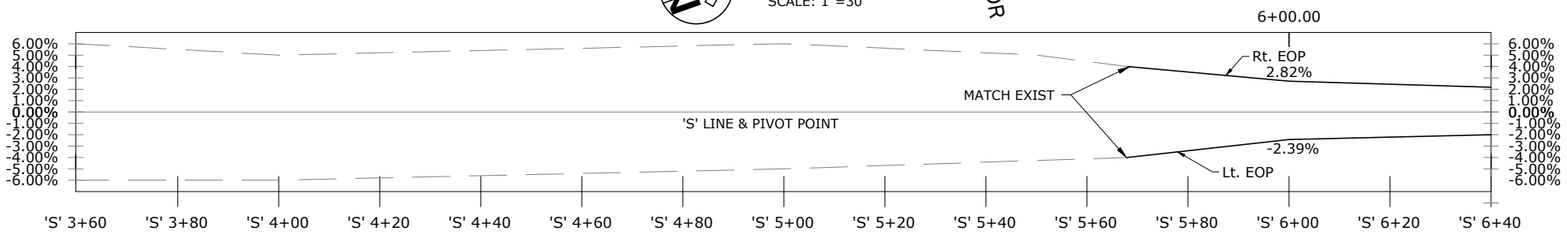
REVISIONS

NO.	DATE:

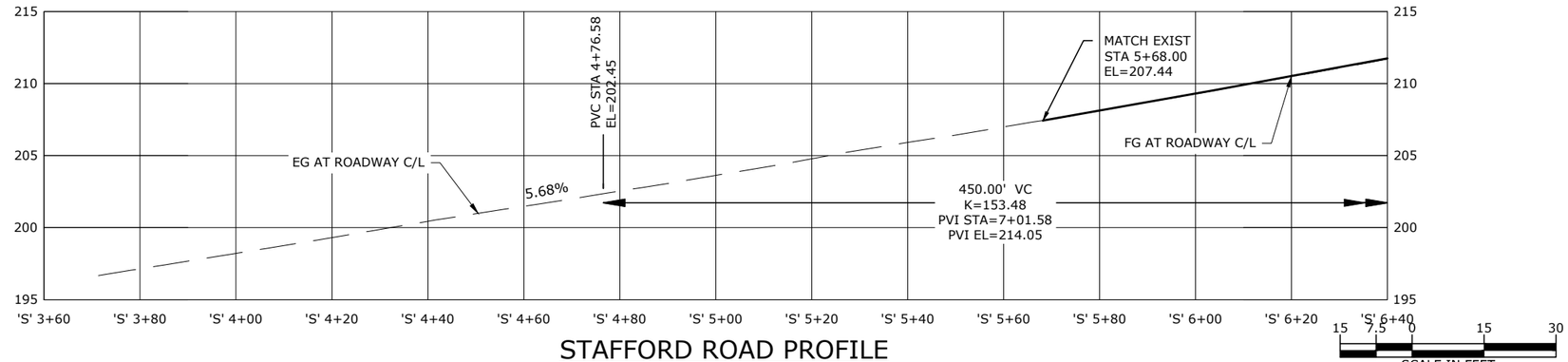
Sheet No.
C00



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

1. MATCH EXIST
17. PROTECT EXIST MONUMENT BOX
24. PROTECT EXIST MAILBOX
47. CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)
49. SAWCUT EXIST PAVEMENT - 44 LF (SEE ODOT STD DWG RD610)

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

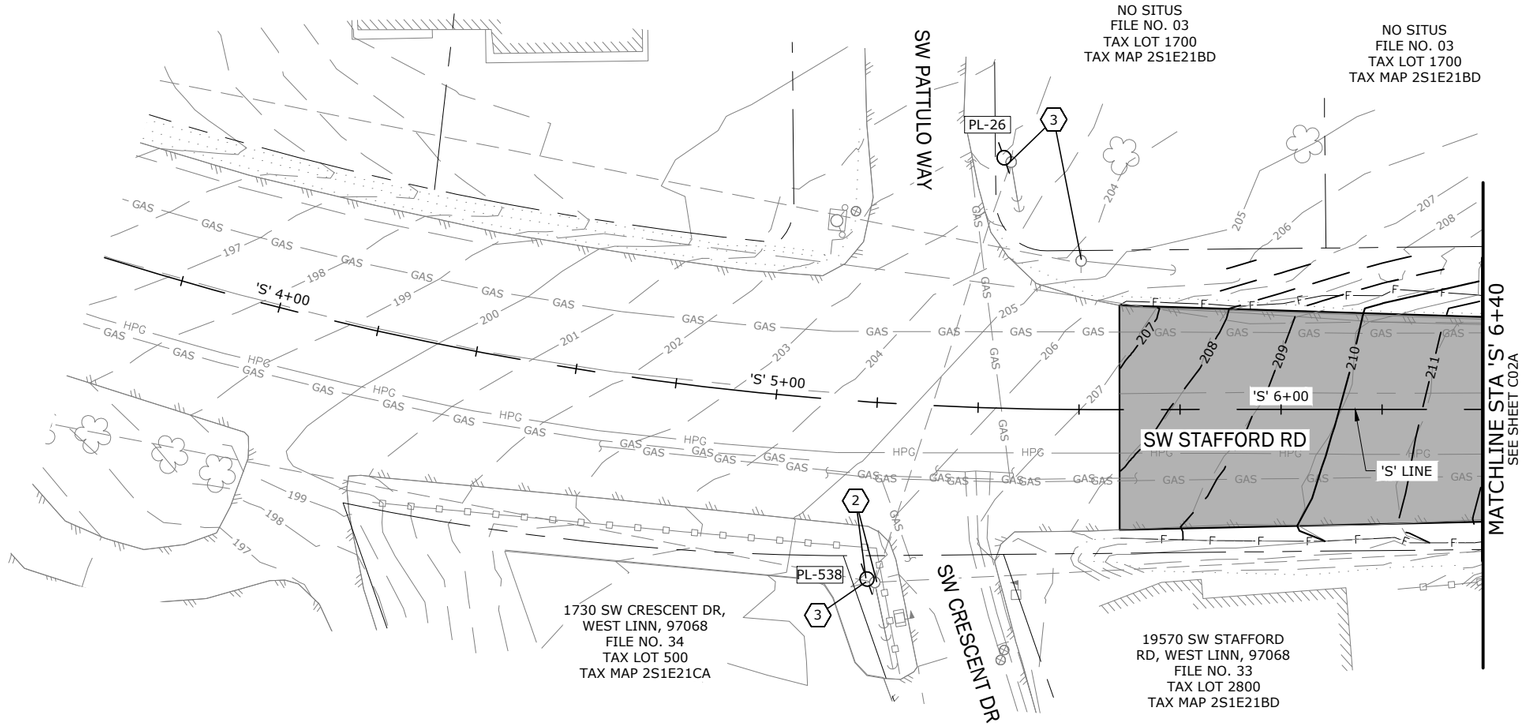
NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

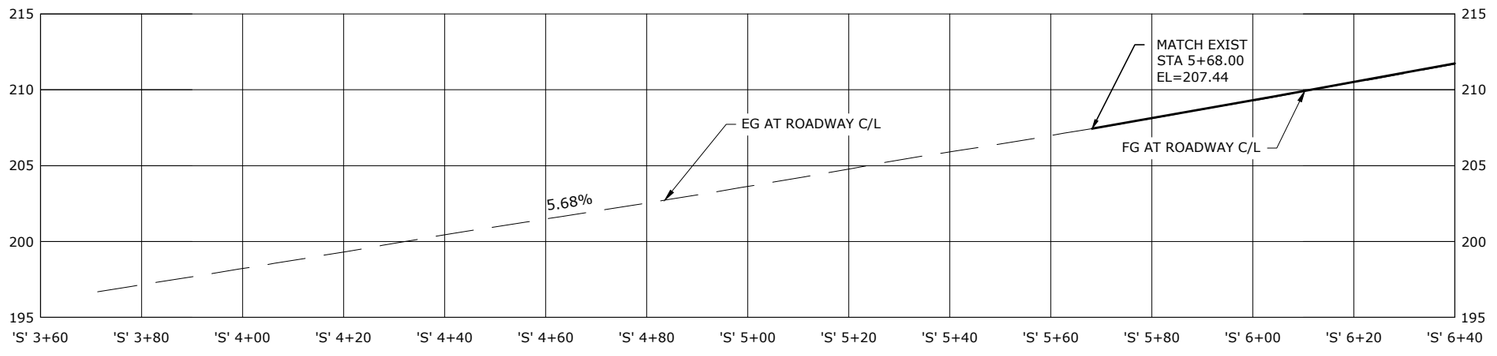
Sheet No. C01

30 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C01 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

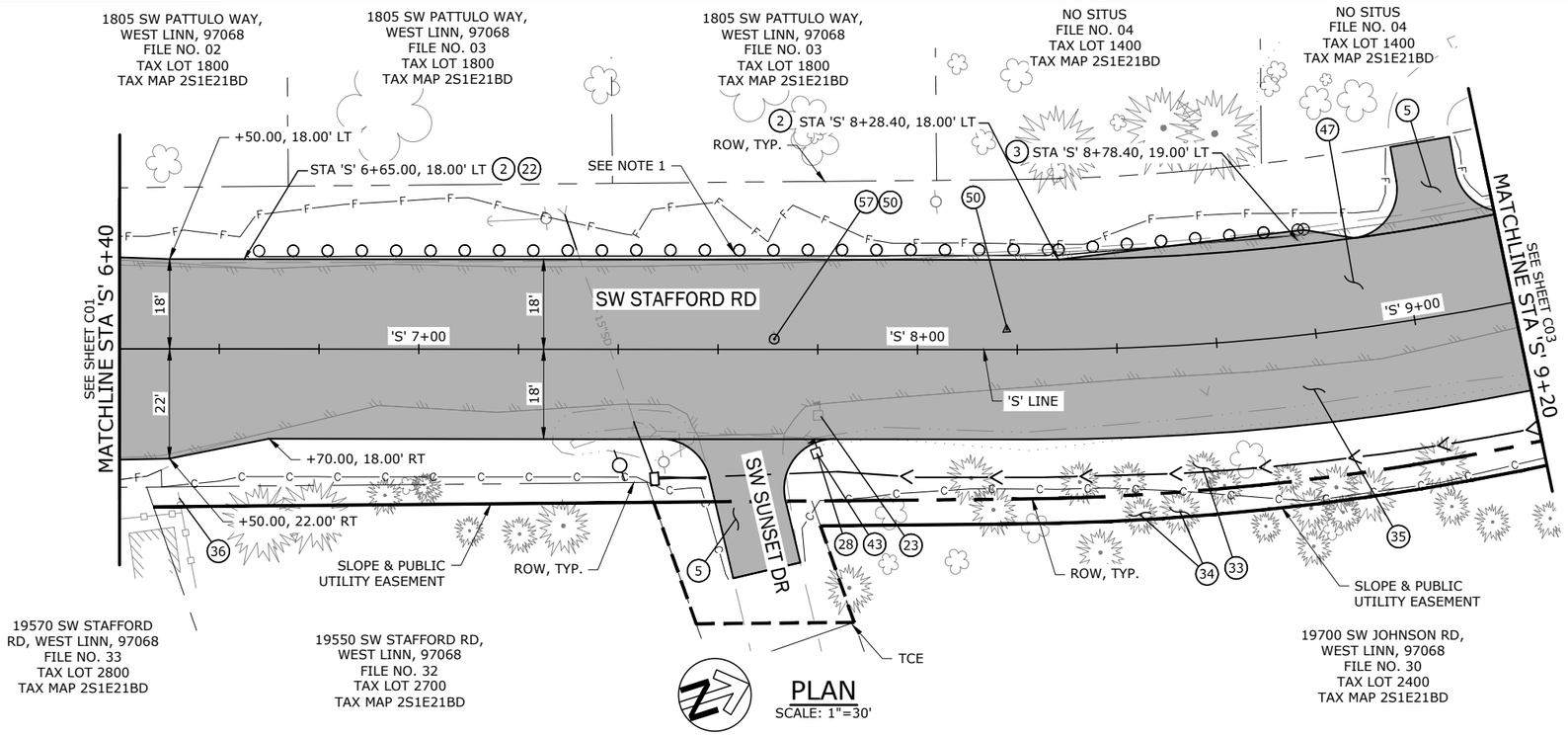
REVISIONS

NO.	DATE:

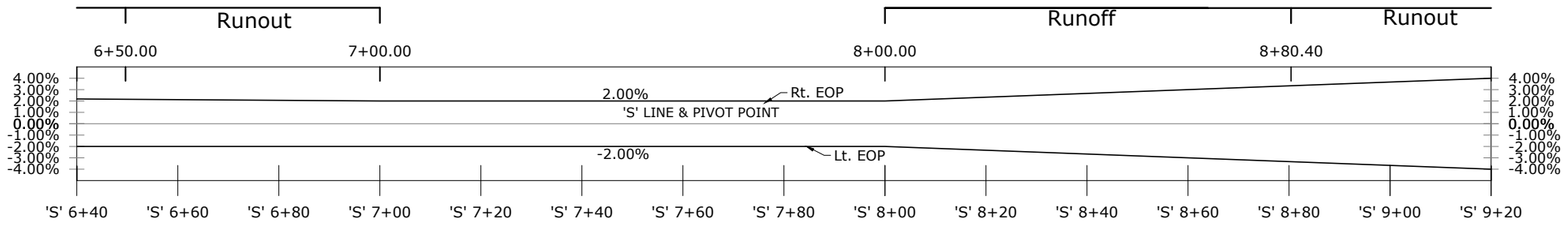
Sheet No.
C01A

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

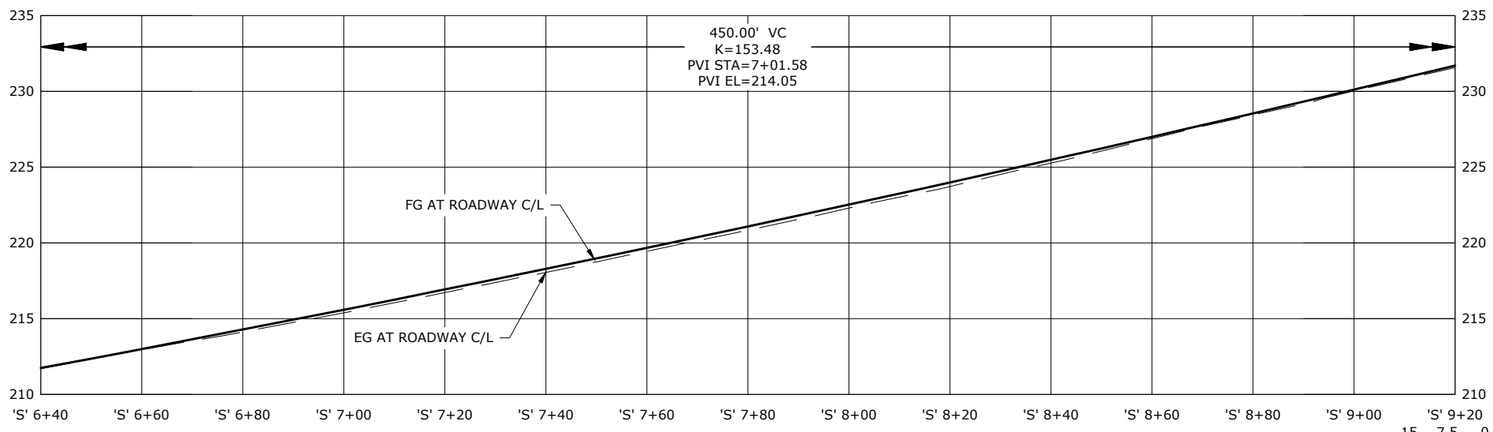
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C01A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 162.5 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(3) INSTALL NON-FLARED, TEST LEVEL 2, W=1', GUARDRAIL TERMINAL - 1 EA (SEE ODOT STD DWG RD420)

(5) CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHEETS D06 & D07 FOR DETAILS)

(22) INSTALL TYPE C GUARDRAIL END PIECE AND TYPE 1 ANCHOR - 1 EA (SEE ODOT STD DWGS RD417, RD450 & RD451)

(23) REMOVE EXIST MAILBOX AND SUPPORT

(28) INSTALL SINGLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 & RD101)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(36) PROTECT EXIST FENCE

(43) INSTALL STANDARD MAILBOX (SIZE 1.5) - 1 EA (SEE ODOT STD DWG RD100)

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 2 EA (SEE SHEET HC02 & CLACKAMAS COUNTY STD DWG M150)

(57) REMOVE EXIST MONUMENT BOX

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR | DRAFTED BY: JSD | CHECKED BY: WRA

REVISIONS

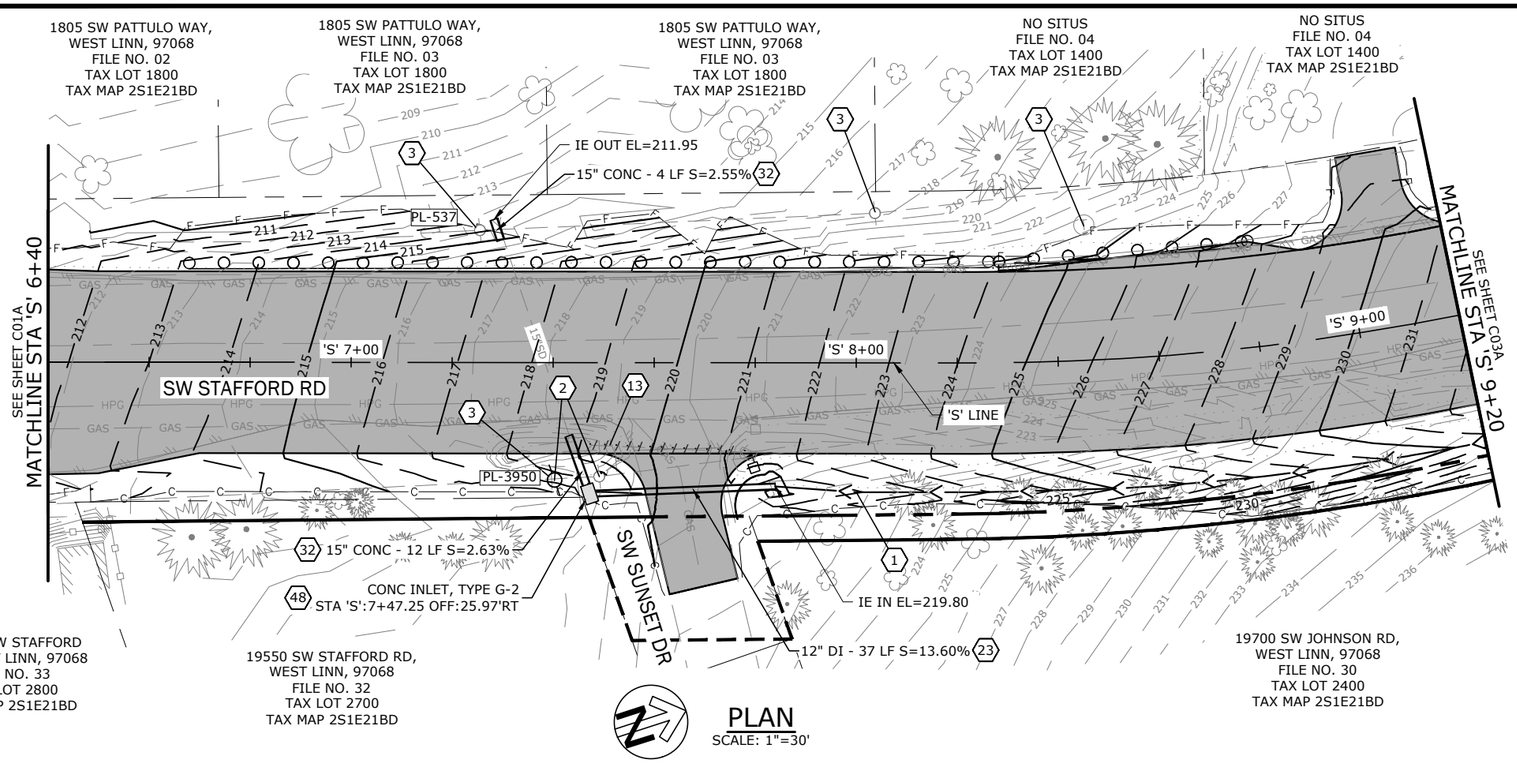
NO.	DATE:

Sheet No. C02

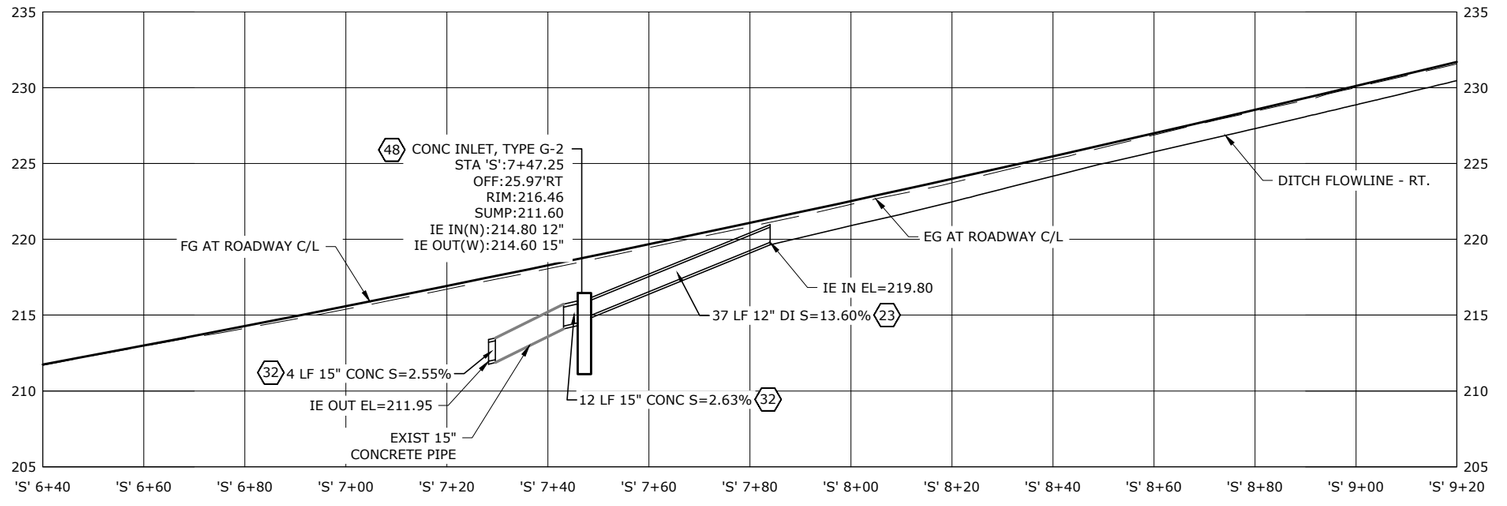
32 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C02 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
13. ABANDON EXIST STRUCTURE, 12" CULVERT PIPE, - 30 LF
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
32. EXTEND EXIST PIPE & CONSTRUCT CONCRETE CLOSURE COLLAR (PER ODOT STD DWG RD306)
48. CONSTRUCT CAST-IN-PLACE TYPE G-2 INLET 3' SUMP (SEE ODOT STD DWG RD364)

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

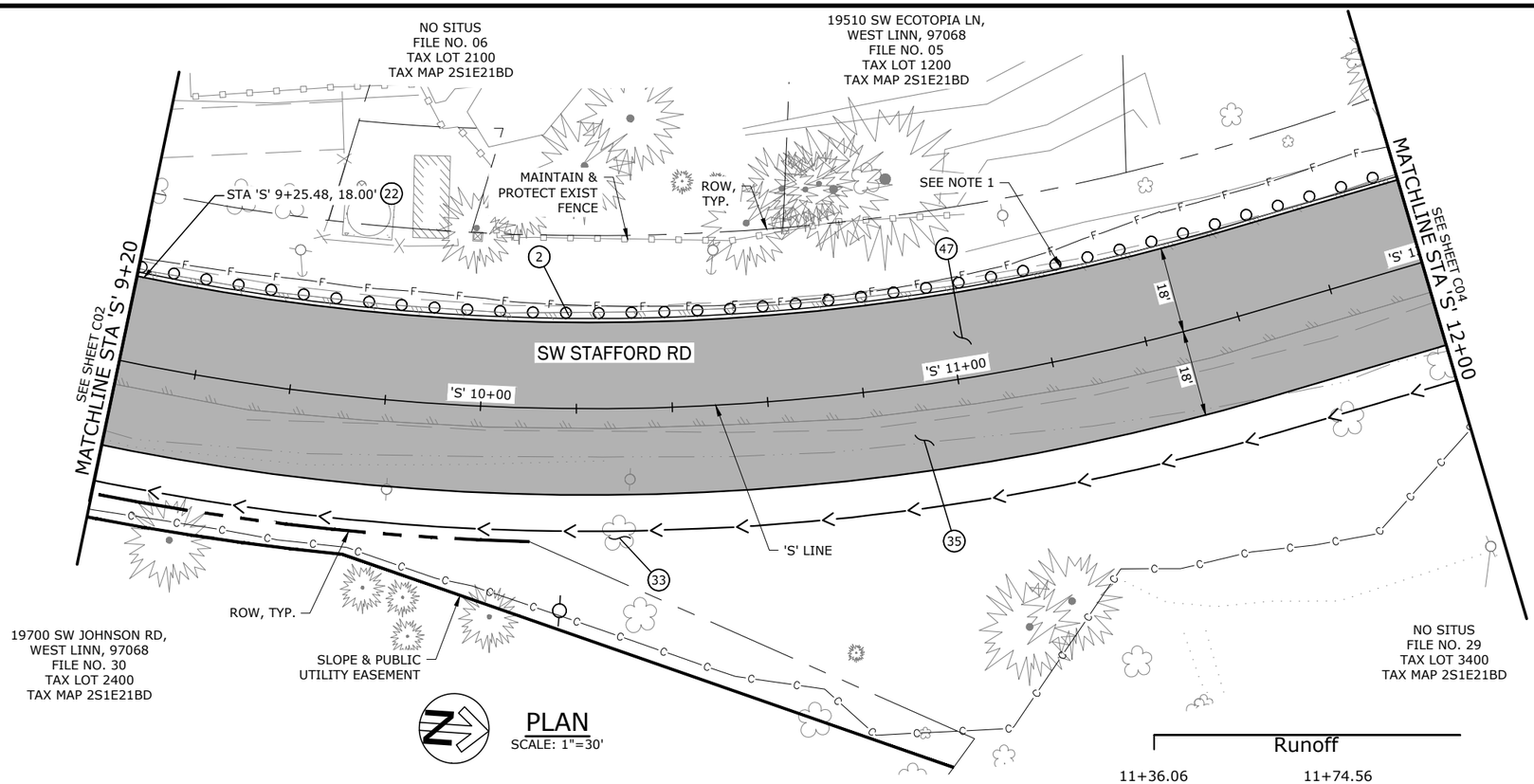
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

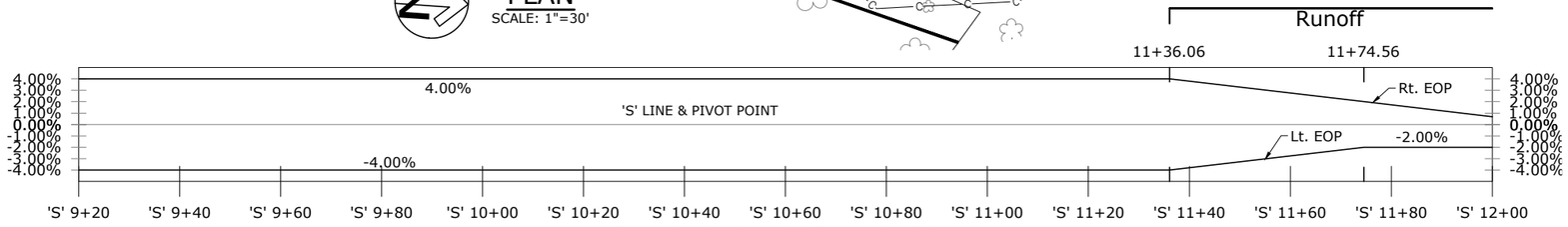
REVISIONS

NO.	DATE:

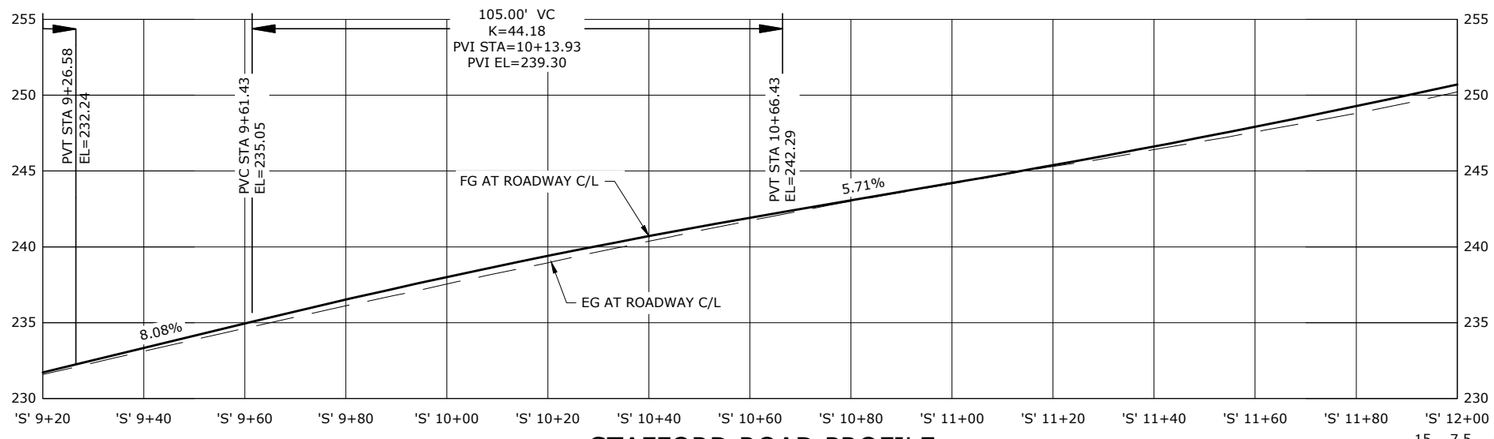
Sheet No.
C02A

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C02A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)





SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 278 LF
(SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(22) INSTALL TYPE C GUARDRAIL END PIECE AND TYPE 1 ANCHOR - 1 EA
(SEE ODOT STD DWGS RD417, RD450 & RD451)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL
(SEE EC SHEETS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION
(SEE TYPICAL SECTIONS)

(47) CONSTRUCT ACP PAVEMENT LEVELING
(SEE SHEETS D01-D04)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

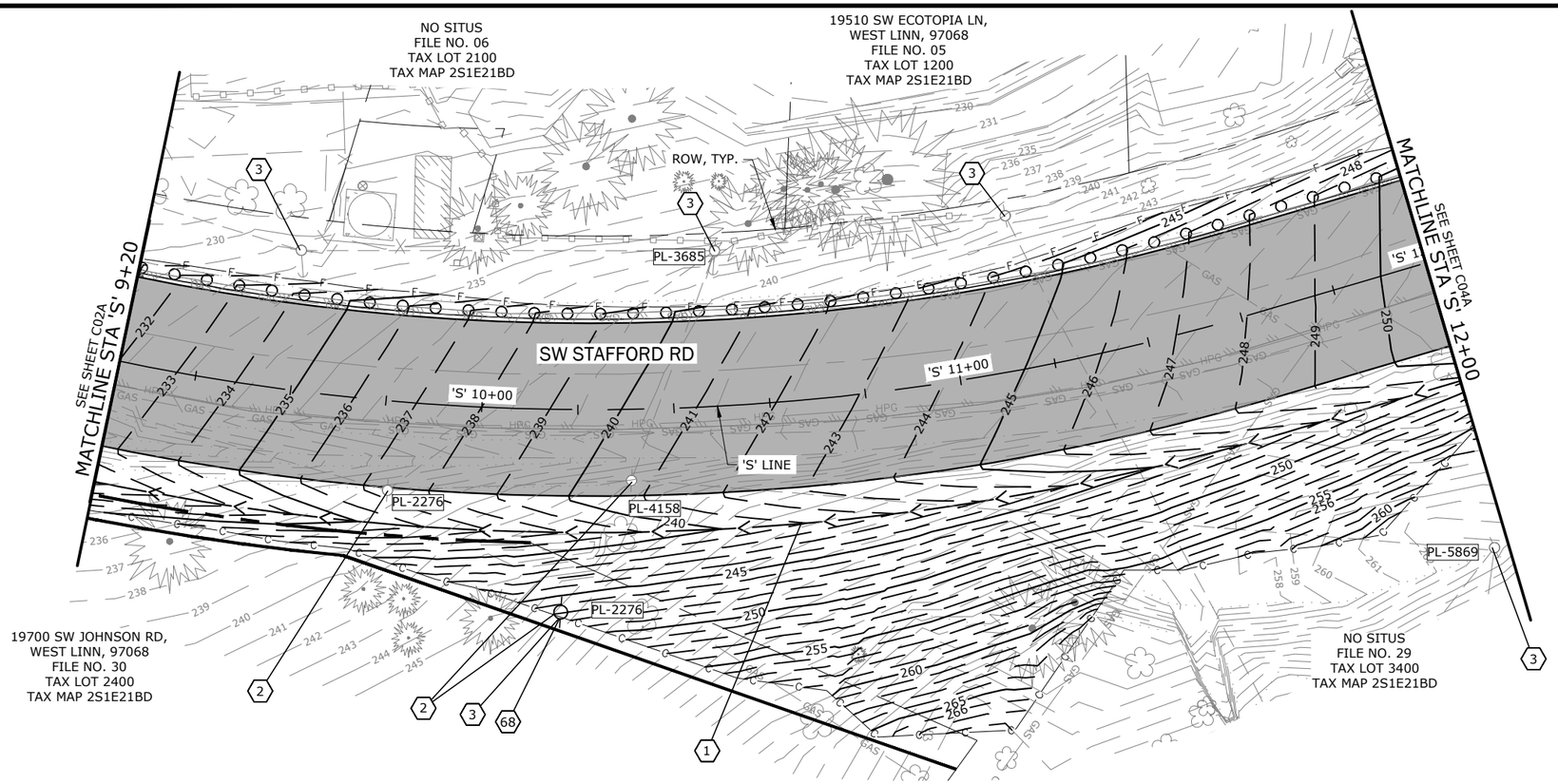
REVISIONS

NO.	DATE:

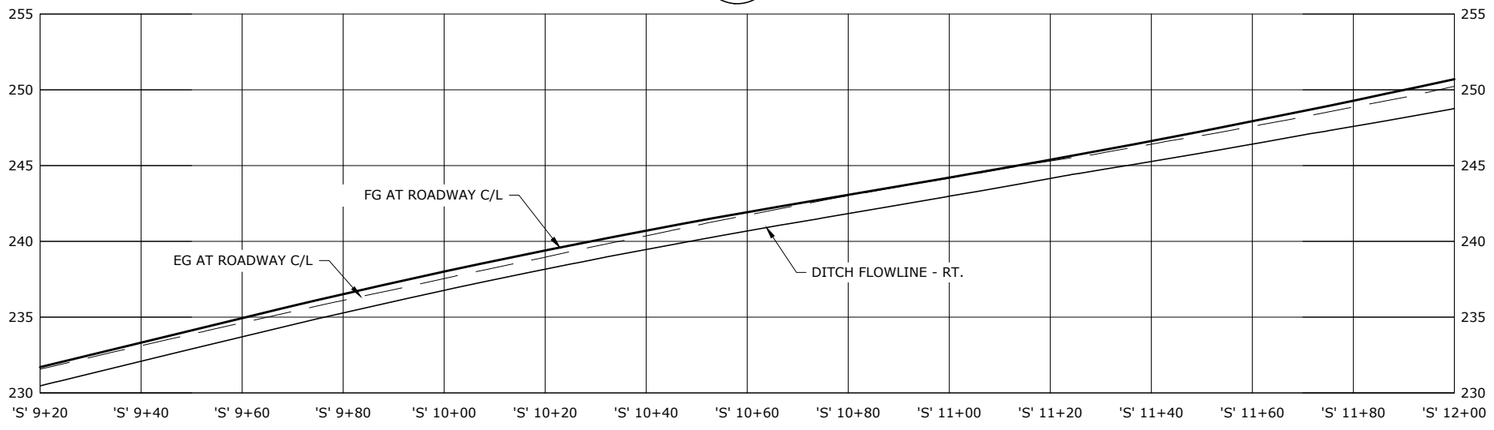
Sheet No.
C03

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C03 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

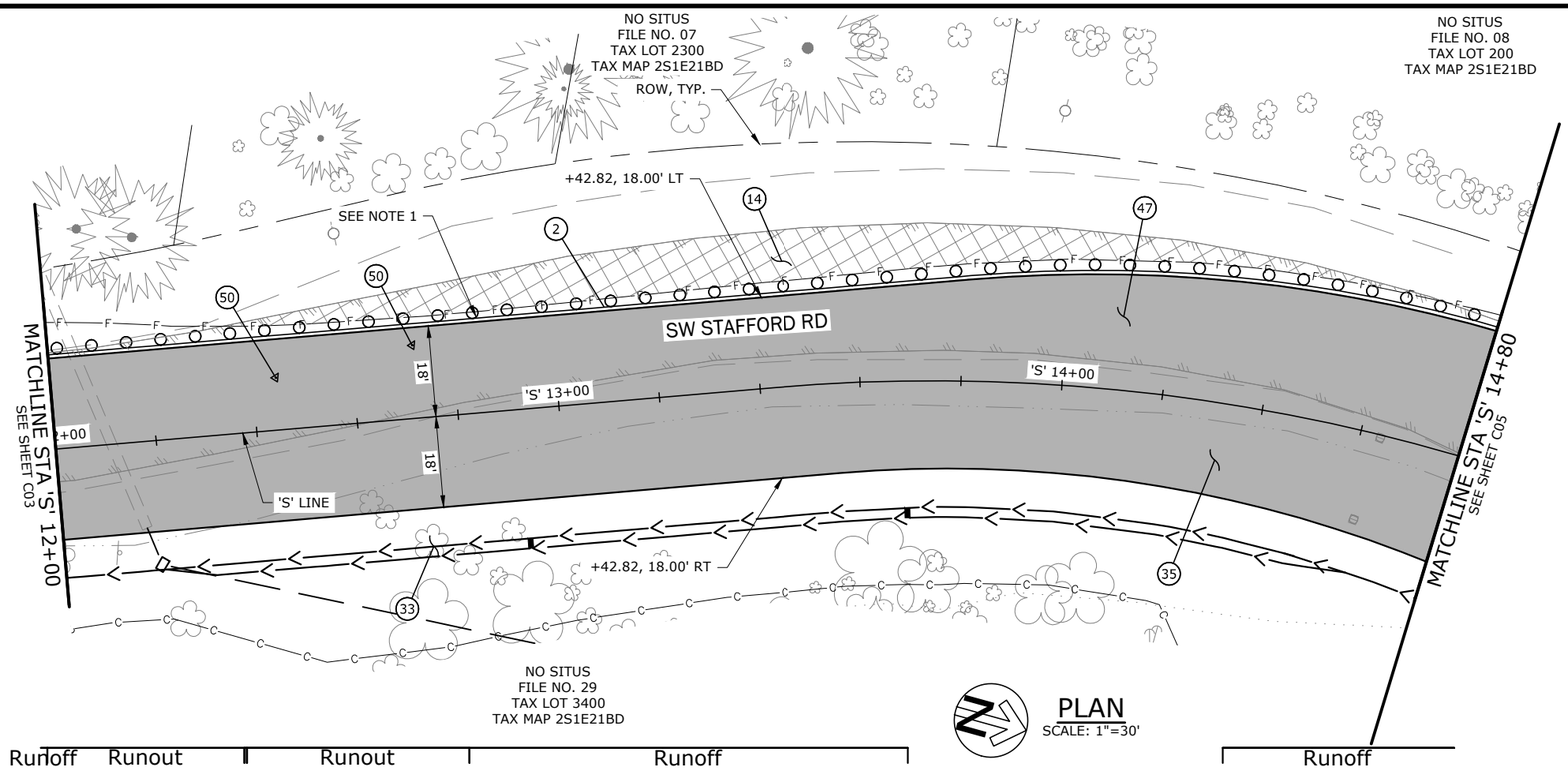
NO.	DATE:

Sheet No.
C03A

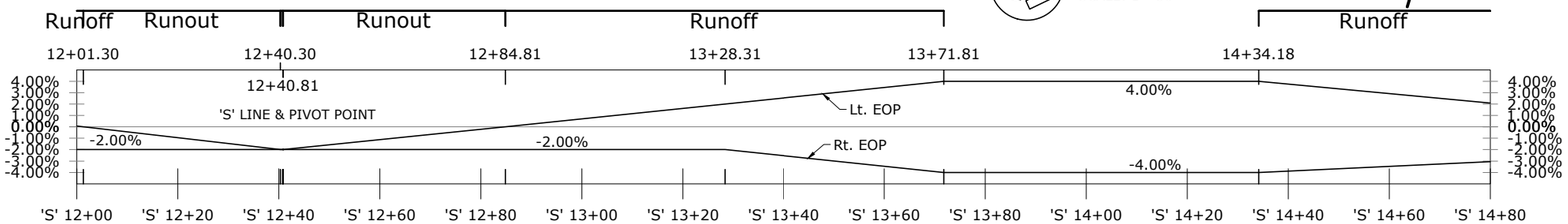
35 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

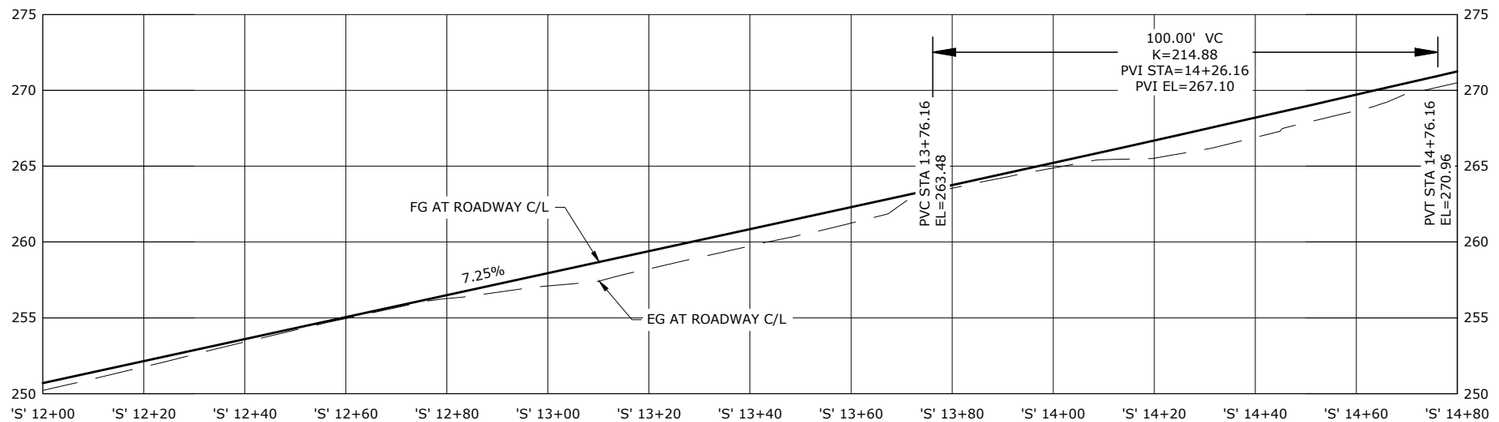
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C03A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 283 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(14) REMOVAL OF SURFACINGS - 243 SY

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 2 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

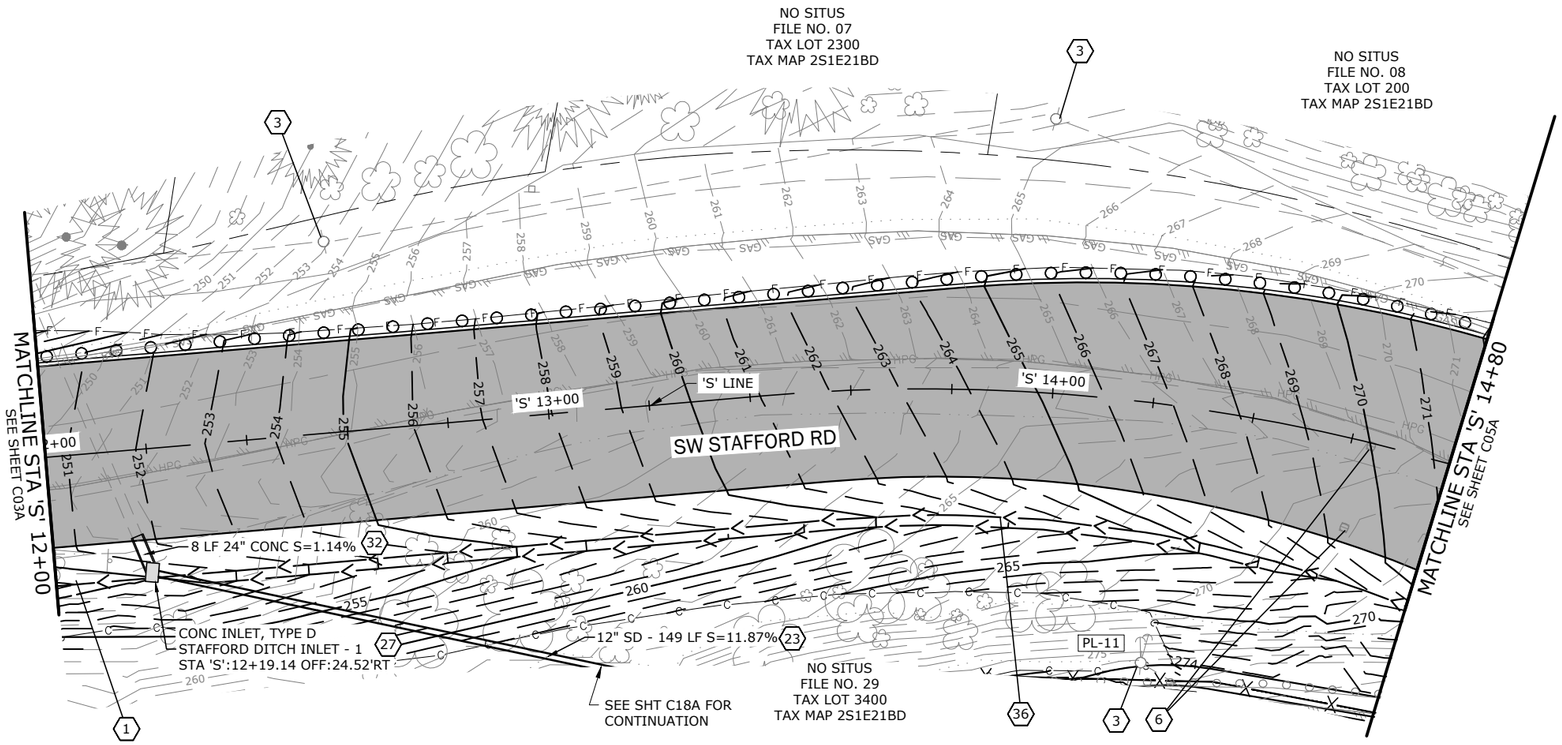
NO.	DATE:

Sheet No.
C04

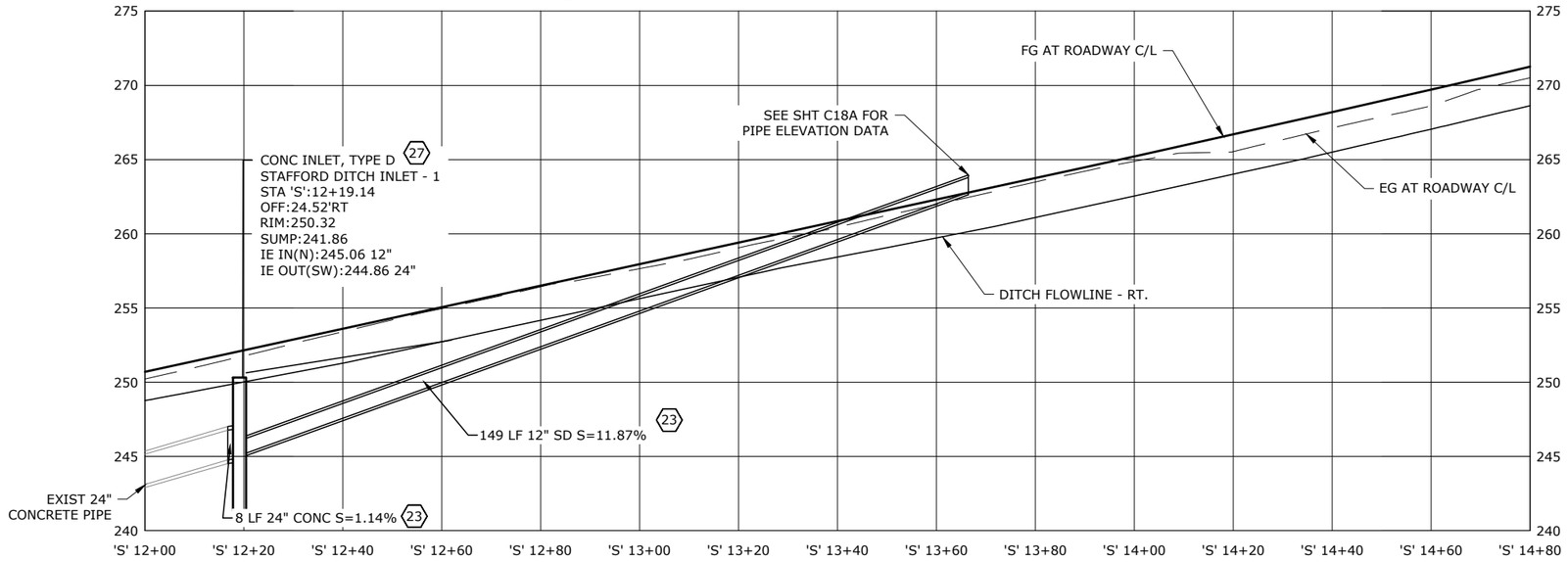
36 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C04 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
6. ADJUST UTILITY BOX TO FINISHED GRADE
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
27. CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 3' SUMP
32. EXTEND EXIST PIPE & CONSTRUCT CONCRETE CLOSURE COLLAR (PER ODOT STD DWG RD306)
36. CONSTRUCT WATER QUALITY SWALE WITH 9-INCH TALL TYPE 1 ROCK CHECK DAMS EVERY 16 FEET (PER WES STD DETAIL SWM-06 & SEE TYPICAL SECTIONS)

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

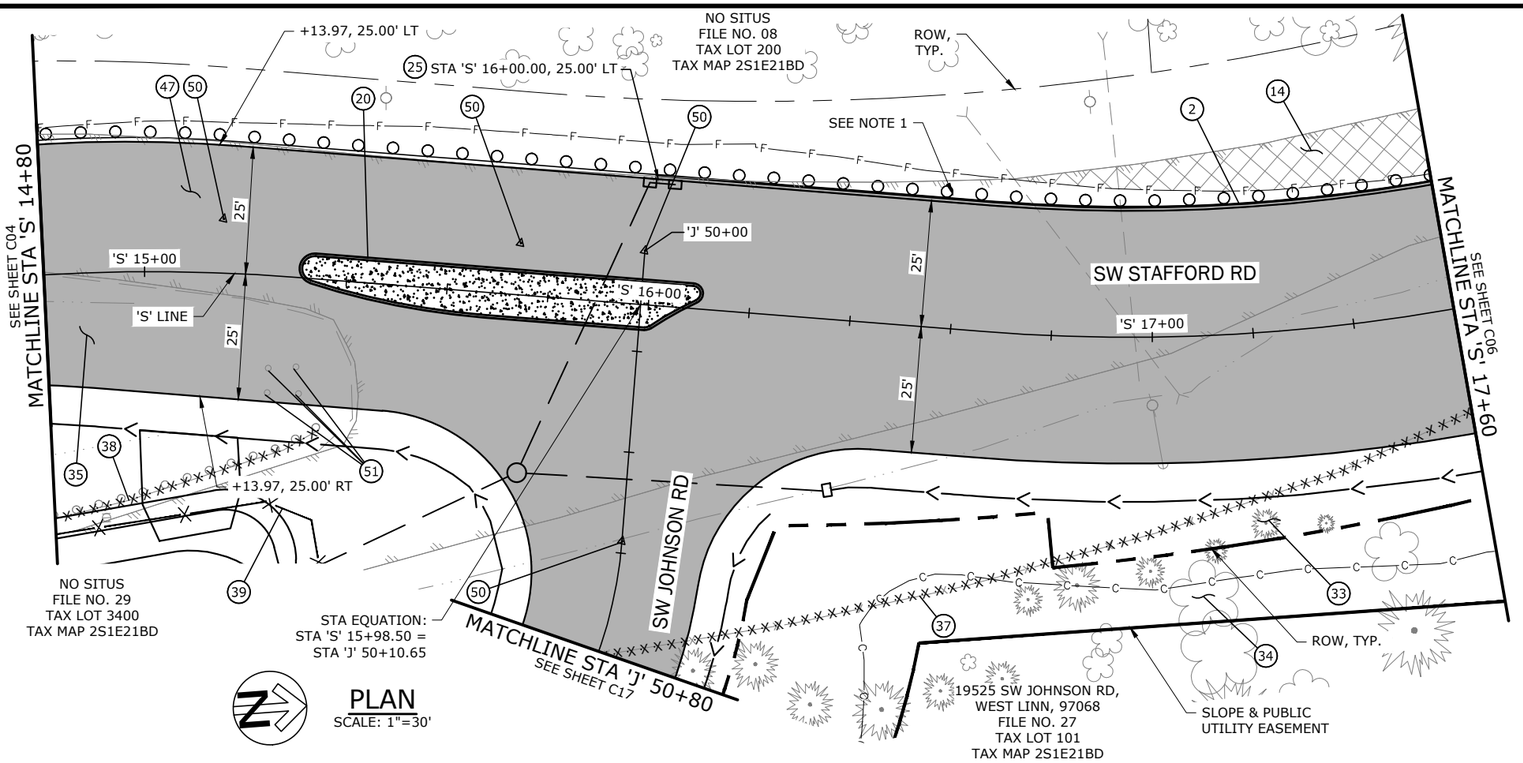
REVISIONS

NO.	DATE:

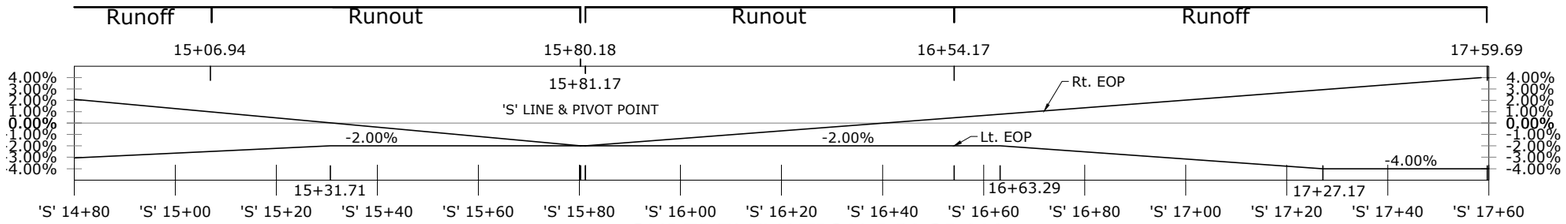
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
C04A

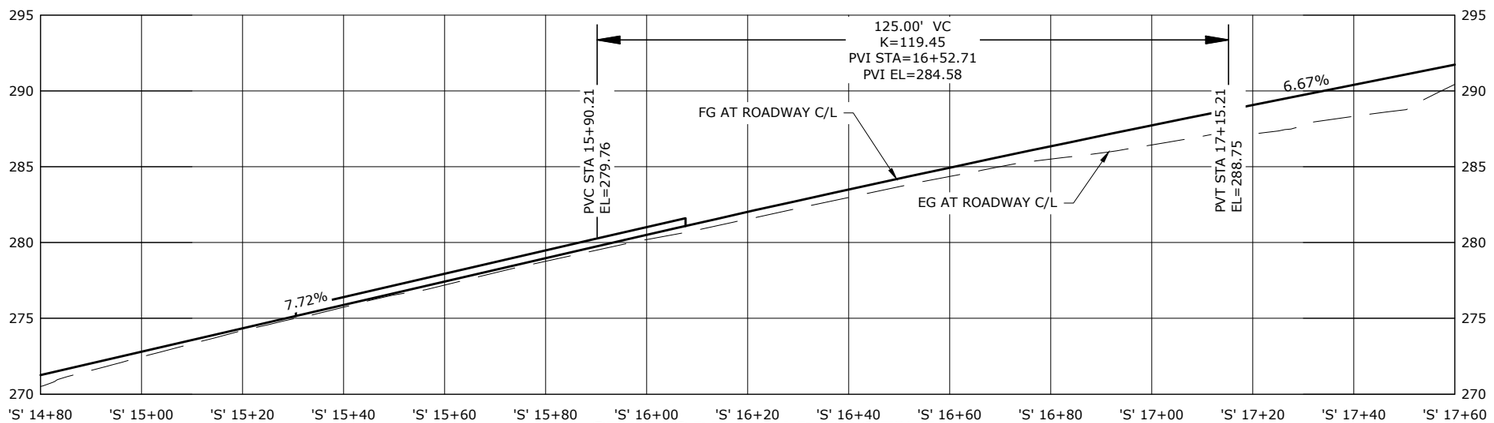
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C04A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 283 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(14) REMOVAL OF SURFACINGS - 105 SY

(20) CONSTRUCT NON-MOUNTABLE TYPE C CONCRETE ISLAND - 701 SF (SEE ODOT STD DWGS RD705 & RD707 AND SHT D05 FOR DETAILS)

(25) CONSTRUCT ASPHALT DRAINAGE CURB - 160 LF (SEE ODOT STD DWG RD701)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 198 LF

(38) REMOVAL OF GUARDRAIL - 344 LF

(39) INSTALL TYPE CL-6R FENCE (BLACK) - 70 LF (SEE ODOT STD DWG RD815)

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 4 EA (SEE SHEET HC02 & CLACKAMAS COUNTY STD DWG M150)

(51) REMOVAL OF BOLLARDS - 4 EA

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

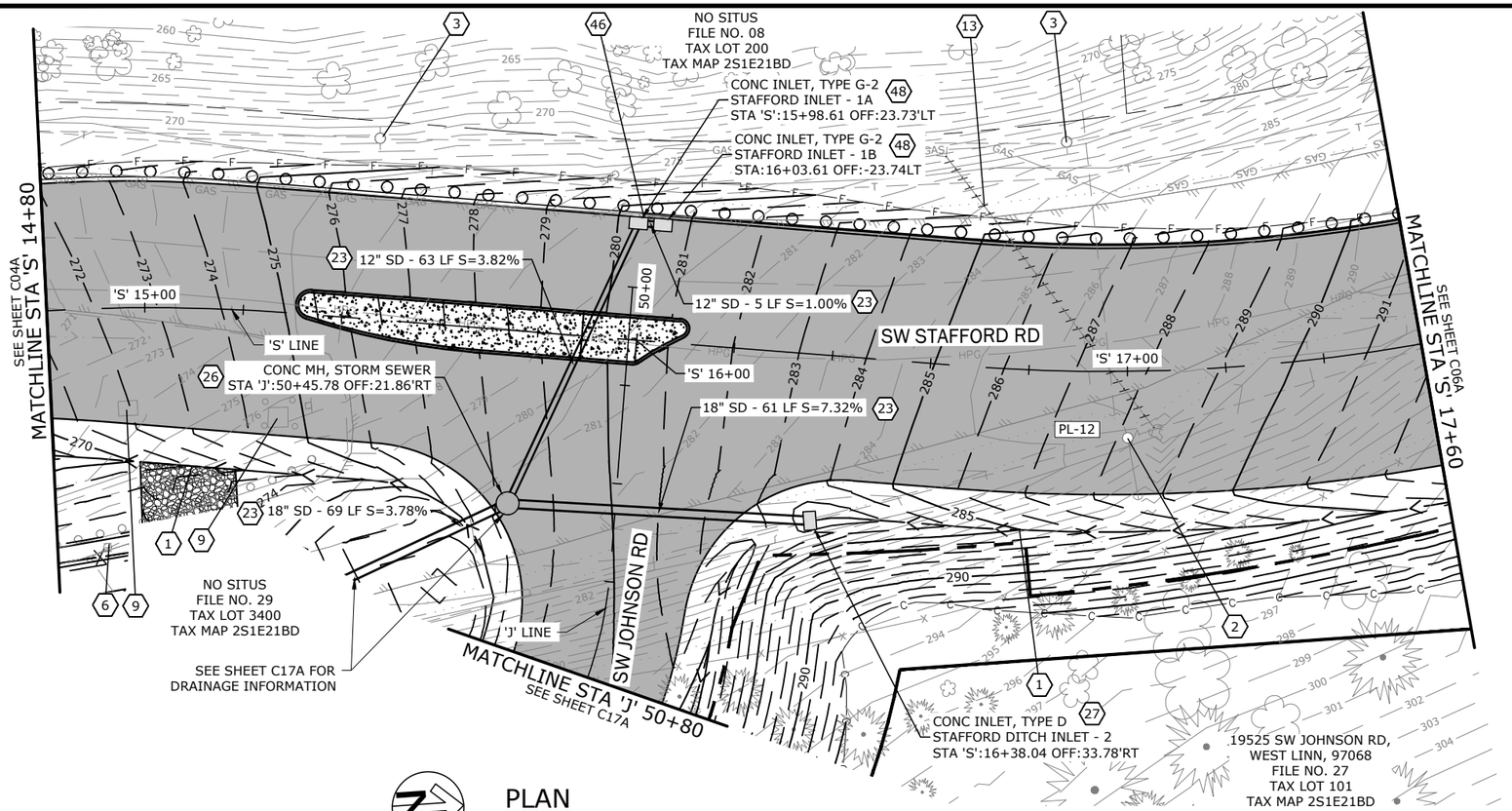
REVISIONS

NO.	DATE:

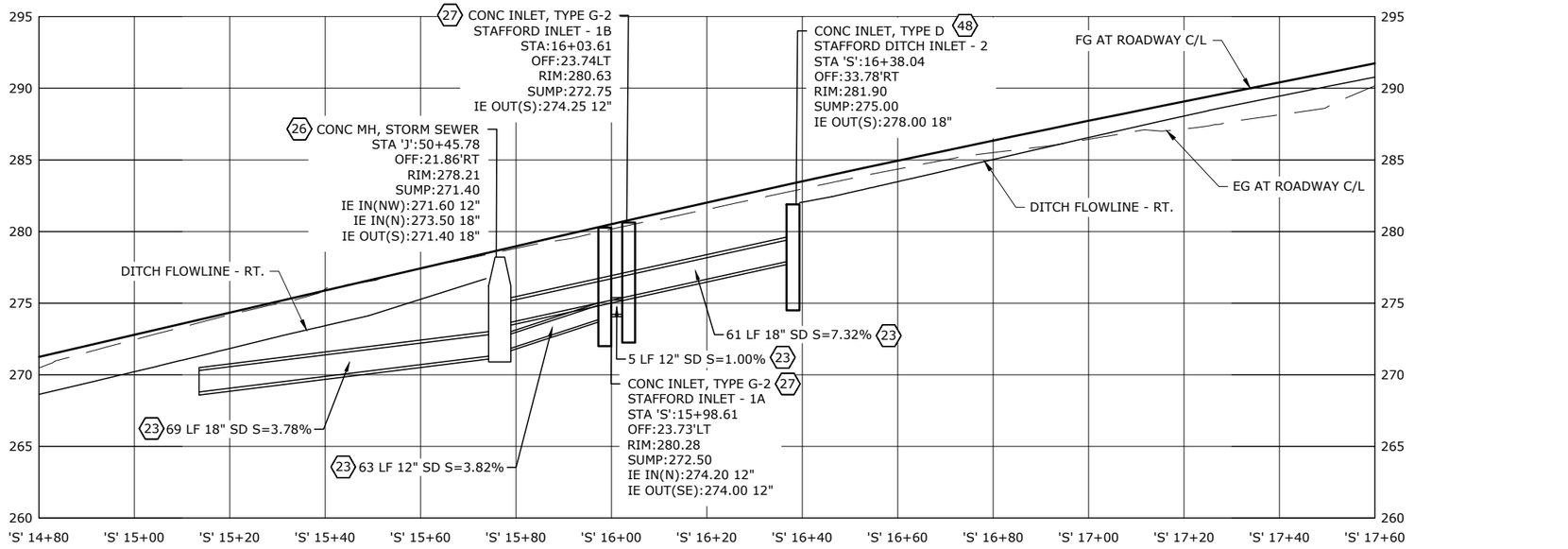
Sheet No. C05

38 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C05 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

(1) CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
(2) RELOCATE EXIST UTILITY POLE (BY OTHERS)
(3) PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
(6) ADJUST UTILITY BOX TO FINISHED GRADE
(9) RELOCATE EXIST UTILITY VAULT/PEDESTAL (BY OTHERS)
(13) ABANDON EXIST STRUCTURE, 12" CULVERT PIPE - 70 LF
(23) INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
(26) CONSTRUCT 48" ECCENTRIC MANHOLE (SEE ODOT STD DWG RD366 & WES STD DWG SWM-33)
(27) CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 3' SUMP
(46) INSTALL ASPHALT DRAINAGE CURB (SEE C05 FOR LIMITS)
(48) CONSTRUCT CAST-IN-PLACE TYPE G-2 INLET 18" MINIMUM SUMP (SEE ODOT STD DWG RD364)

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

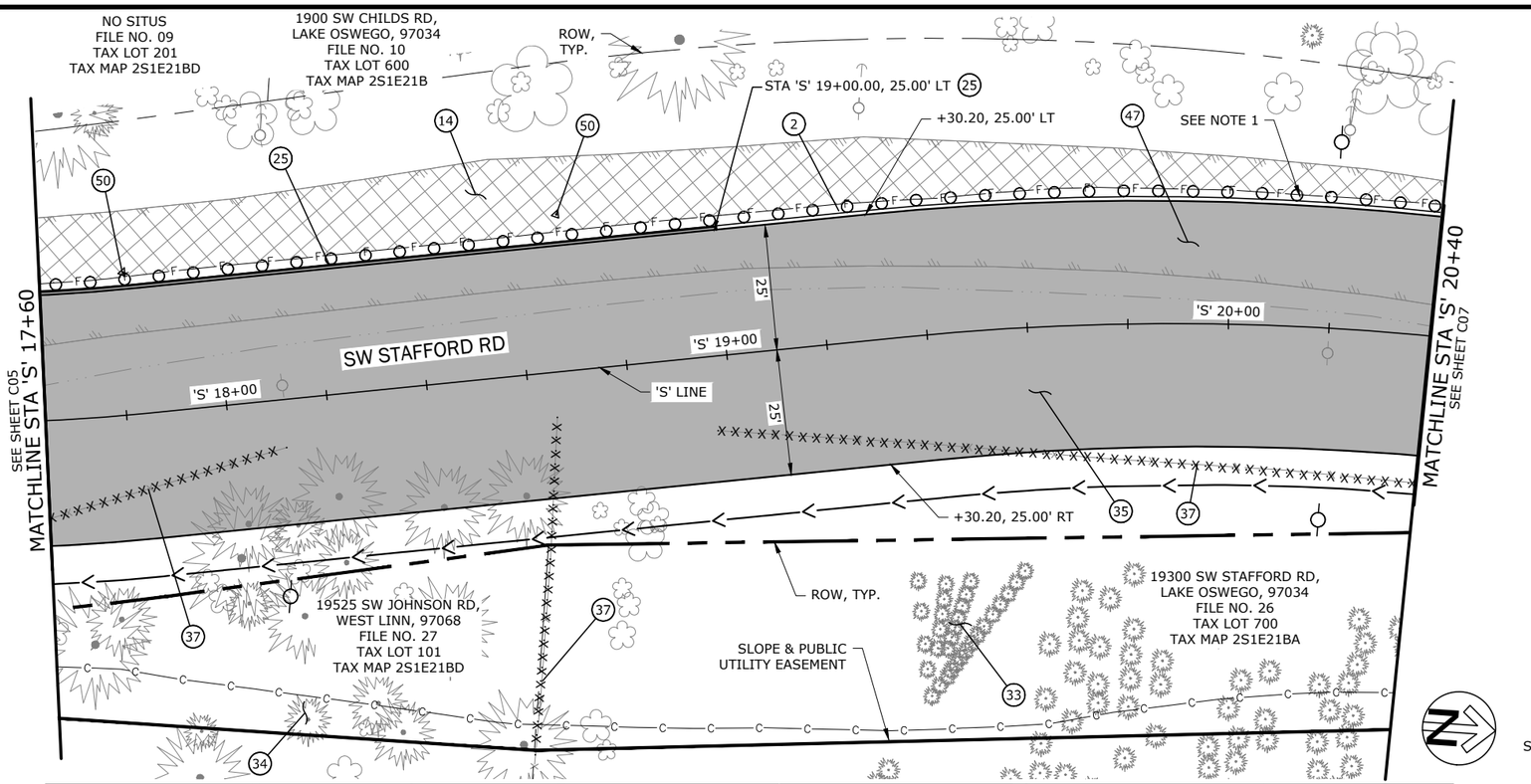
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS
NO. | DATE:

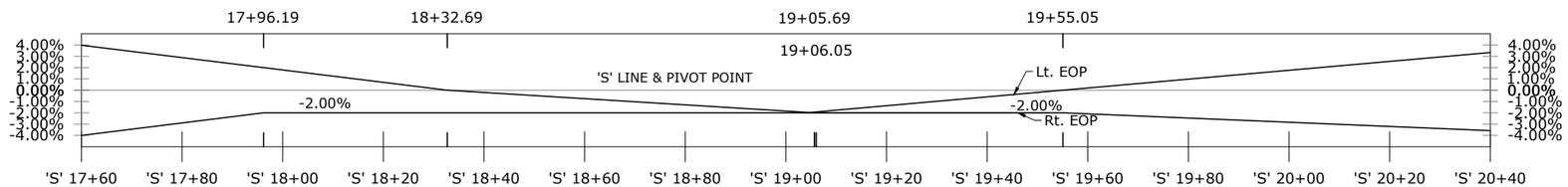
Sheet No.
C05A

39 of 162

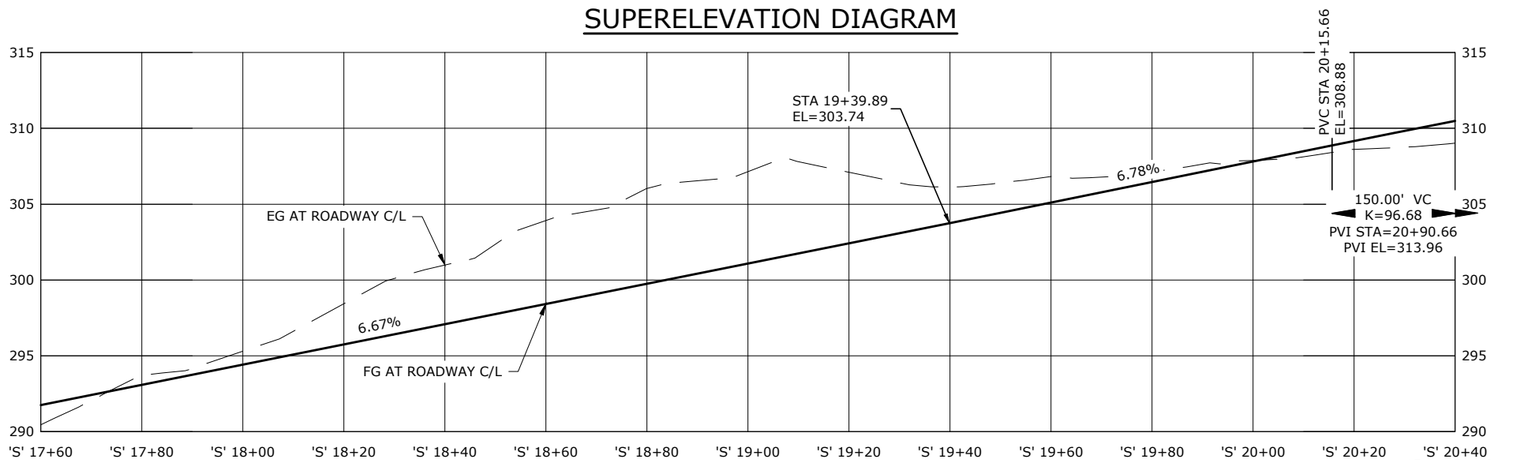
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C05A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 283 LF
(SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(14) REMOVAL OF SURFACINGS - 448 SY

(25) CONSTRUCT ASPHALT DRAINAGE CURB - 140 LF
(SEE ODOT STD DWG RD701)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL
(SEE EC SHTS)

(34) PROTECT EXIST TREE
(SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION
(SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 256 LF

(47) CONSTRUCT ACP PAVEMENT LEVELING
(SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 2 EA
(SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

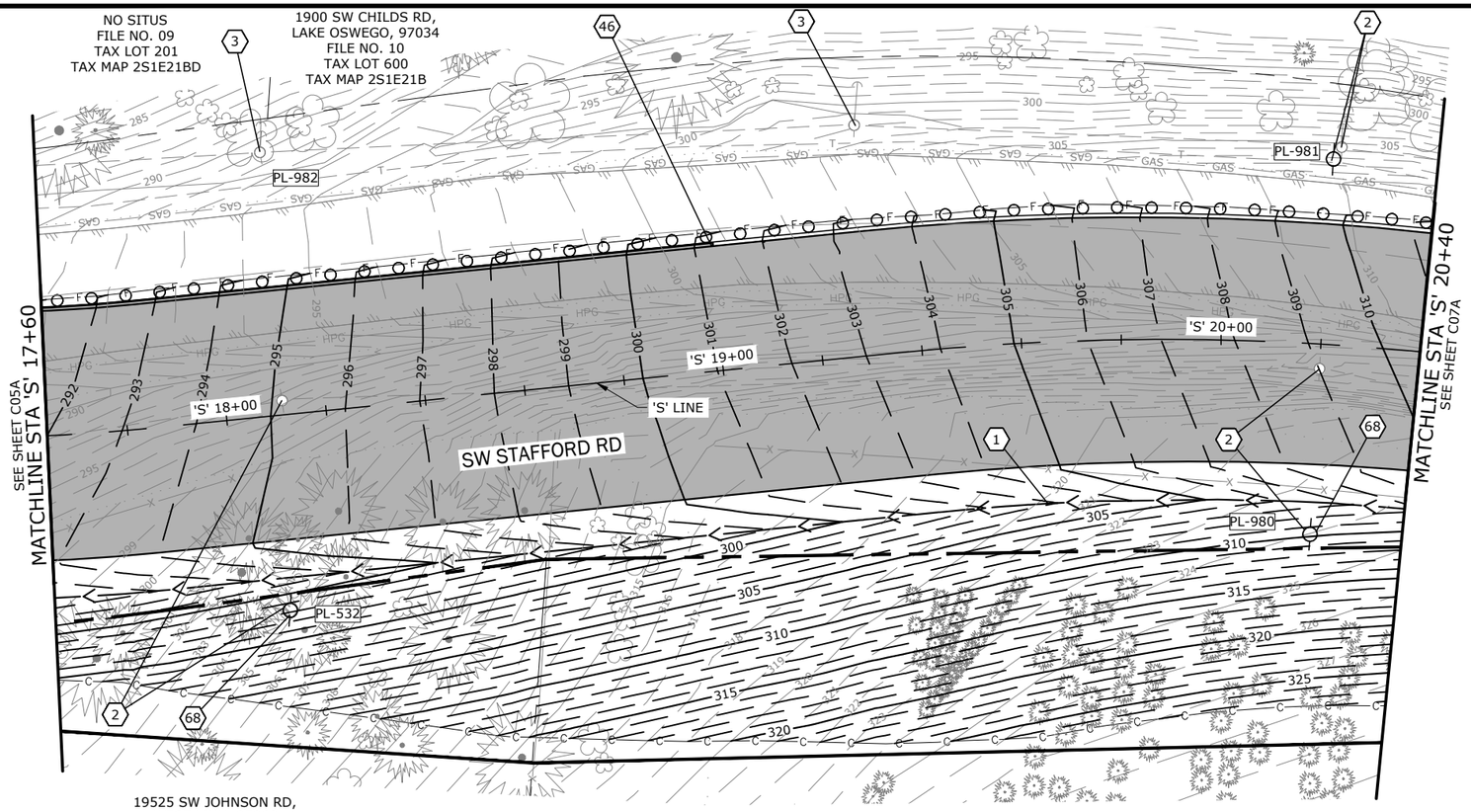
NO.	DATE:

Sheet No.
C06

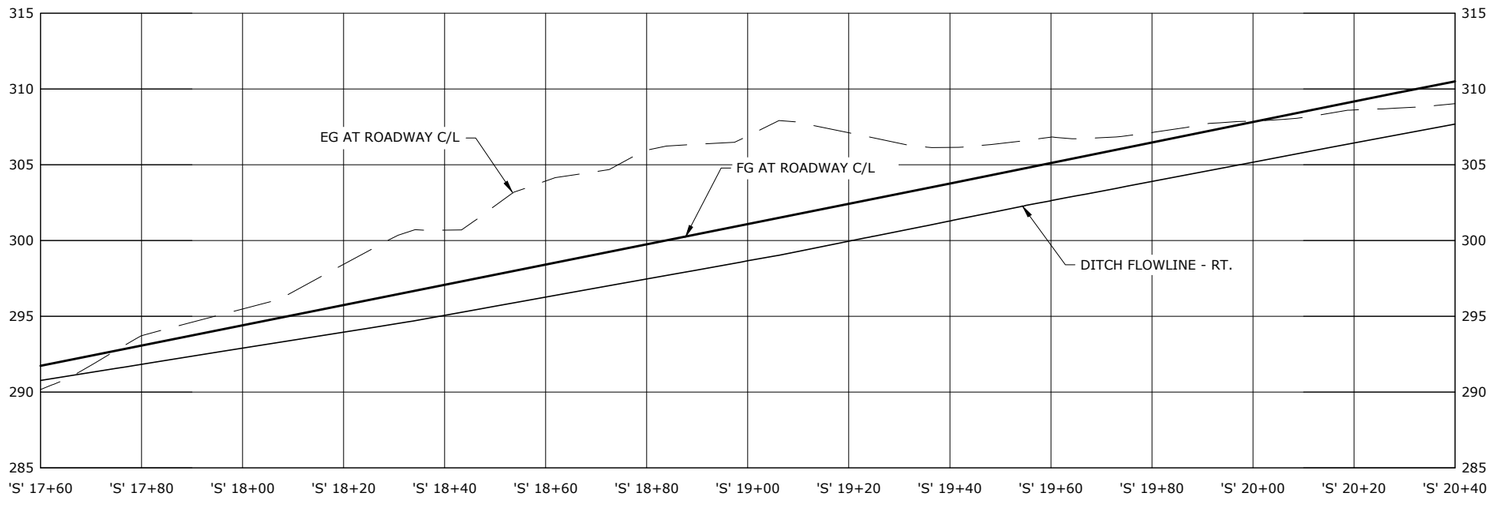
40 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C06 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
46. INSTALL ASPHALT DRAINAGE CURB (SEE C06 FOR LIMITS)
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

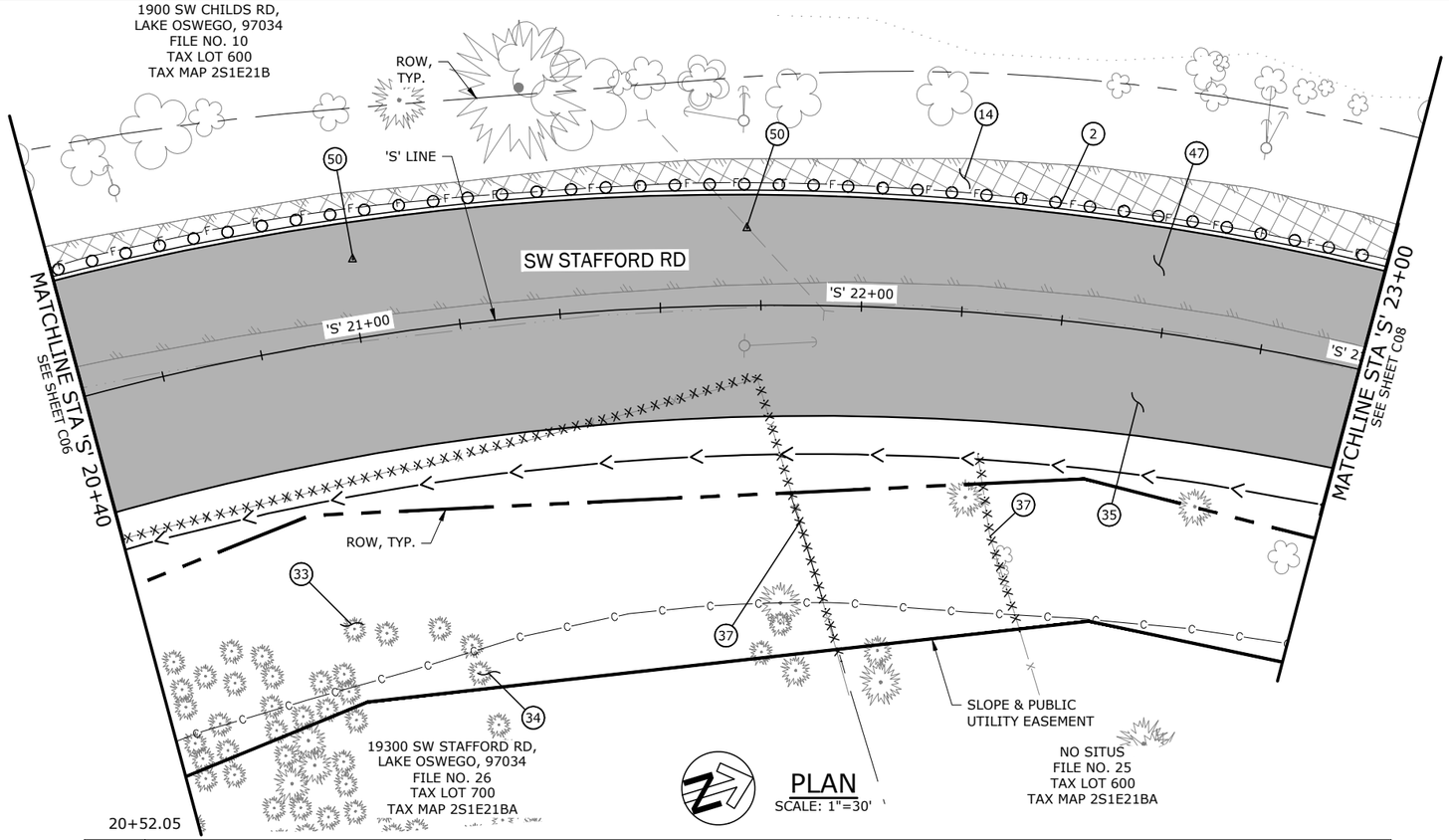
NO.	DATE:

Sheet No.
C06A

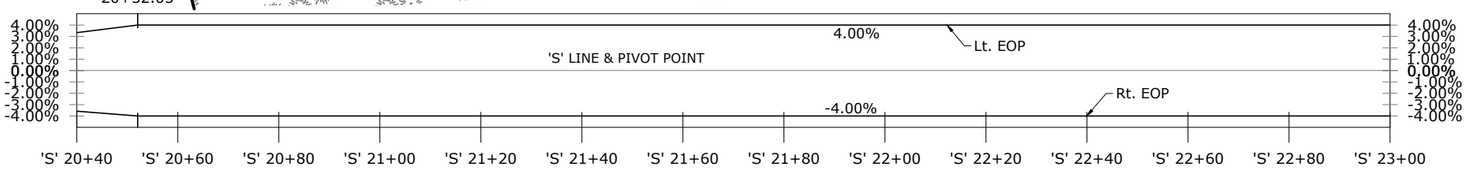
41 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

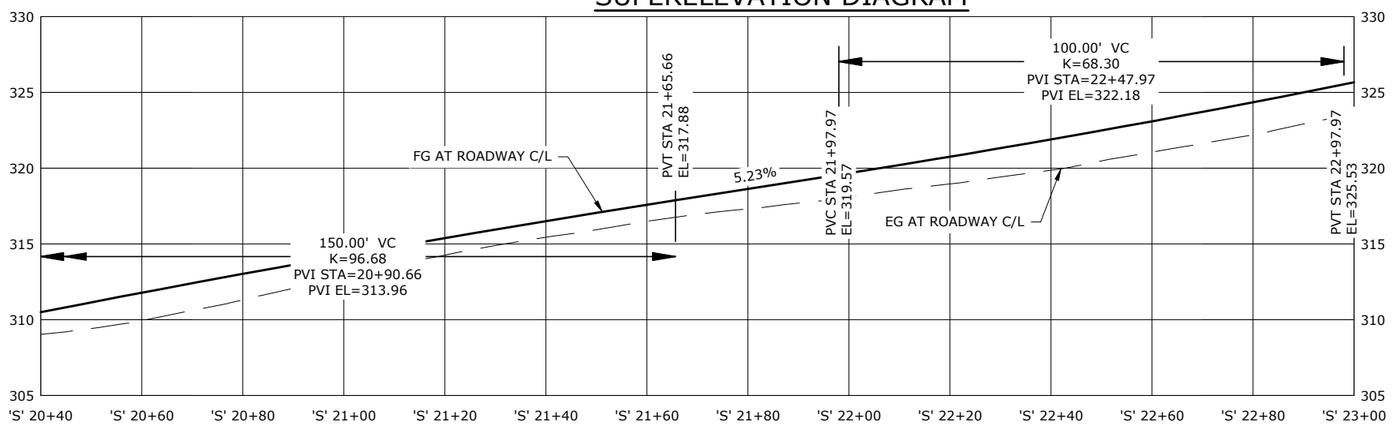
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C06A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 263 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(14) REMOVAL OF SURFACINGS - 1825 SY

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 222 LF

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 2 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

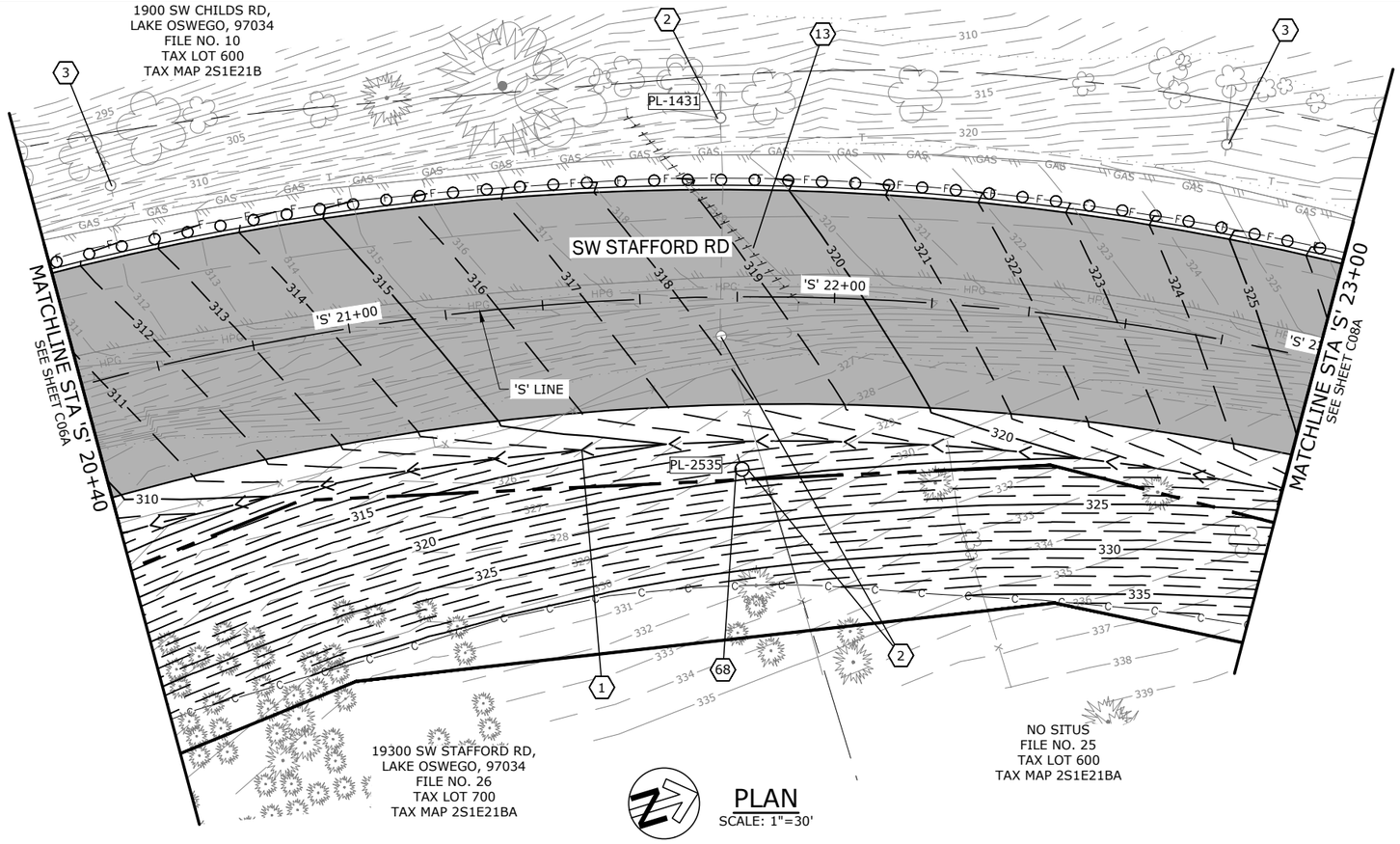
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

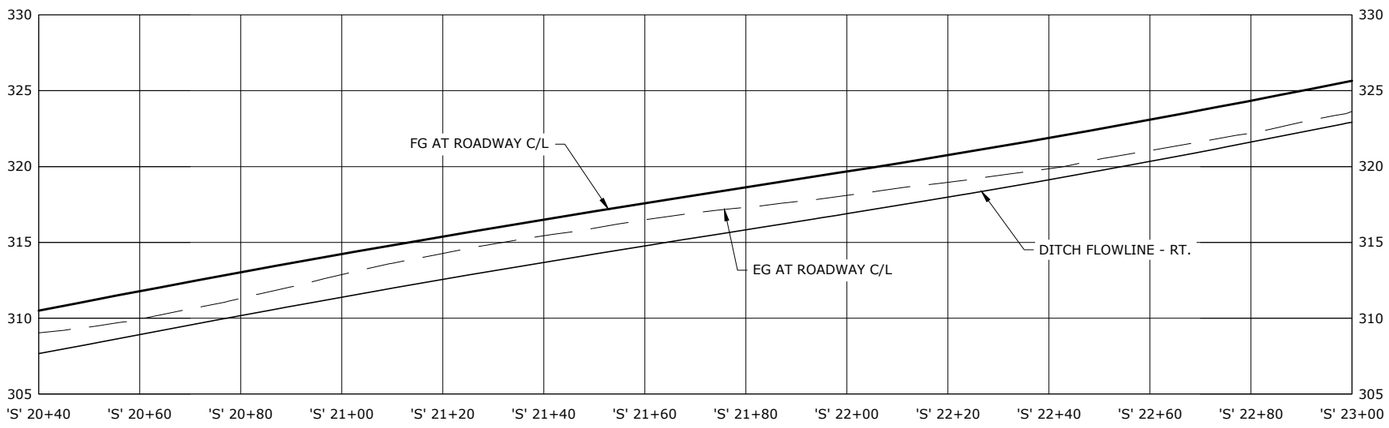
NO.	DATE:

Sheet No. C07

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C07 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
13. ABANDON EXIST STRUCTURE, 12" CULVERT PIPE, - 52 LF
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

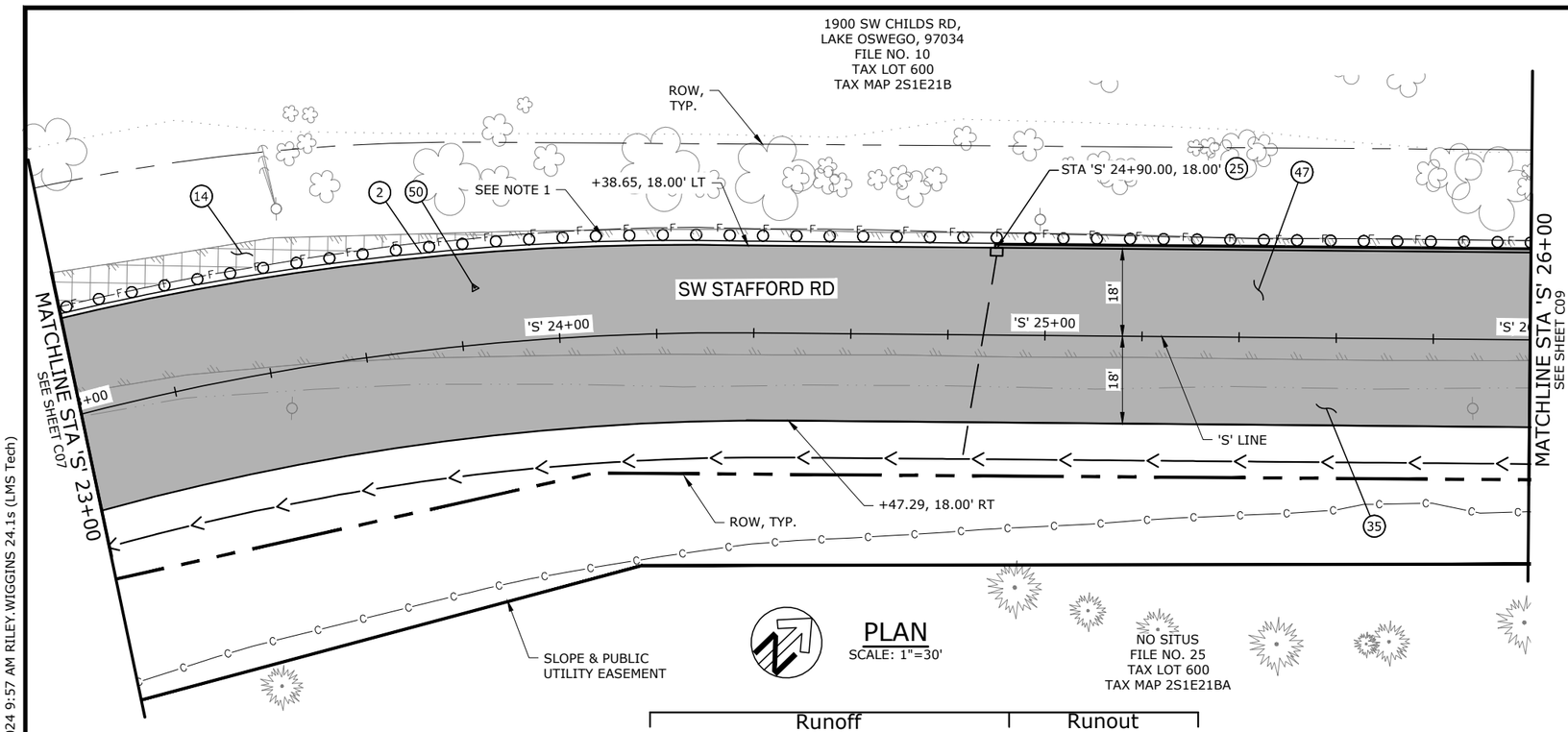
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

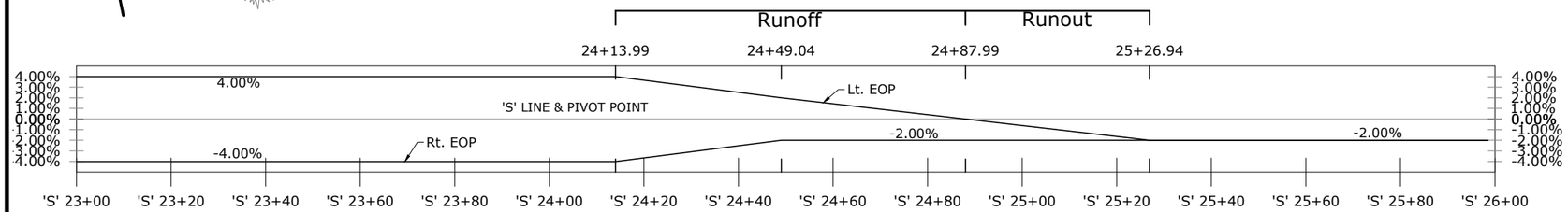
NO.	DATE:

Sheet No.
C07A

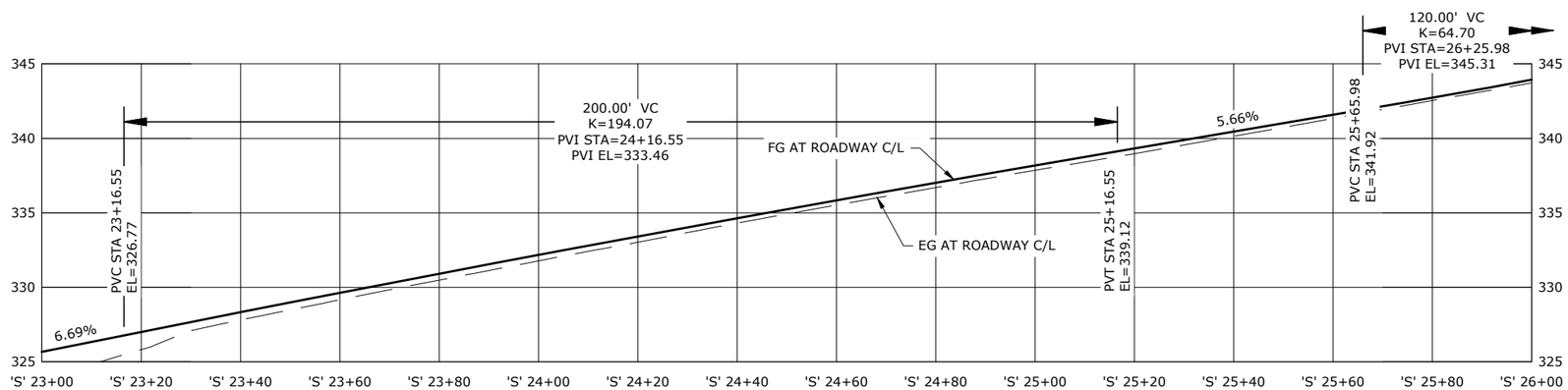
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C07A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 300 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(14) REMOVAL OF SURFACINGS - 128 SY

(25) CONSTRUCT ASPHALT DRAINAGE CURB- 110 LF (SEE ODOT STD DWG RD701)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

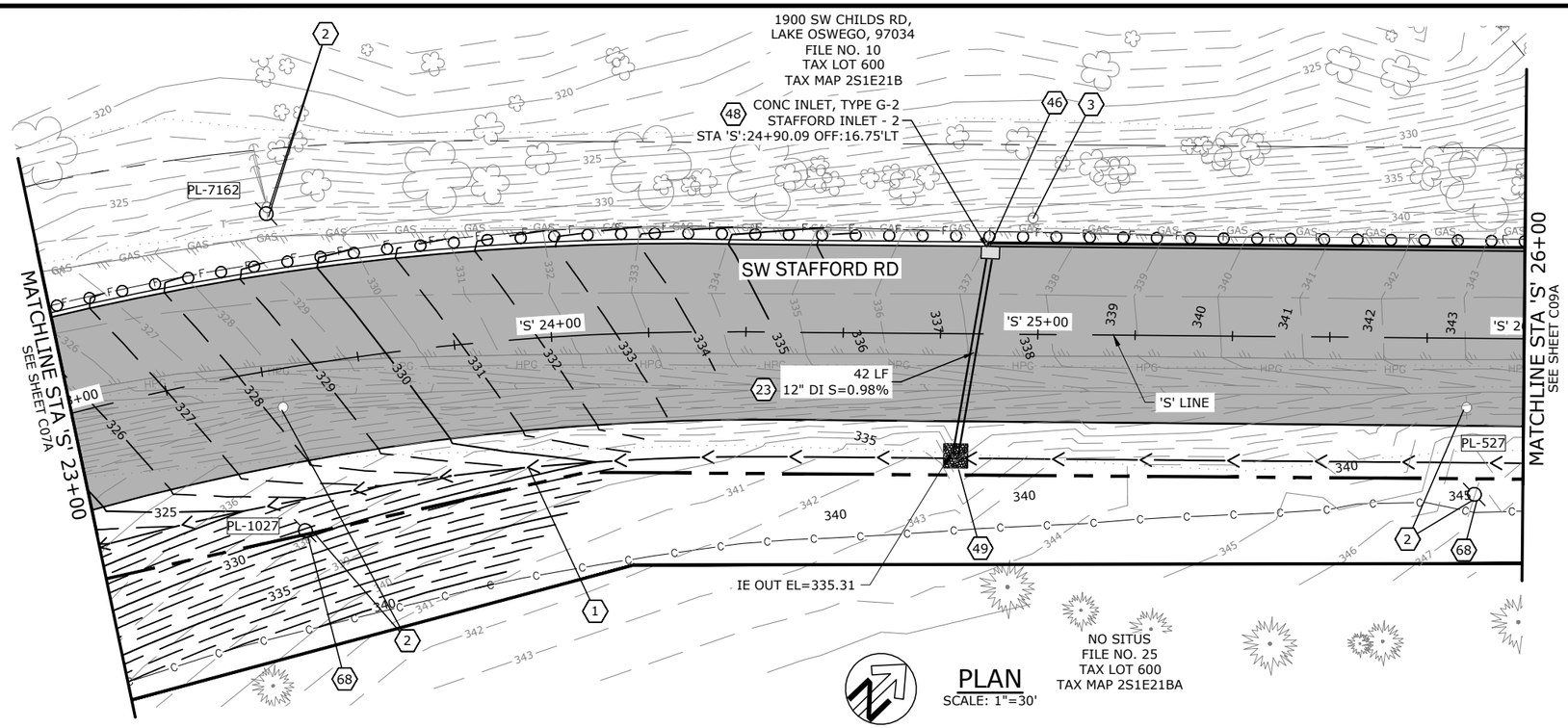
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

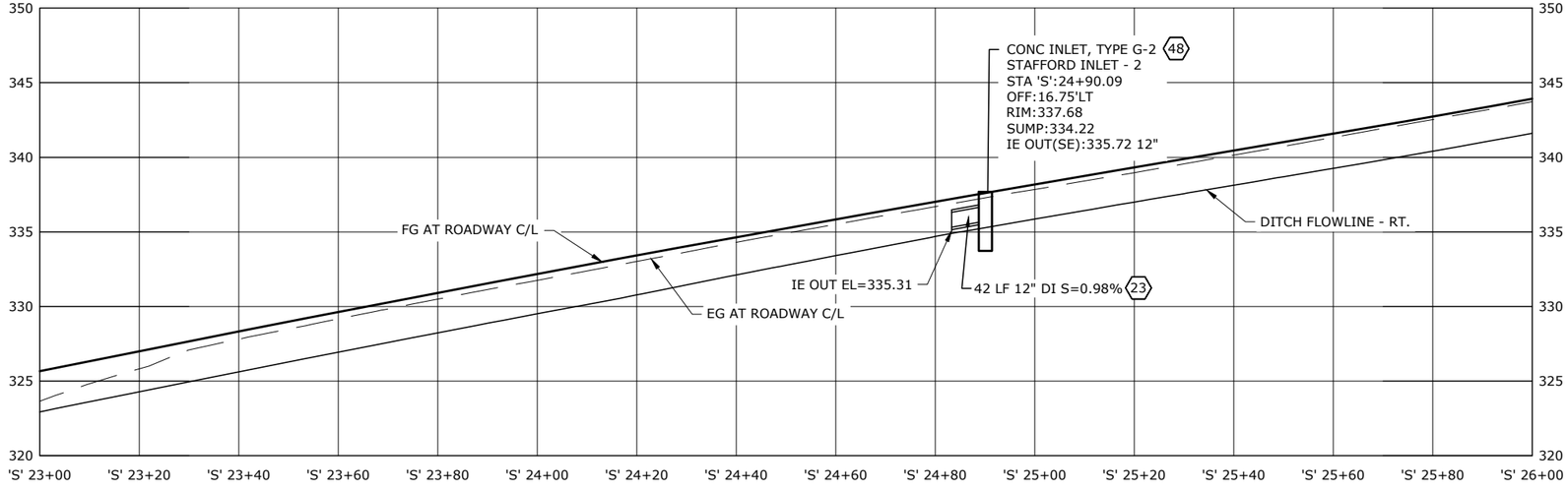
NO.	DATE:

Sheet No.
C08

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C08 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
46. INSTALL ASPHALT DRAINAGE CURB (SEE C08 FOR LIMITS)
48. CONSTRUCT CAST-IN-PLACE TYPE G-2 INLET 18" MINIMUM SUMP (SEE ODOT STD DWG RD364)
49. CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

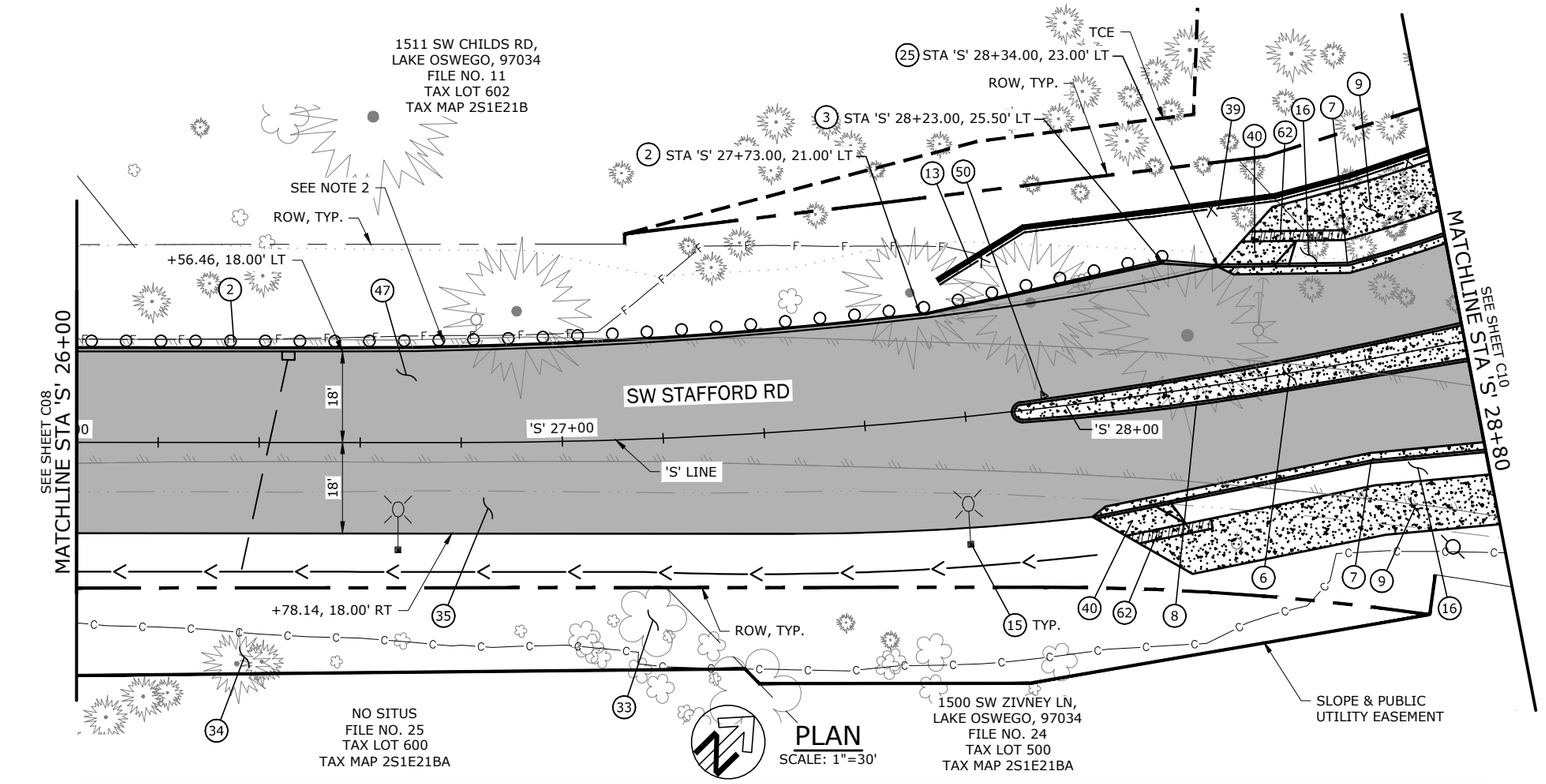
NO.	DATE:

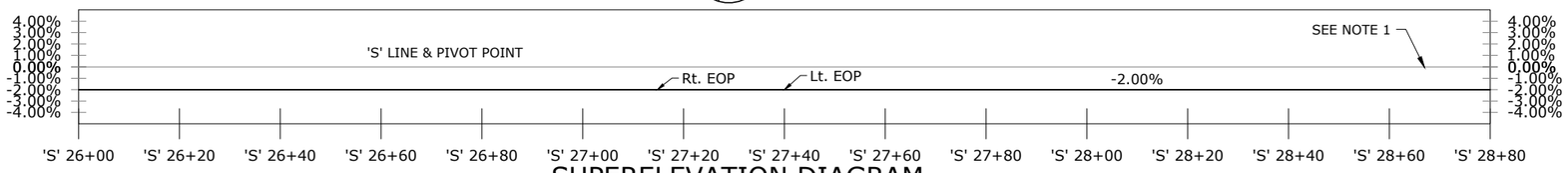
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
C08A

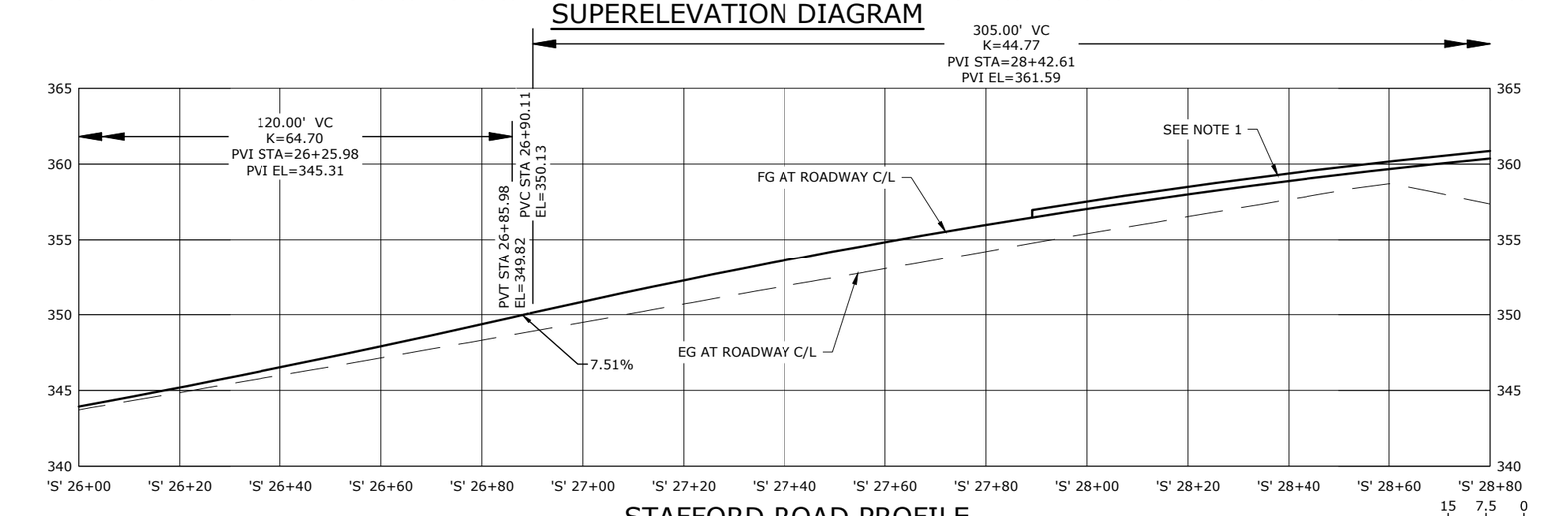
45 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C08A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)





SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12–31–25

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 172.5 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)

(3) INSTALL NON-FLARED, TEST LEVEL 2, W=1', GUARDRAIL TERMINAL - 1 EA (SEE ODOT STD DWG RD420)

(6) CONSTRUCT CONCRETE ISLAND (SEE ODOT STD DWGS RD705, RD707 & CR SHEETS FOR DETAILS)

(7) CONSTRUCT STANDARD CURB AND GUTTER (SEE CLACKAMAS COUNTY STD DWG S150)

(8) CONSTRUCT STANDARD TYPE C VERTICAL CURB (SEE CLACKAMAS COUNTY STD DWG S100)

(9) CONSTRUCT STANDARD SIDEWALK (SEE CLACKAMAS COUNTY STD DWG S960)

(13) CONSTRUCT 'W1' RETAINING WALL (SEE R SHTS)

(15) INSTALL ILLUMINATION POLE (SEE IL SHTS)

(16) CONSTRUCT PLANTER STRIP (SEE TYPICAL SECTIONS AND LS SHTS FOR DETS)

(25) CONSTRUCT ASPHALT DRAINAGE CURB - 234 LF (SEE ODOT STD DWG RD701)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(39) INSTALL TYPE CL-6R FENCE (BLACK) - 101 LF (SEE ODOT STD DWG RD815)

(40) CONSTRUCT BIKE RAMP TRANSITION (SEE CR SHEETS FOR DETAILS)

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

(62) INSTALL DETECTABLE GUIDE STRIP - 75 LF (SEE ODOT STD DWG RD909)

SHEET NOTES:

1. SEE CR SHEETS FOR SUPERELEVATION & PROFILE DESIGN WITHIN THE PROPOSED ROUNDABOUT.
2. HAND DIG GUARDRAIL POSTS AS NEEDED TO PROTECT UNDERGROUND UTILITIES.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

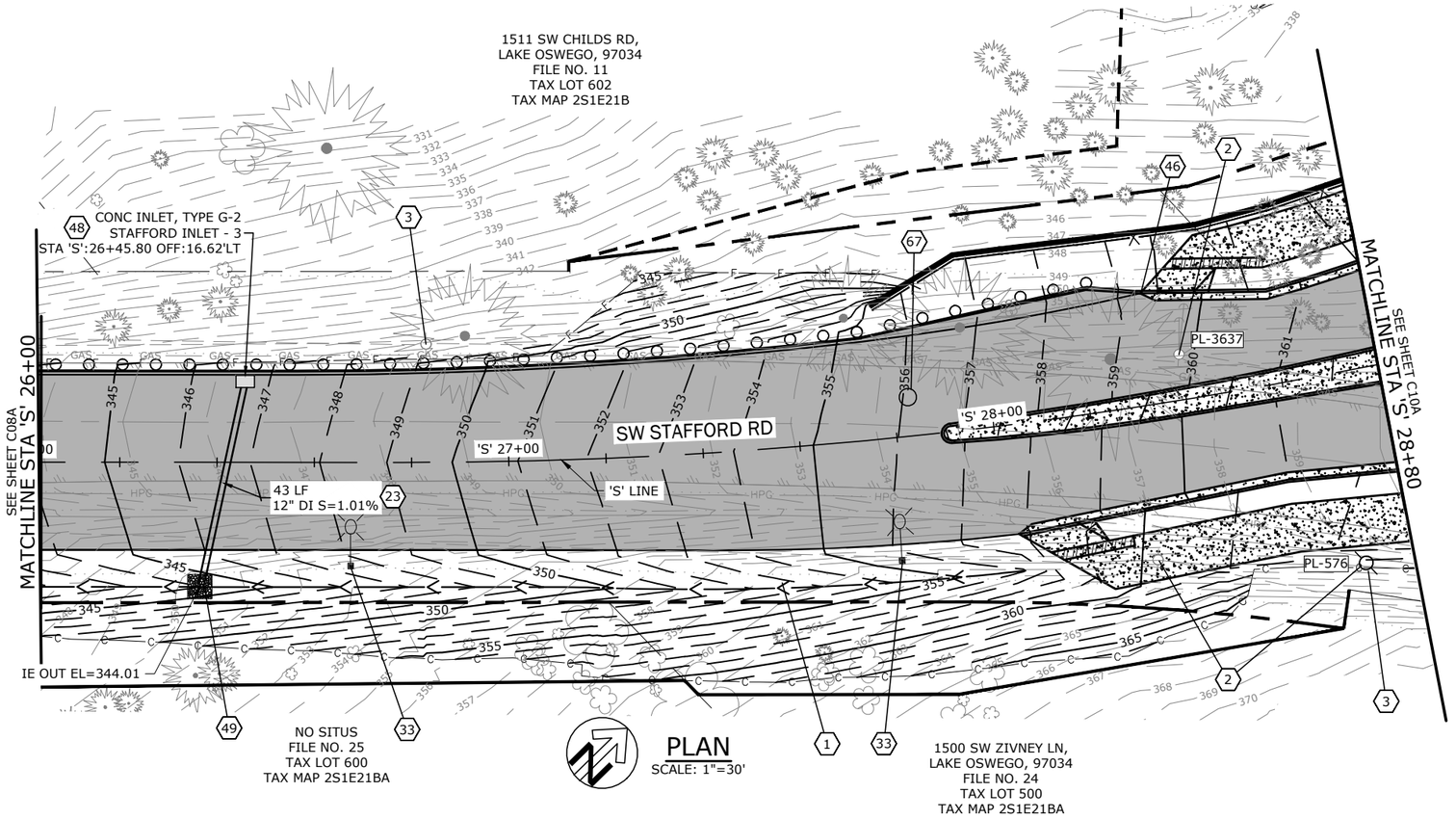
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

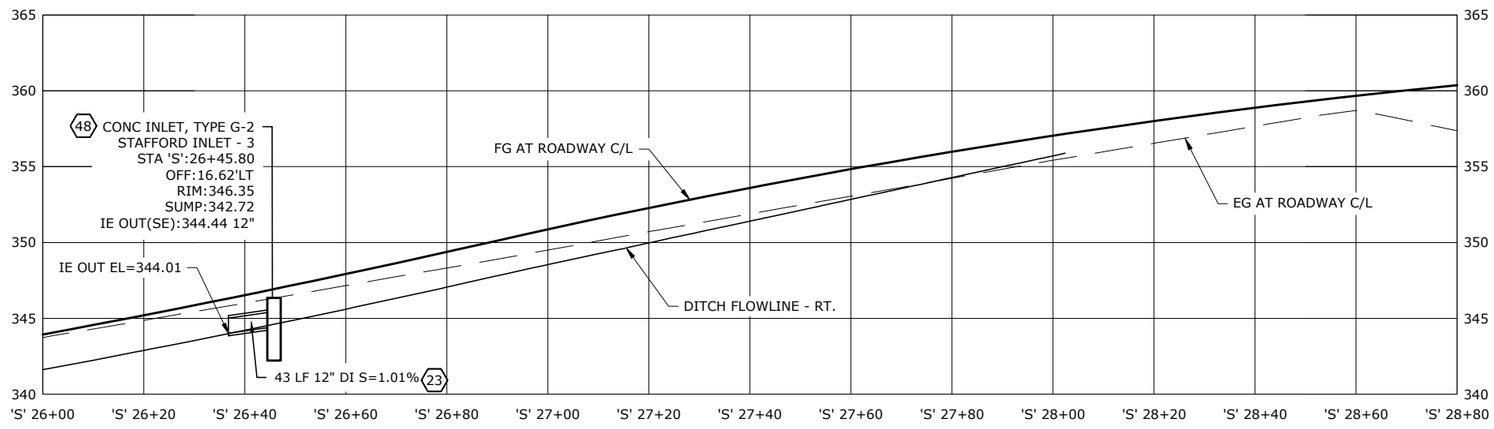
REVISIONS
NO. DATE:

Sheet No.
C09

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C09 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
33. INSTALL ILLUMINATION (SEE IL SHEETS)
46. INSTALL ASPHALT DRAINAGE CURB (SEE C09 FOR LIMITS)
48. CONSTRUCT CAST-IN-PLACE TYPE G-2 INLET 18" MINIMUM SUMP (SEE ODOT STD DWG RD364)
49. CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
67. ADJUST UTILITY MANHOLE TO FINISHED GRADE (SEE ODOT STD DWG RD360)

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

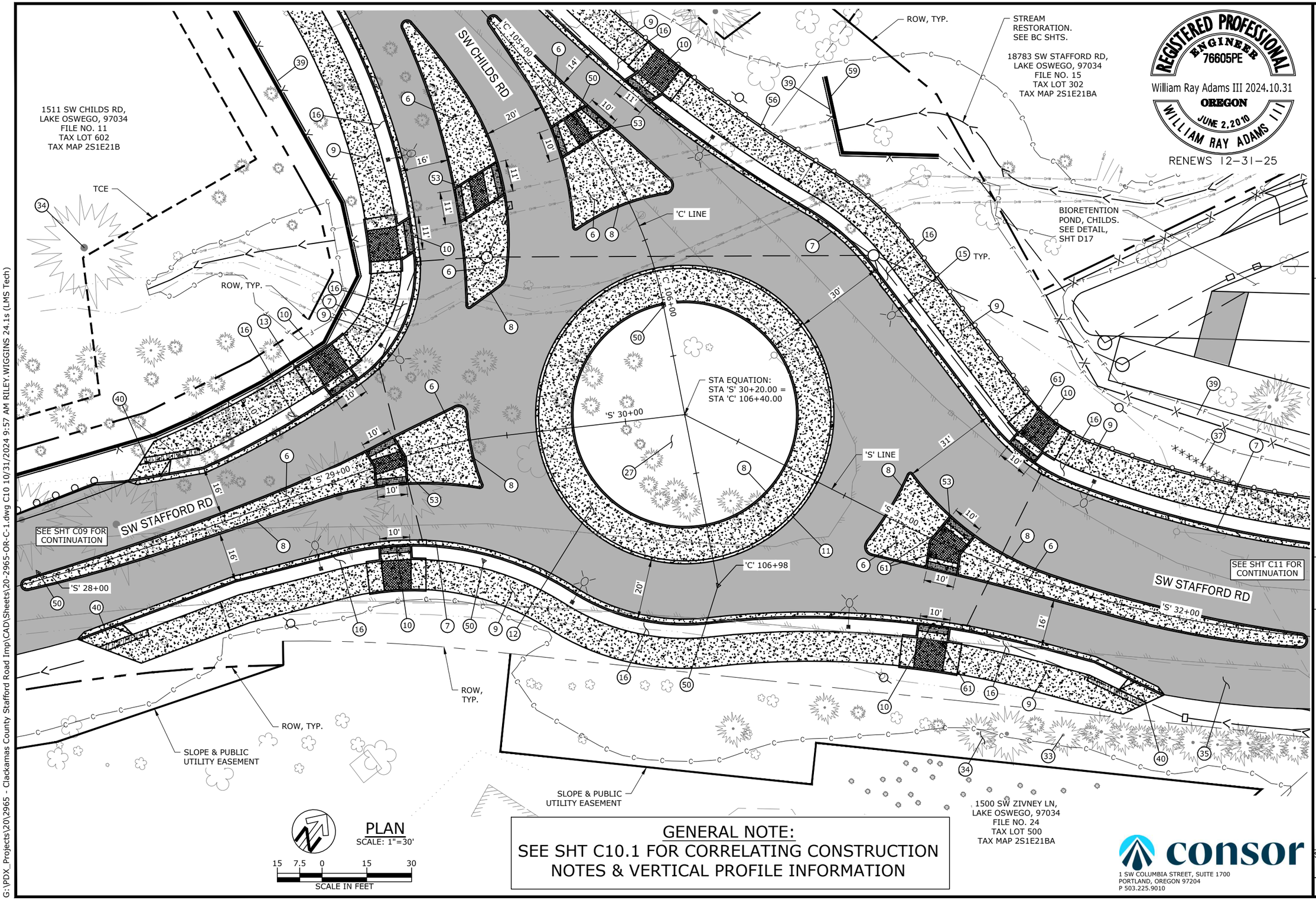
REVISIONS

NO.	DATE:

Sheet No. C09A

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C09A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'

15 7.5 0 15 30
SCALE IN FEET

GENERAL NOTE:
SEE SHT C10.1 FOR CORRELATING CONSTRUCTION NOTES & VERTICAL PROFILE INFORMATION

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY PLAN

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

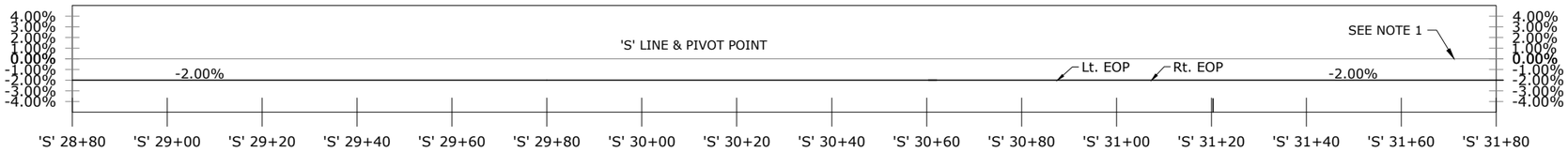
REVISIONS
NO. | DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

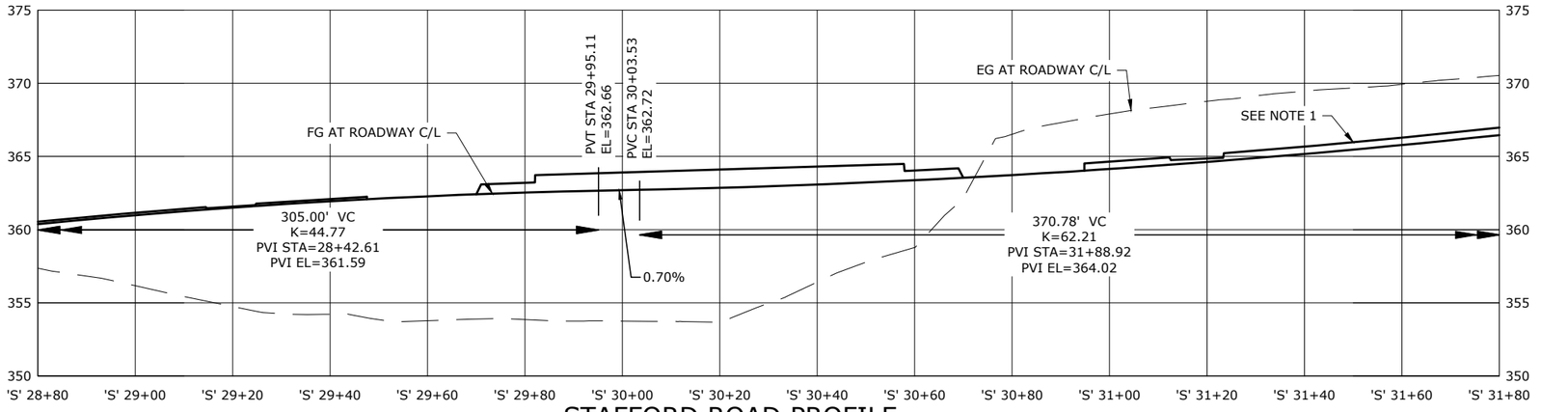
Sheet No.
C10

48 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C10 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)

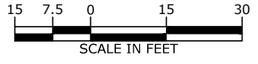


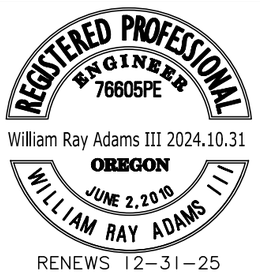
SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT





CONSTRUCTION KEYNOTES:

(6) CONSTRUCT CONCRETE ISLAND
(SEE ODOT STD DWGS RD705, RD707 & CR SHEETS FOR DETAILS)

(7) CONSTRUCT STANDARD CURB AND GUTTER
(SEE CLACKAMAS COUNTY STD DWG S150)

(8) CONSTRUCT STANDARD TYPE C VERTICAL CURB
(SEE CLACKAMAS COUNTY STD DWG S100)

(9) CONSTRUCT STANDARD SIDEWALK
(SEE CLACKAMAS COUNTY STD DWG S960)

(10) CONSTRUCT PERPENDICULAR CURB RAMP. INSTALL TRUNCATED DOMES
(SEE ODOT STD DWG RD902, RD910 & CR SHEETS)

(11) INSTALL MOUNTABLE CURB - 314 LF
(SEE CLACKAMAS COUNTY STD DWG S180)

(12) INSTALL 8" CONCRETE TRUCK APRON
(SEE TYPICAL SECTIONS AND SHEET CR05 FOR DETAILS)

(13) CONSTRUCT 'W1' RETAINING WALL
(SEE R SHTS)

(15) INSTALL ILLUMINATION POLE
(SEE IL SHTS)

(16) CONSTRUCT PLANTER STRIP
(SEE TYPICAL SECTIONS AND LS SHTS FOR DETS)

(27) ROUNDABOUT LANDSCAPING
(SEE LS SHTS FOR DETAILS)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL
(SEE EC SHTS)

(34) PROTECT EXIST TREE
(SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION
(SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 53 LF

(39) INSTALL TYPE CL-6R FENCE (BLACK) - 576 LF
(SEE ODOT STD DWG RD815)

(40) CONSTRUCT BIKE RAMP TRANSITION
(SEE CR SHEETS FOR DETAILS)

(50) INSTALL MONUMENT BOX - 5 EA
(SEE ODOT STD DWG RD115)

(53) CONSTRUCT ACCESSIBLE ROUTE ISLAND. INSTALL TRUNCATED DOMES
(SEE ODOT STD DWGS RD710, RD906 & CR SHEETS)

(56) INSTALL METAL HANDRAIL, TWO RAIL - 440 LF
(SEE ODOT STD DWGS RD770 & RD771)

(59) CONSTRUCT 'W2' RETAINING WALL
(SEE BC SHEETS)

(61) INSTALL RRFB
(SEE IL SHEETS)

SHEET NOTES:

1. SEE CR SHEETS FOR SUPERELEVATION & PROFILE DESIGN WITHIN THE PROPOSED ROUNDABOUT.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PROFILE & PLAN NOTES

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

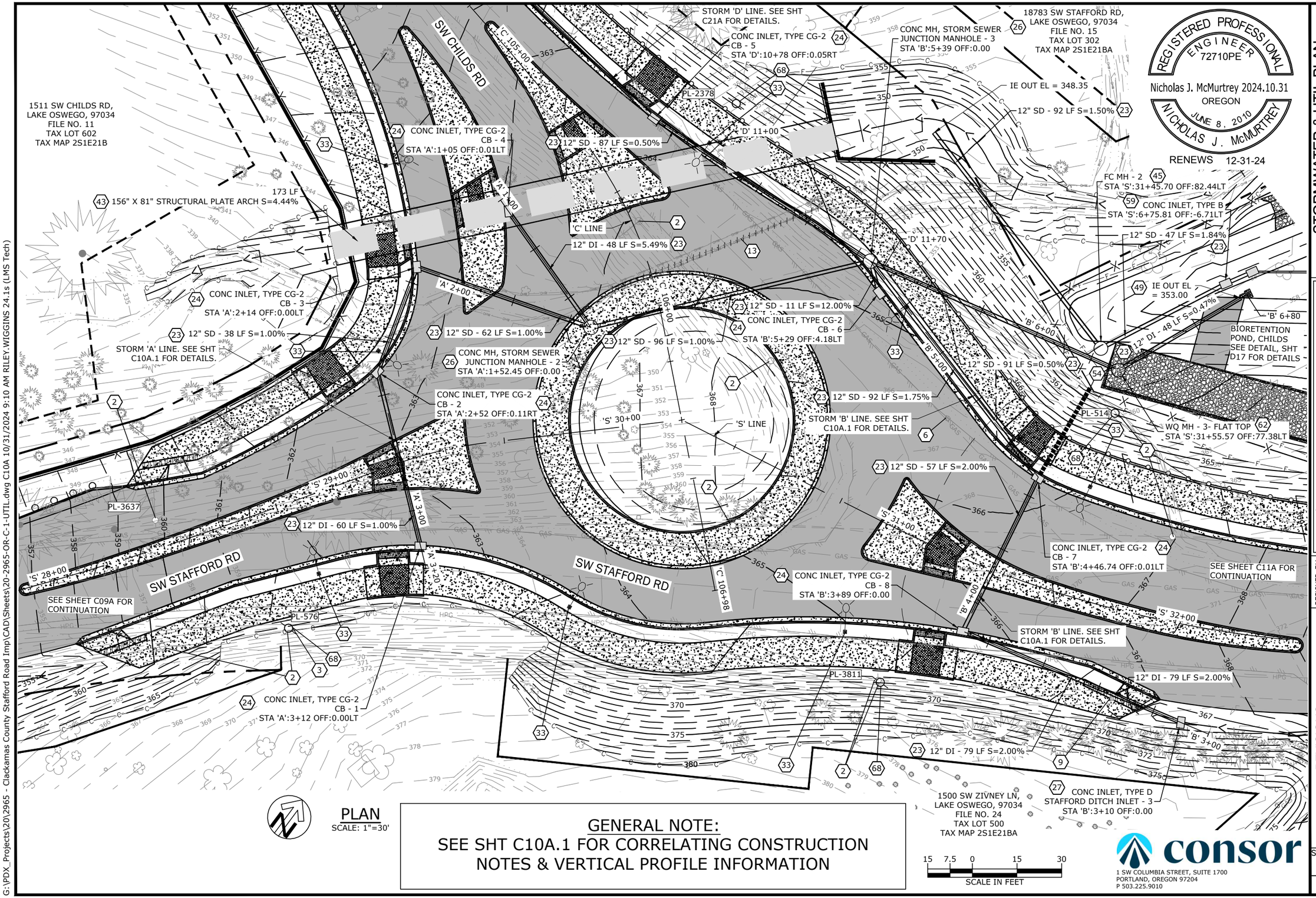
DESIGNED BY: RPW/AJR | DRAFTED BY: JSD | CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
C10.1

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C10.1 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'

GENERAL NOTE:
SEE SHT C10A.1 FOR CORRELATING CONSTRUCTION NOTES & VERTICAL PROFILE INFORMATION

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STORMWATER & UTIL PLAN

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

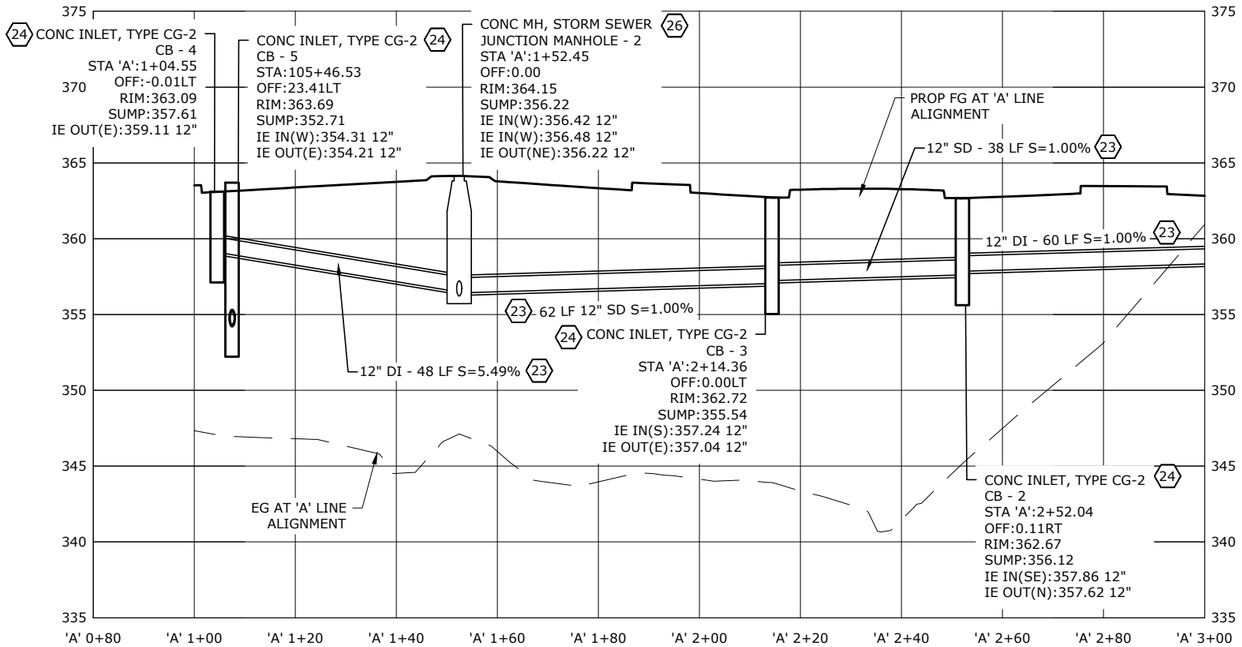
REVISIONS
NO. | DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
C10A

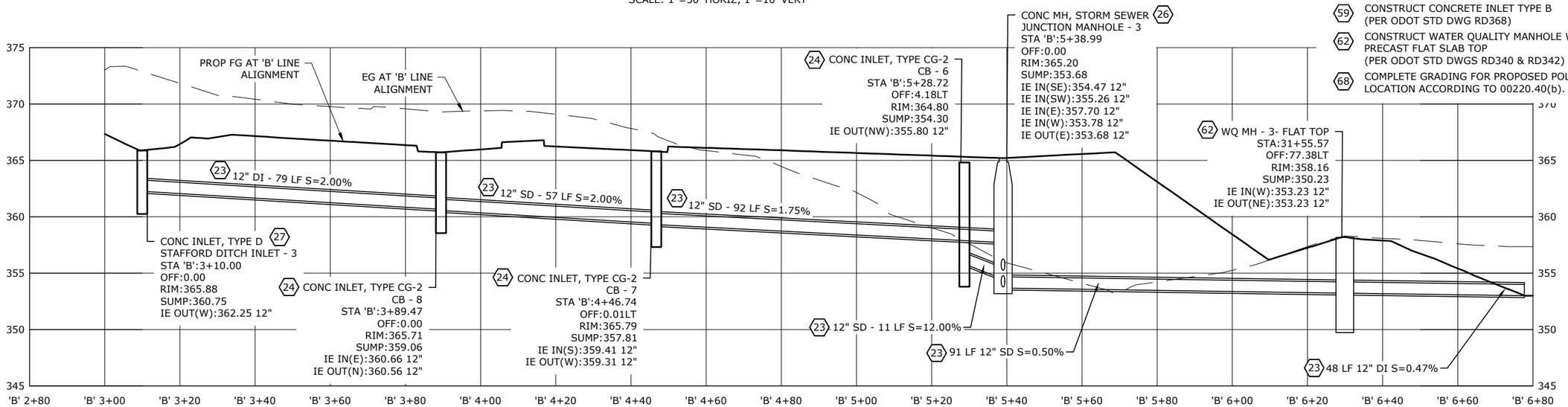
50 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C10A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



'A' LINE STORMWATER PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT



'B' LINE STORMWATER PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

2 RELOCATE EXIST UTILITY POLE (BY OTHERS)
3 PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
6 ADJUST UTILITY BOX TO FINISHED GRADE
13 ABANDON EXIST STRUCTURE, 36" CULVERT PIPE, - 79 LF
23 INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
24 CONSTRUCT CAST-IN-PLACE TYPE CG-2 INLET 18" MINIMUM SUMP (SEE ODOT STD DWG RD366)
26 CONSTRUCT 48" ECCENTRIC MANHOLE (SEE ODOT STD DWG RD366 & WES STD DWG SWM-33)
27 CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 18" MINIMUM SUMP
33 INSTALL ILLUMINATION (SEE IL SHEETS)
43 SEE BC SHEETS FOR CULVERT INSTALLATION DETAILS
45 INSTALL STORMWATER FLOW CONTROL MANHOLE (PER WES STD DWG SWM-22)
49 CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
54 CONSTRUCT TEMPORARY DRAINAGE FACILITY
59 CONSTRUCT CONCRETE INLET TYPE B (PER ODOT STD DWG RD368)
62 CONSTRUCT WATER QUALITY MANHOLE WITH PRECAST FLAT SLAB TOP (PER ODOT STD DWGS RD340 & RD342)
68 COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER PROF & PLAN NOTES

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

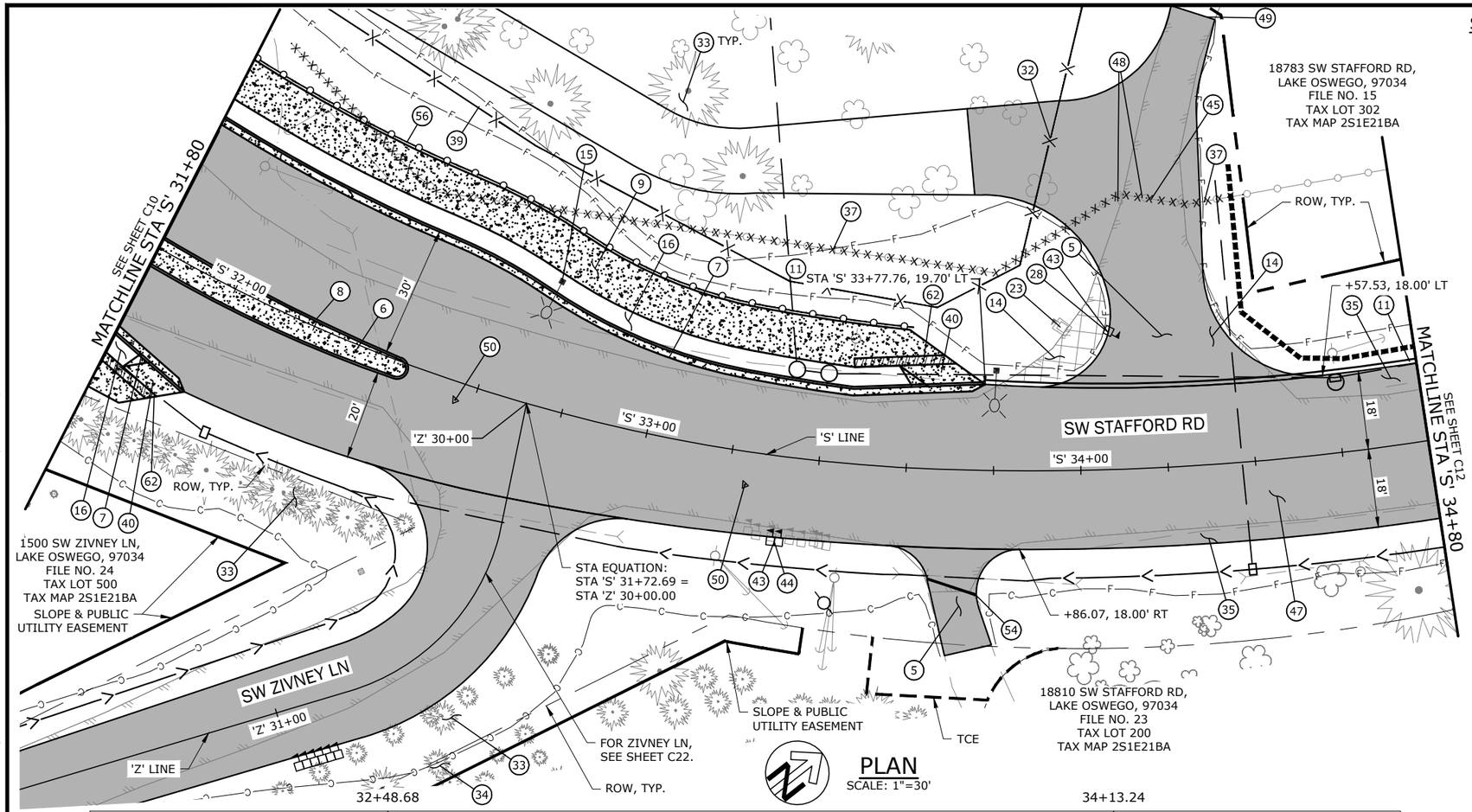
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

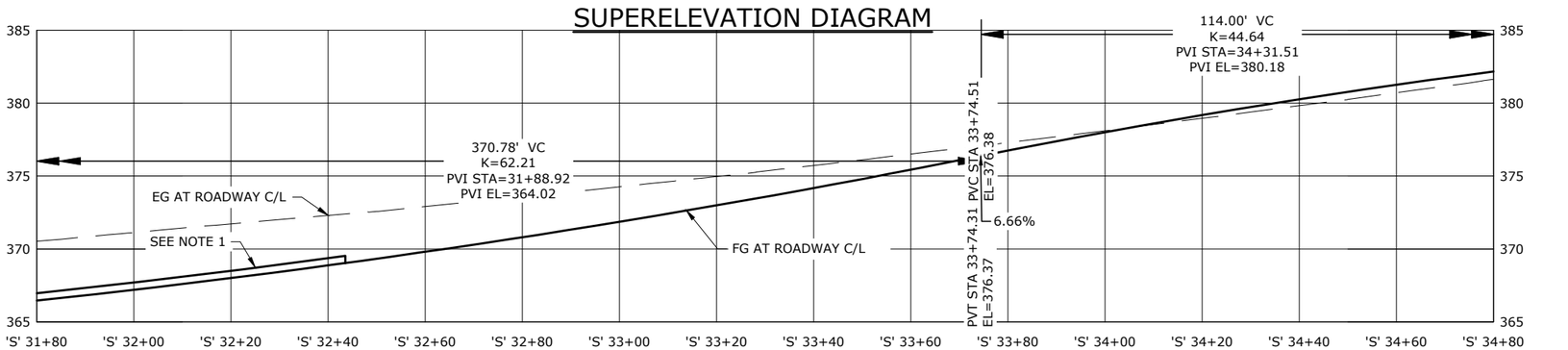
Sheet No.
C10A.1

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C10A.1 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'

SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

SHEET NOTES:

1. SEE CR SHEETS FOR SUPERELEVATION & PROFILE DESIGN WITHIN THE PROPOSED ROUNDABOUT.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

CONSTRUCTION KEYNOTES:

(5) CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHEETS D06, D11, D12, AND D17)
(6) CONSTRUCT CONCRETE ISLAND (SEE ODOT STD DWGS RD705, RD707 & CR SHEETS FOR DETAILS)
(7) CONSTRUCT STANDARD CURB AND GUTTER (SEE CLACKAMAS COUNTY STD DWG S150)
(8) CONSTRUCT STANDARD TYPE C VERTICAL CURB (SEE CLACKAMAS COUNTY STD DWG S100)
(9) CONSTRUCT STANDARD SIDEWALK (SEE CLACKAMAS COUNTY STD DWG S960)
(11) INSTALL MOUNTABLE CURB - 118 LF (SEE CLACKAMAS COUNTY STD DWG S180)
(14) REMOVAL OF SURFACINGS - 26 SY
(15) INSTALL ILLUMINATION POLE (SEE IL SHTS)
(16) CONSTRUCT PLANTER STRIP (SEE TYPICAL SECTIONS AND LS SHTS FOR DETS)
(23) REMOVE EXIST MAILBOX AND SUPPORT
(28) INSTALL SINGLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 & RD101)
(32) INSTALL 12-FOOT SINGLE GATE - 1 EA (SEE ODOT STD DWG RD815)
(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)
(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)
(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)
(37) REMOVAL OF FENCE - 207 LF
(39) INSTALL TYPE CL-6R FENCE (BLACK) - 206 LF (SEE ODOT STD DWG RD815)
(40) CONSTRUCT BIKE RAMP TRANSITION (SEE CR SHEETS FOR DETAILS)
(43) STANDARD MAILBOX, SIZE 1.5 - 2 EA
(44) INSTALL MULTIPLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 & RD101)
(45) REMOVE EXIST AUTOMATED GATE - 1 EA
(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)
(48) REMOVE EXIST ELECTRICAL, COMM., AND ASSOCIATED CONDUIT SERVICING GATE BACK TO ROW LIMITS
(49) SAWCUT EXIST PAVEMENT - 11 LF (SEE ODOT STD DWG RD610)
(50) INSTALL MONUMENT BOX - 2 EA (SEE ODOT STD DWG RD115)
(54) INSTALL WATER BAR (SEE CLACKAMAS COUNTY STD DWG D700)
(56) INSTALL METAL HANDRAIL, TWO RAIL - 440 LF (SEE ODOT STD DWGS RD770 & RD771)
(62) INSTALL DETECTABLE GUIDE STRIP - 90 SF (SEE ODOT STD DWG RD909)

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

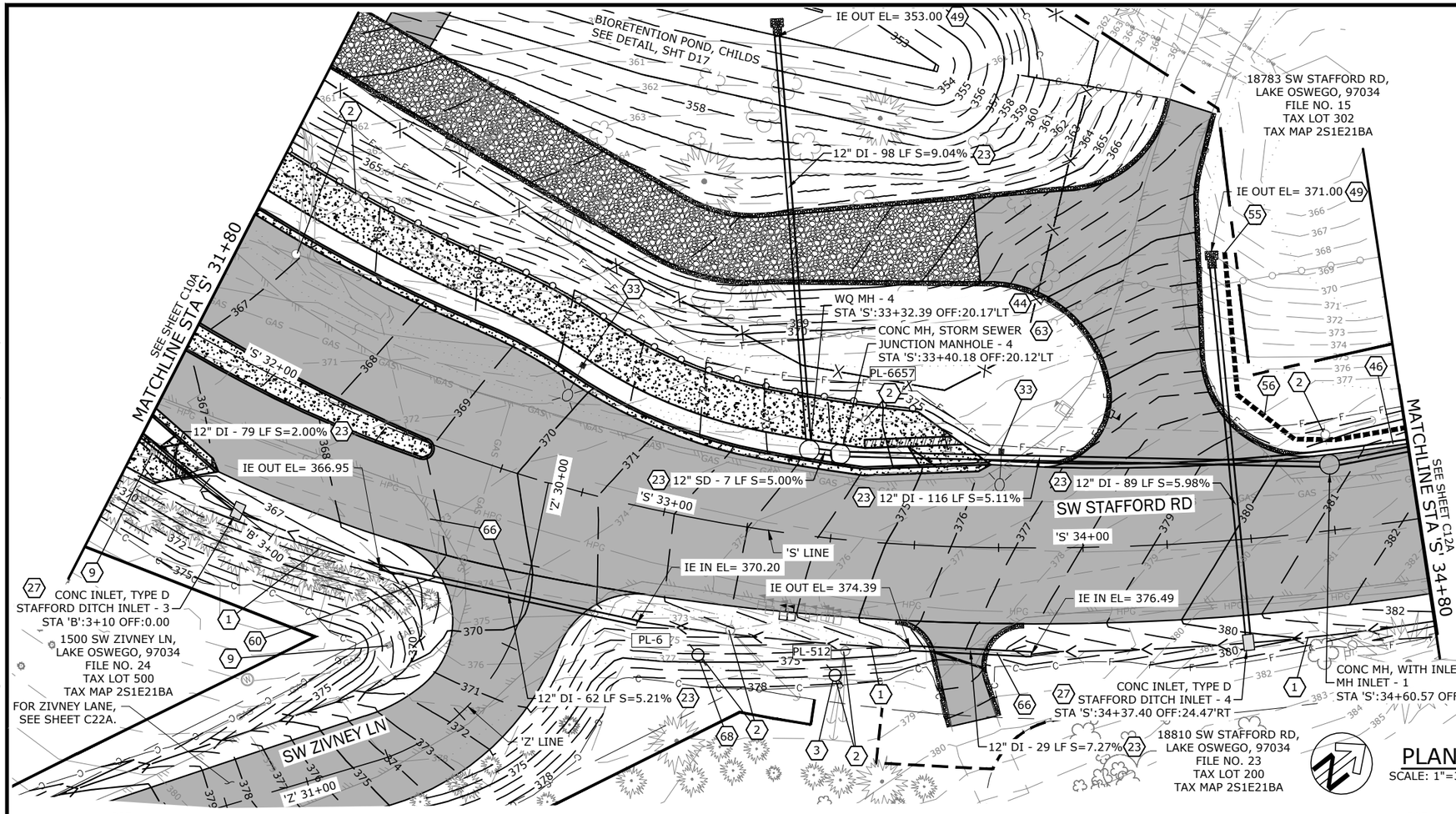
REVISIONS

NO.	DATE:

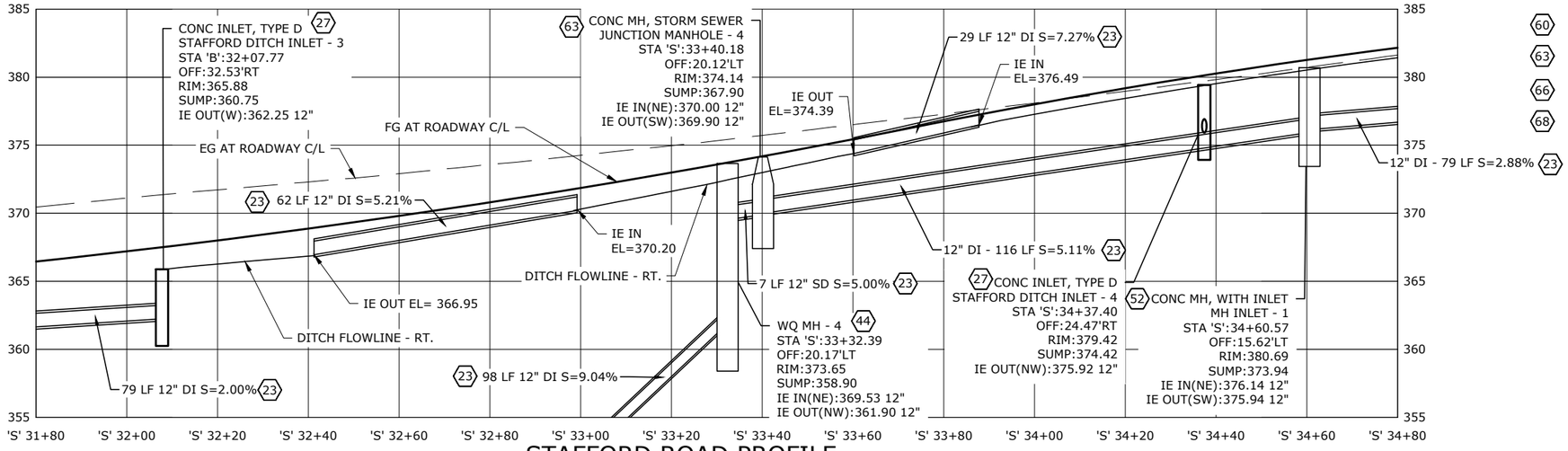
Sheet No.
C11

52 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1.dwg C11 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
9. RELOCATE EXIST UTILITY VAULT/PEDESTAL (BY OTHERS)
13. ABANDON EXIST STRUCTURE, 12" CULVERT PIPE, - 109 LF
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
27. CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 18" MINIMUM SUMP
33. INSTALL ILLUMINATION (SEE IL SHEETS)
44. CONSTRUCT WATER QUALITY MANHOLE (PER ODOT STD DWG RD340)
46. INSTALL MOUNTABLE CURB (SEE SHEETS C11 THRU C15 FOR LIMITS)
49. CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
52. CONSTRUCT STORM SEWER MANHOLE WITH INLET TOP (PER ODOT STD DWG RD335 & RD342)
55. CONSTRUCT SUBSURFACE DRAIN OUTLET (PER ODOT STD DWG RD312)
56. CONSTRUCT 4" DRAIN PIPE (PER ODOT STD DWG RD312) & FIELD VERIFY LIMITS IN FIELD WITH ENGINEER
60. REMOVE EXISTING INLET
63. CONSTRUCT MANHOLE-OUTSIDE DROP (PER WES STD DWG SAN-005)
66. REMOVE EXISTING CULVERT PIPE - 137 LF
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

PROJECT MANAGER: JONATHAN HANGARTNER

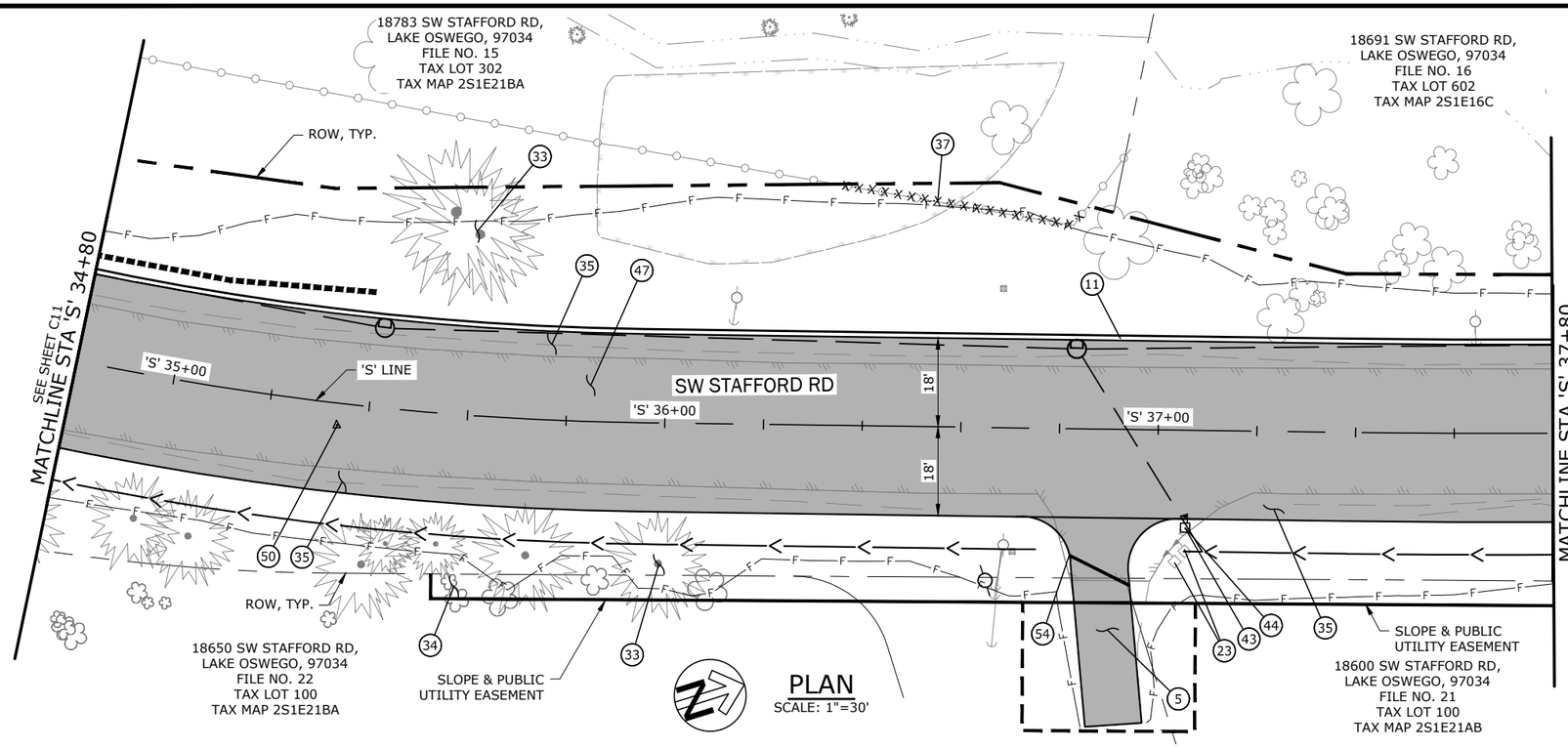
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

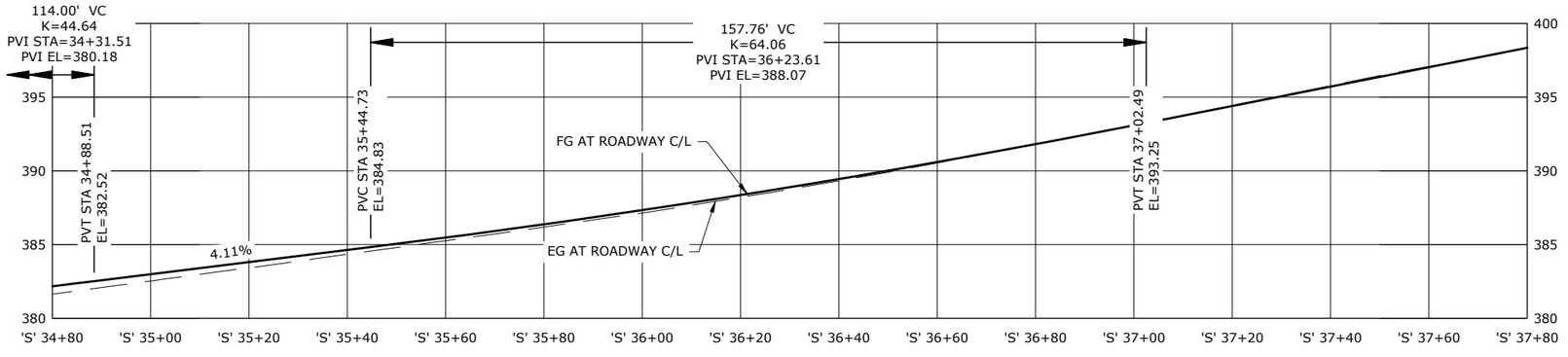
NO.	DATE:

Sheet No.
C11A
53 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-1-UTIL.dwg C11A 10/31/2024 9:10 AM RILEY.WIGGINS 24.1s (LMS Tech)



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

(5) CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHTS D06 & D09)

(11) INSTALL MOUNTABLE CURB - 280 LF (SEE CLACKAMAS COUNTY STD DWG S180)

(23) REMOVE EXIST MAILBOX AND SUPPORT

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHEETS FOR ALL TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 53 LF

(43) STANDARD MAILBOX, SIZE 1.5 - 2 EA

(44) INSTALL MULTIPLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 &RD101)

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(50) INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

(54) INSTALL WATER BAR (SEE CLACKAMAS COUNTY STD DWG D700)

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

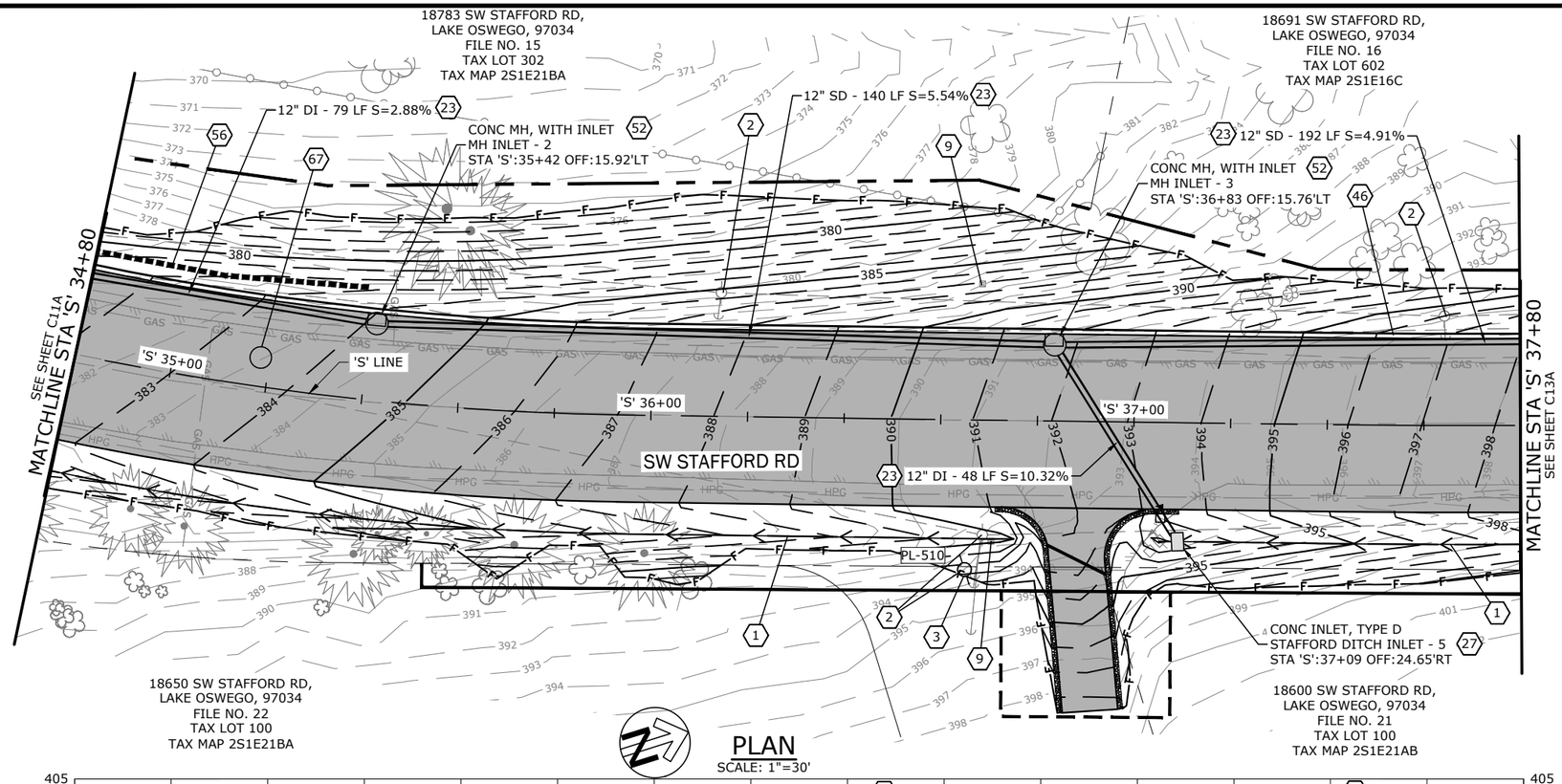
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

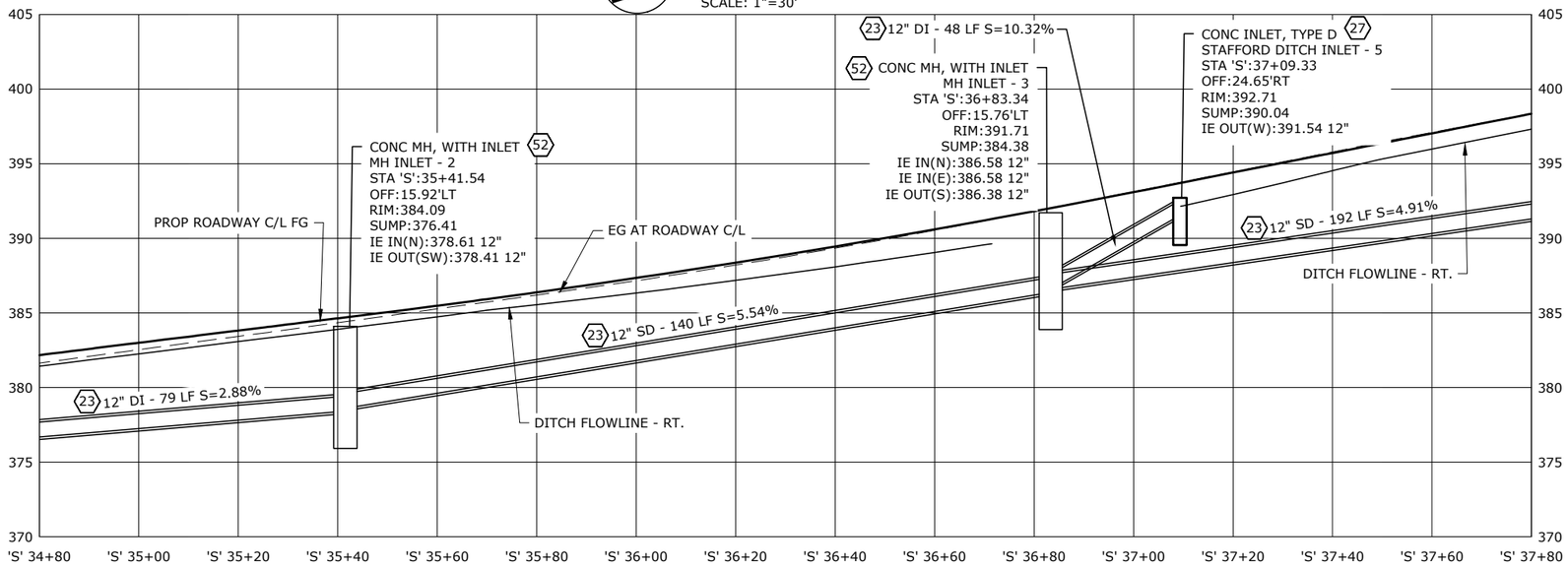
NO.	DATE:

Sheet No.
C12

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C12 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
9. RELOCATE EXIST UTILITY VAULT/PEDESTAL (BY OTHERS)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
27. CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 18" MINIMUM SUMP
46. INSTALL MOUNTABLE CURB (SEE SHEETS C11 THRU C15 FOR LIMITS)
52. CONSTRUCT STORM SEWER MANHOLE WITH INLET TOP (PER ODOT STD DWG RD335 & RD342)
56. CONSTRUCT 4" DRAIN PIPE (PER ODOT STD DWG RD312) & FIELD VERIFY LIMITS IN FIELD WITH ENGINEER
67. ADJUST UTILITY MANHOLE TO FINISHED GRADE (SEE ODOT STD DWG RD360)

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

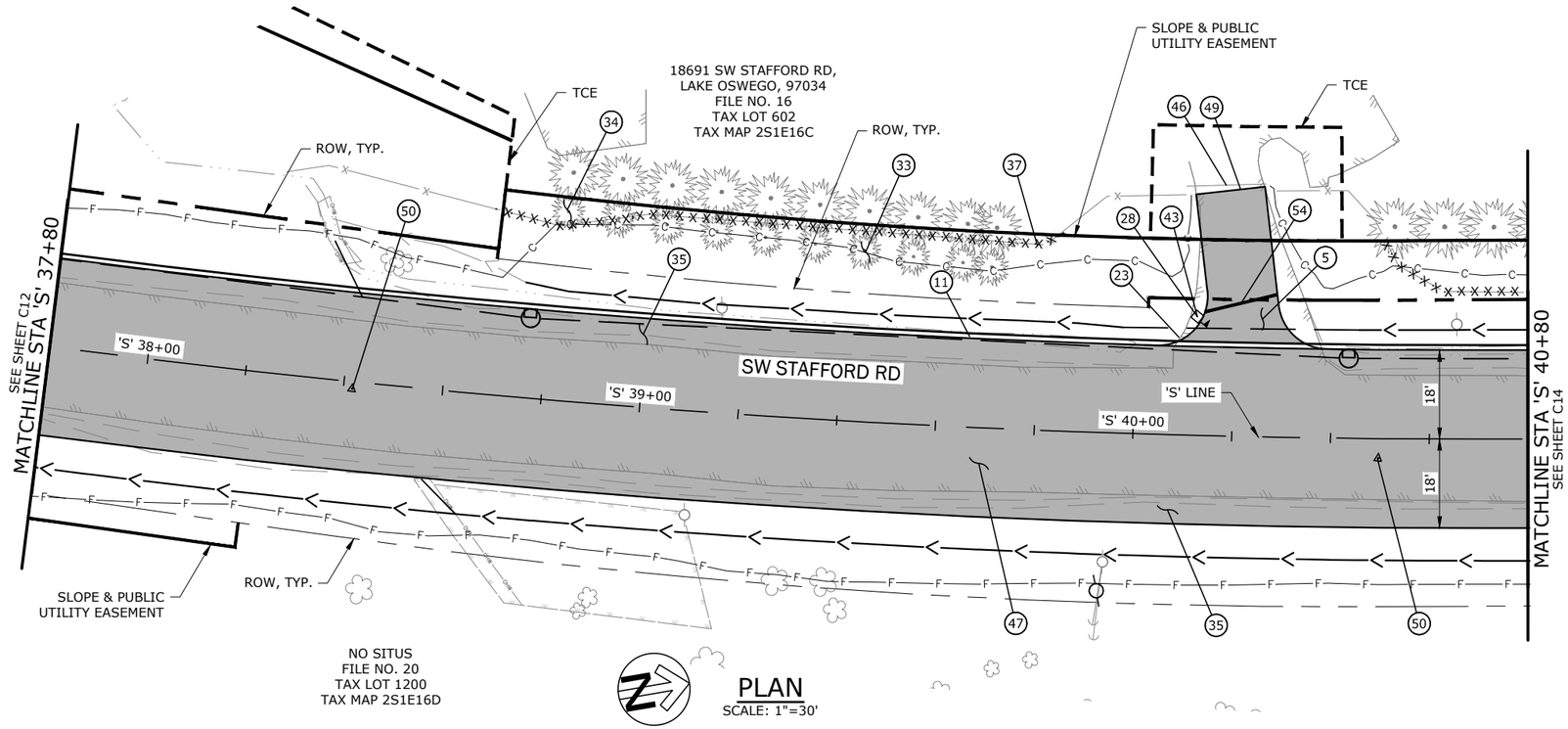
NO.	DATE:

Sheet No.
C12A

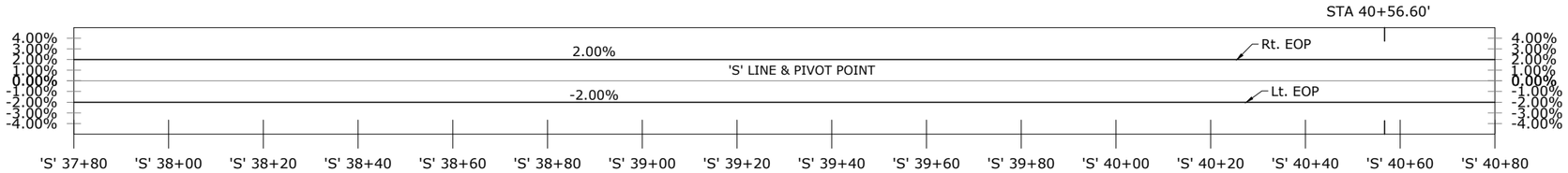
55 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

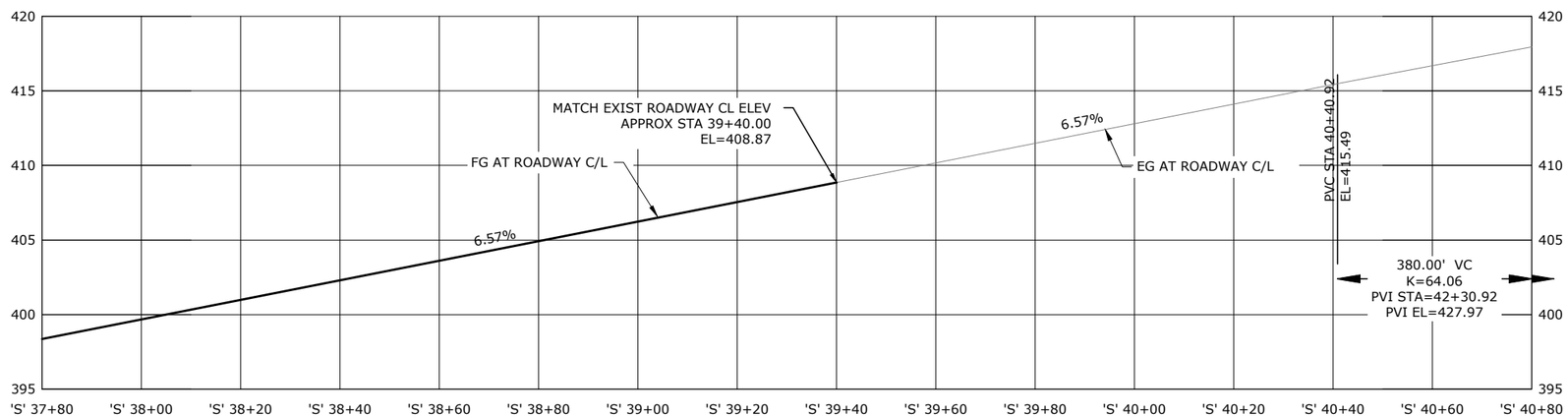
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C12A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

SCALE IN FEET

CONSTRUCTION KEYNOTES:

(5) CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHTS D06 & D10)

(11) INSTALL MOUNTABLE CURB - 300 LF (SEE CLACKAMAS COUNTY STD DWG S180)

(23) REMOVE EXIST MAILBOX AND SUPPORT

(28) INSTALL SINGLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 & RD101)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 148 LF

(43) STANDARD MAILBOX, SIZE 1.5 - 1 EA

(46) PROTECT EXIST AUTOMATED GATE AND APPURTENANCES

(47) CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

(49) SAWCUT EXIST PAVEMENT - 14 LF (SEE ODOT STD DWG RD610)

(50) INSTALL MONUMENT BOX - 2 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

(54) INSTALL WATER BAR (SEE CLACKAMAS COUNTY STD DWG D700)

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

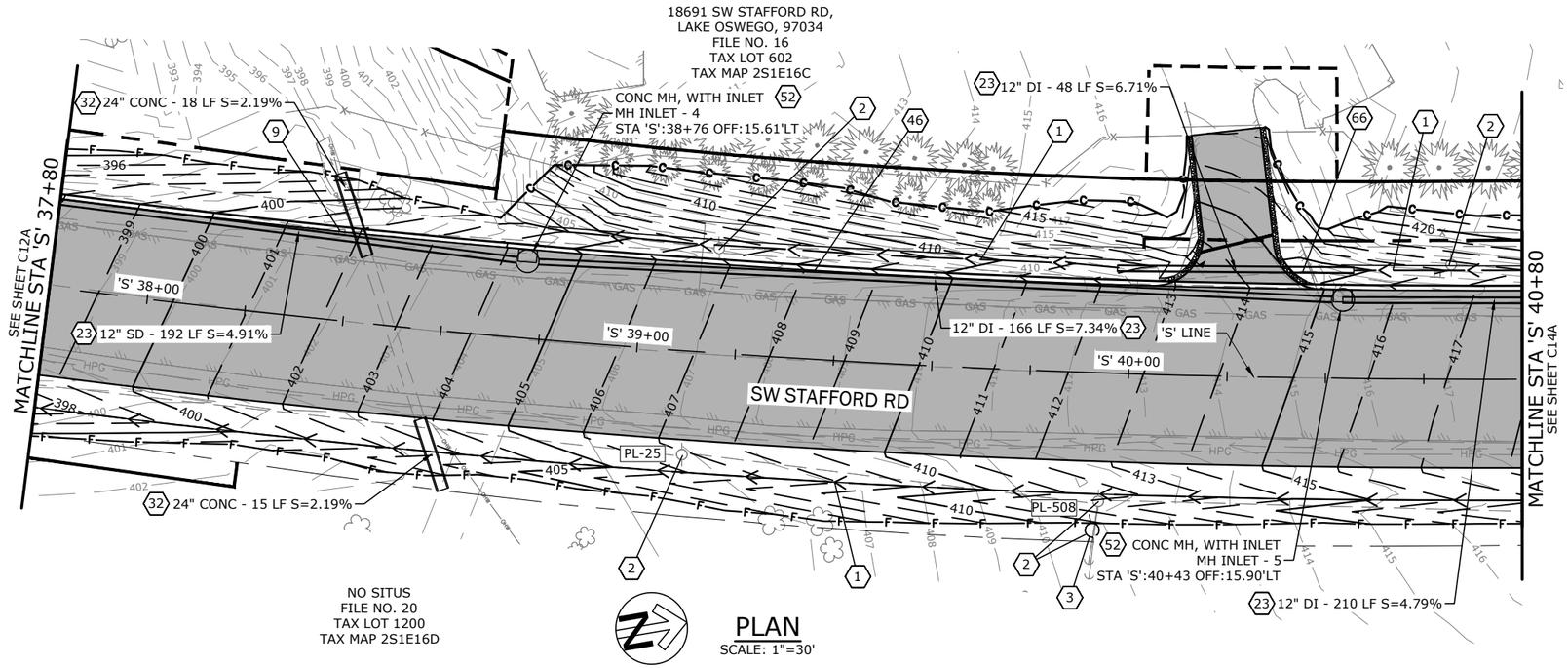
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

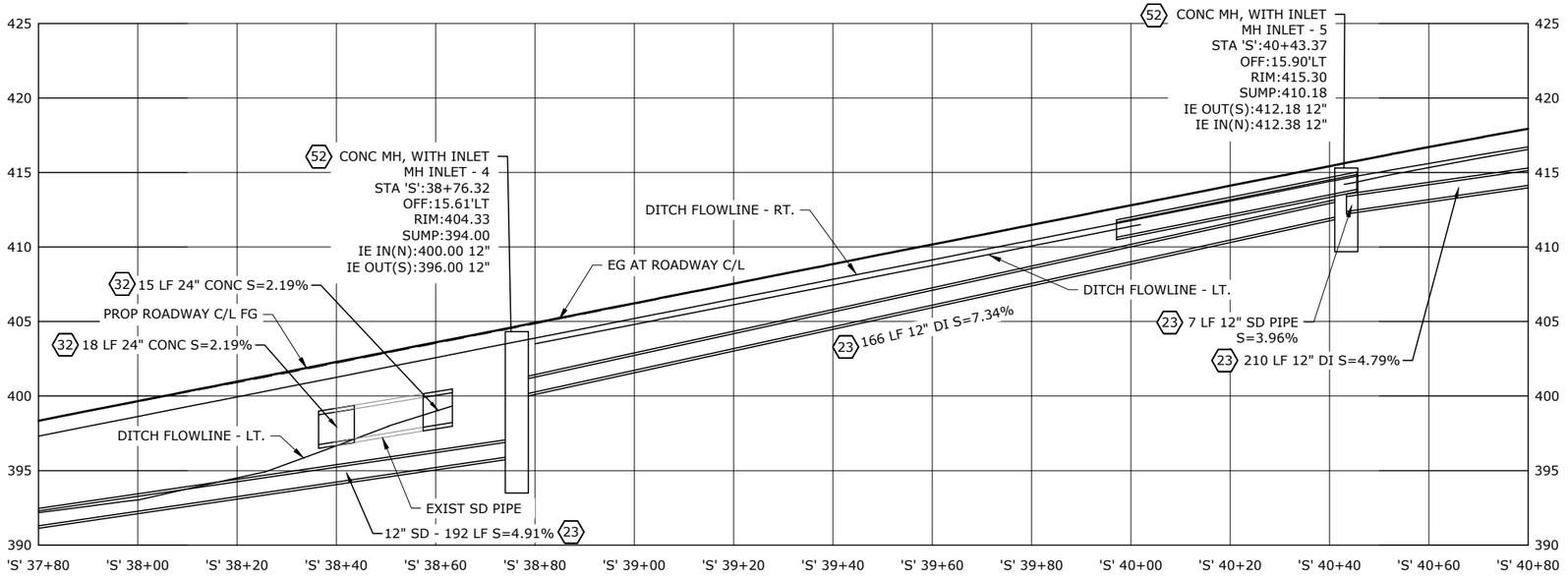
NO.	DATE:

Sheet No. C13

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C13 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
9. RELOCATE EXIST UTILITY VAULT/PEDESTAL (BY OTHERS)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
32. EXTEND EXIST PIPE & CONSTRUCT CONCRETE CLOSURE COLLAR (PER ODOT STD DWG RD306)
46. INSTALL MOUNTABLE CURB (SEE C13 FOR LIMITS)
52. CONSTRUCT STORM SEWER MANHOLE WITH INLET TOP (PER ODOT STD DWG RD335 & RD342)
66. REMOVE EXISTING CULVERT PIPE - 66 LF

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

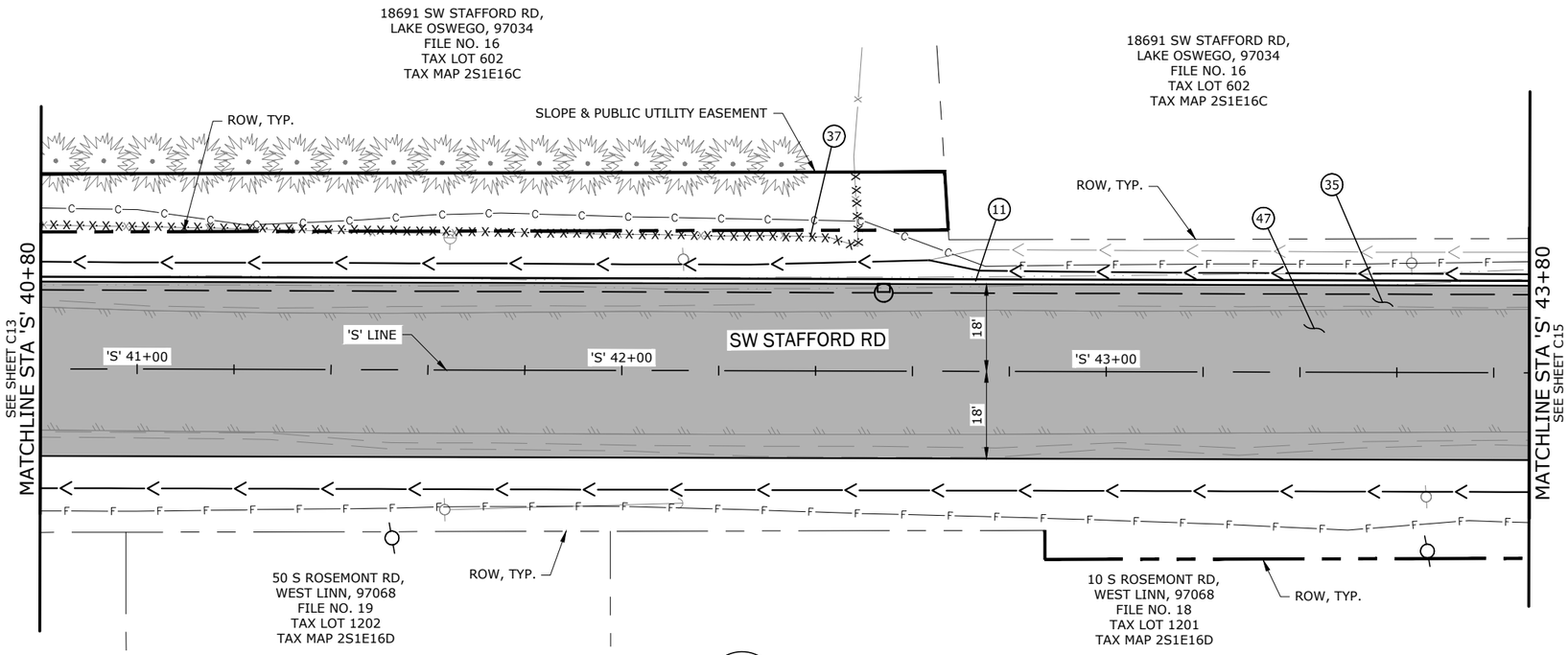
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

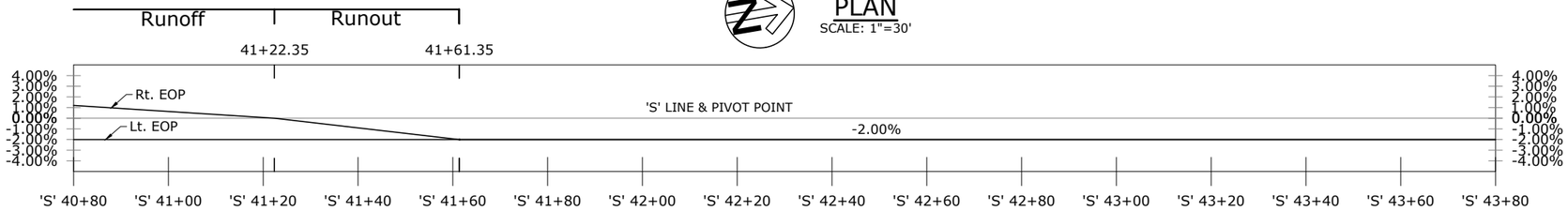
REVISIONS
NO. | DATE:

Sheet No.
C13A

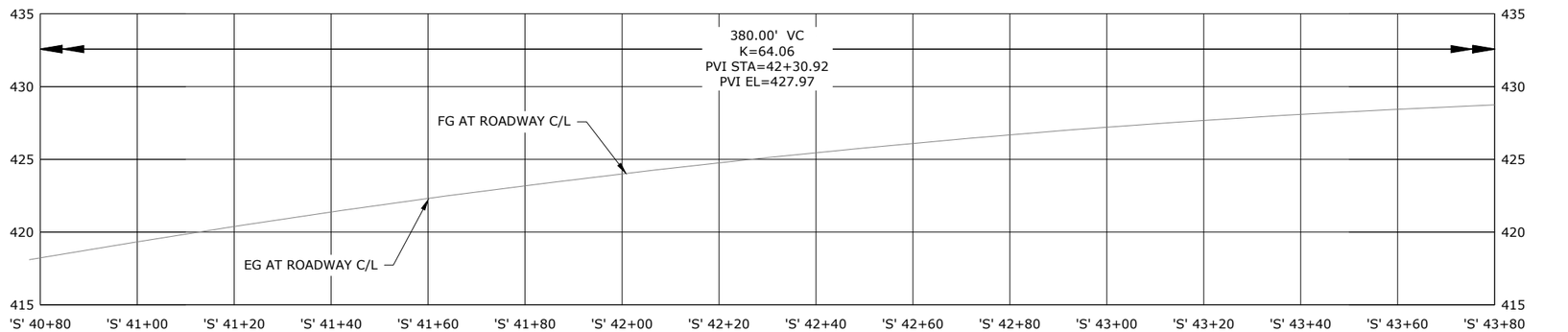
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C13A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

CONSTRUCTION KEYNOTES:

(11) INSTALL MOUNTABLE CURB - 300 LF
(SEE CLACKAMAS COUNTY STD DWG S180)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION
(SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 185 LF

(47) CONSTRUCT ACP PAVEMENT LEVELING
(SEE SHTS D01-D04)

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

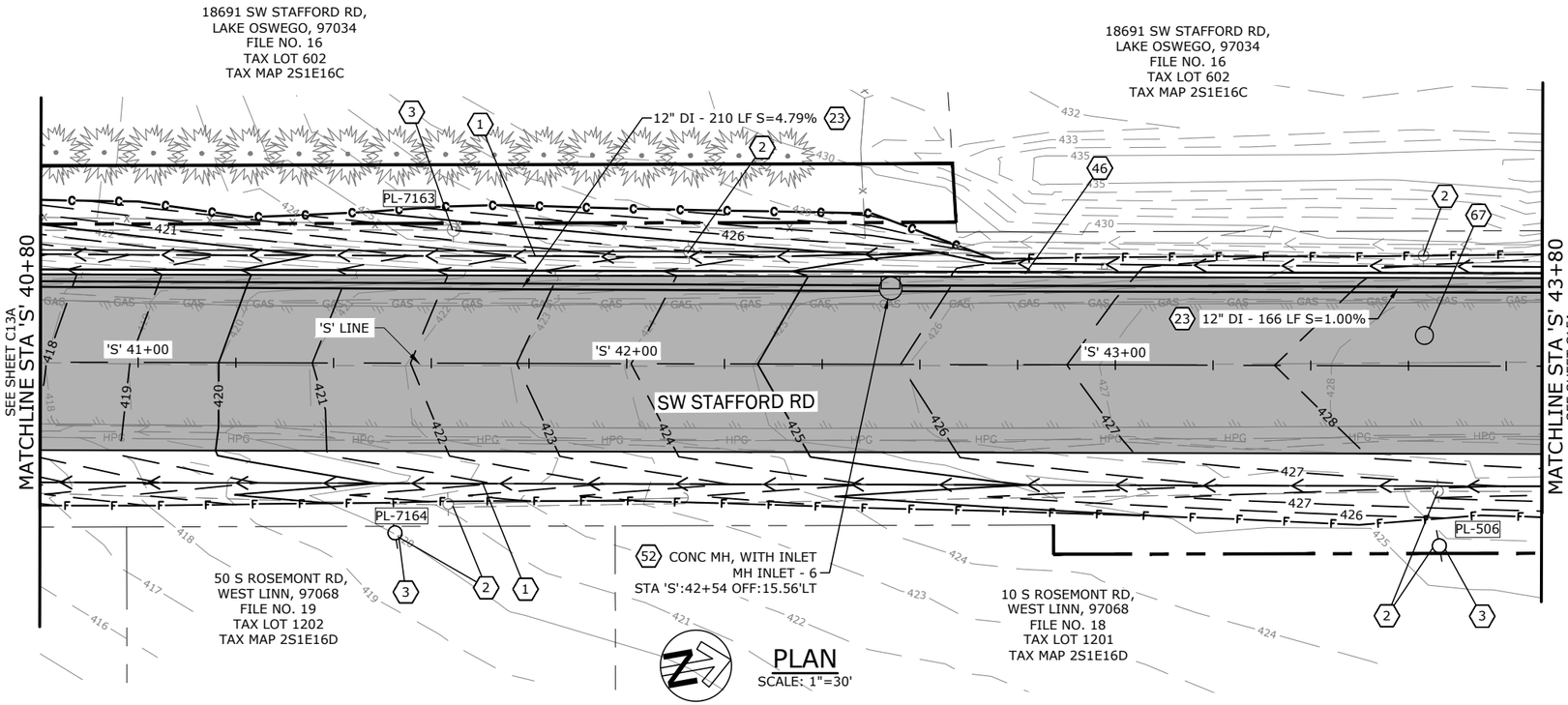
REVISIONS

NO.	DATE:

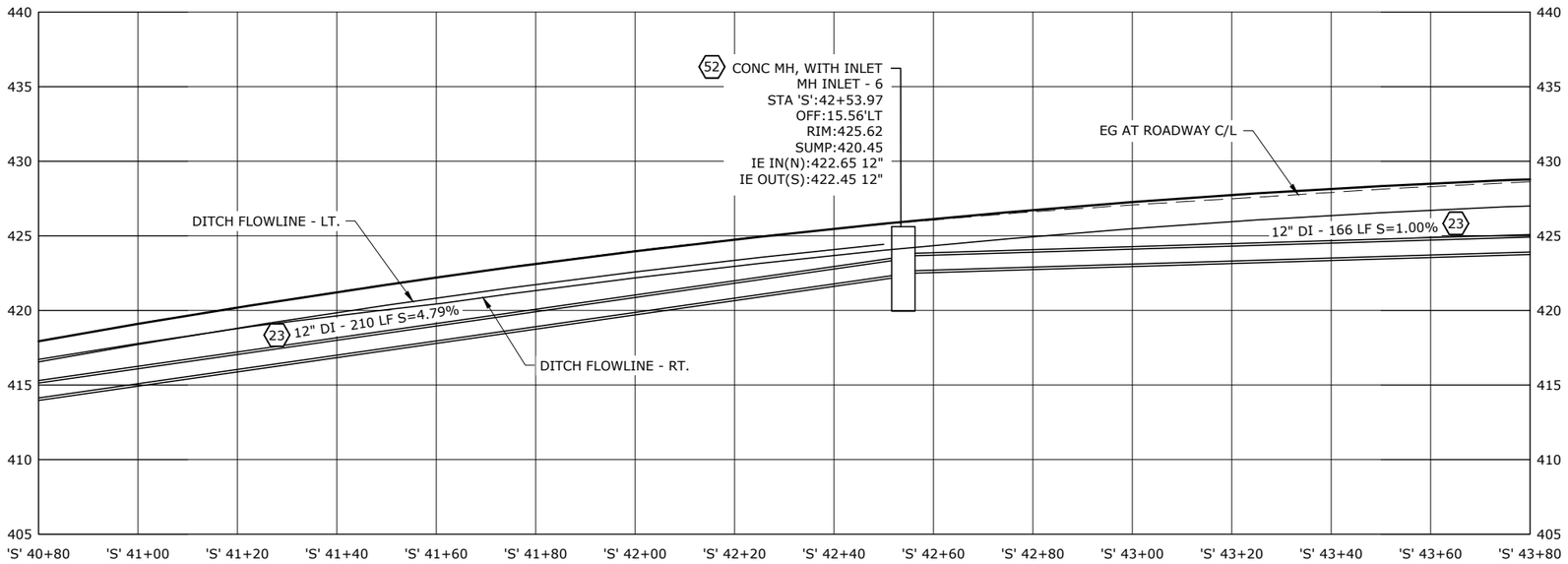
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
C14

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C14 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
46. INSTALL MOUNTABLE CURB (SEE C14 FOR LIMITS)
52. CONSTRUCT STORM SEWER MANHOLE WITH INLET TOP (PER ODOT STD DWG RD335 & RD342)
67. ADJUST UTILITY MANHOLE TO FINISHED GRADE (SEE ODOT STD DWG RD360)

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

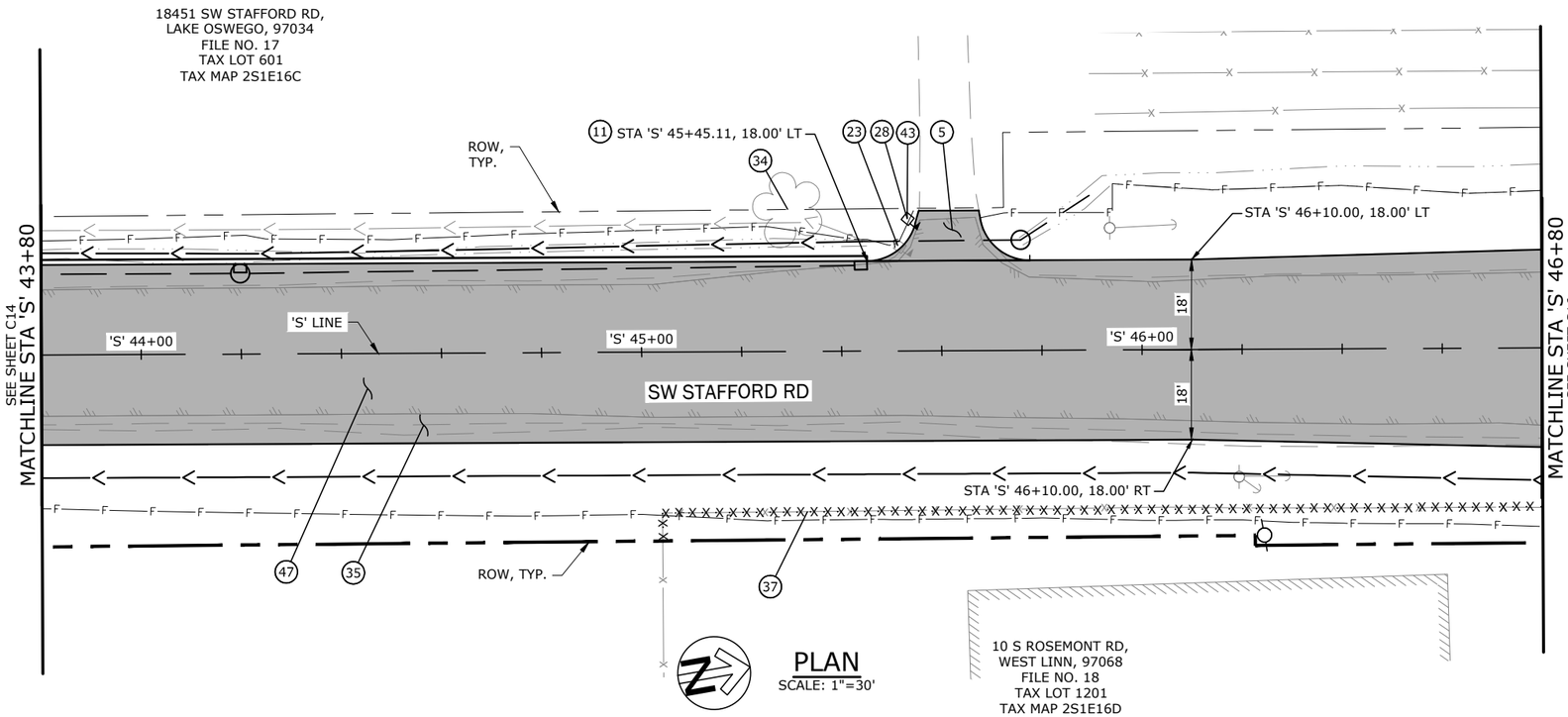
NO.	DATE:

Sheet No.
C14A

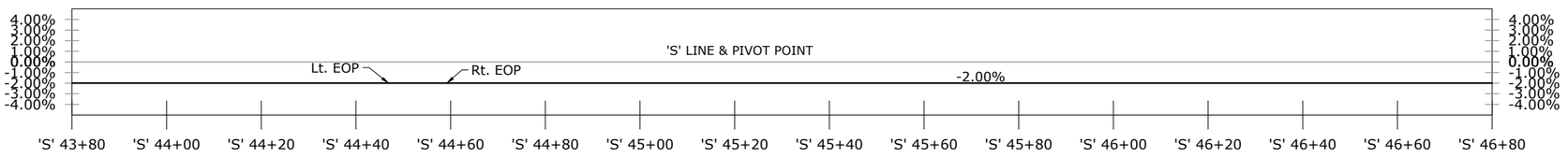
59 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

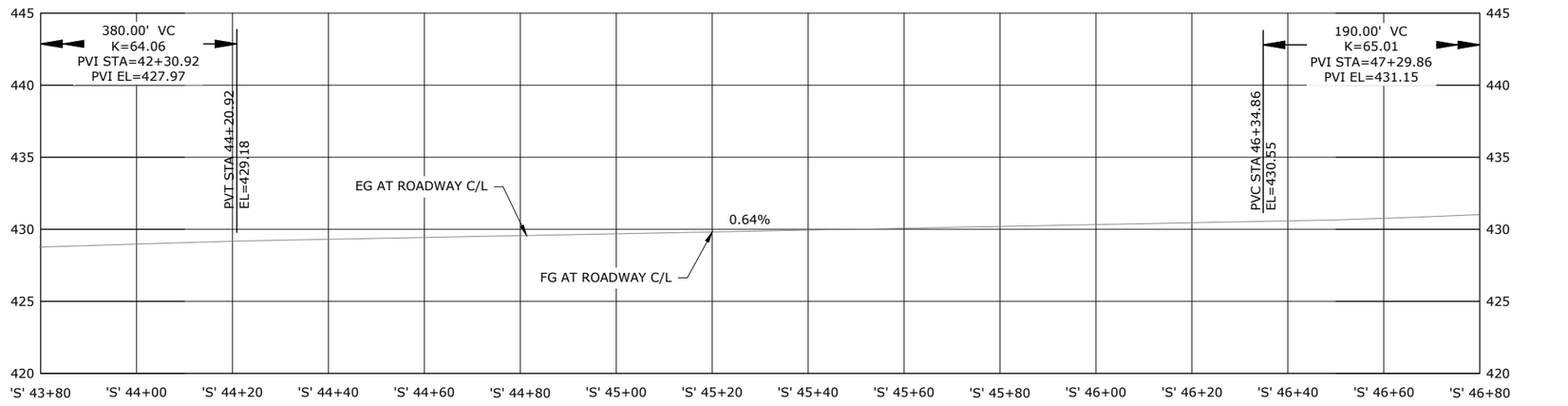
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C14A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

5. CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHTS D06 & D10)
11. INSTALL MOUNTABLE CURB - 175 LF (SEE CLACKAMAS COUNTY STD DWG S180)
23. REMOVE EXIST MAILBOX AND SUPPORT
28. INSTALL SINGLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 AND RD101)
34. PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)
35. CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)
37. REMOVAL OF FENCE - 182 LF
43. STANDARD MAILBOX, SIZE 1.5 - 1 EA
47. CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

PROJECT MANAGER: JONATHAN HANGARTNER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

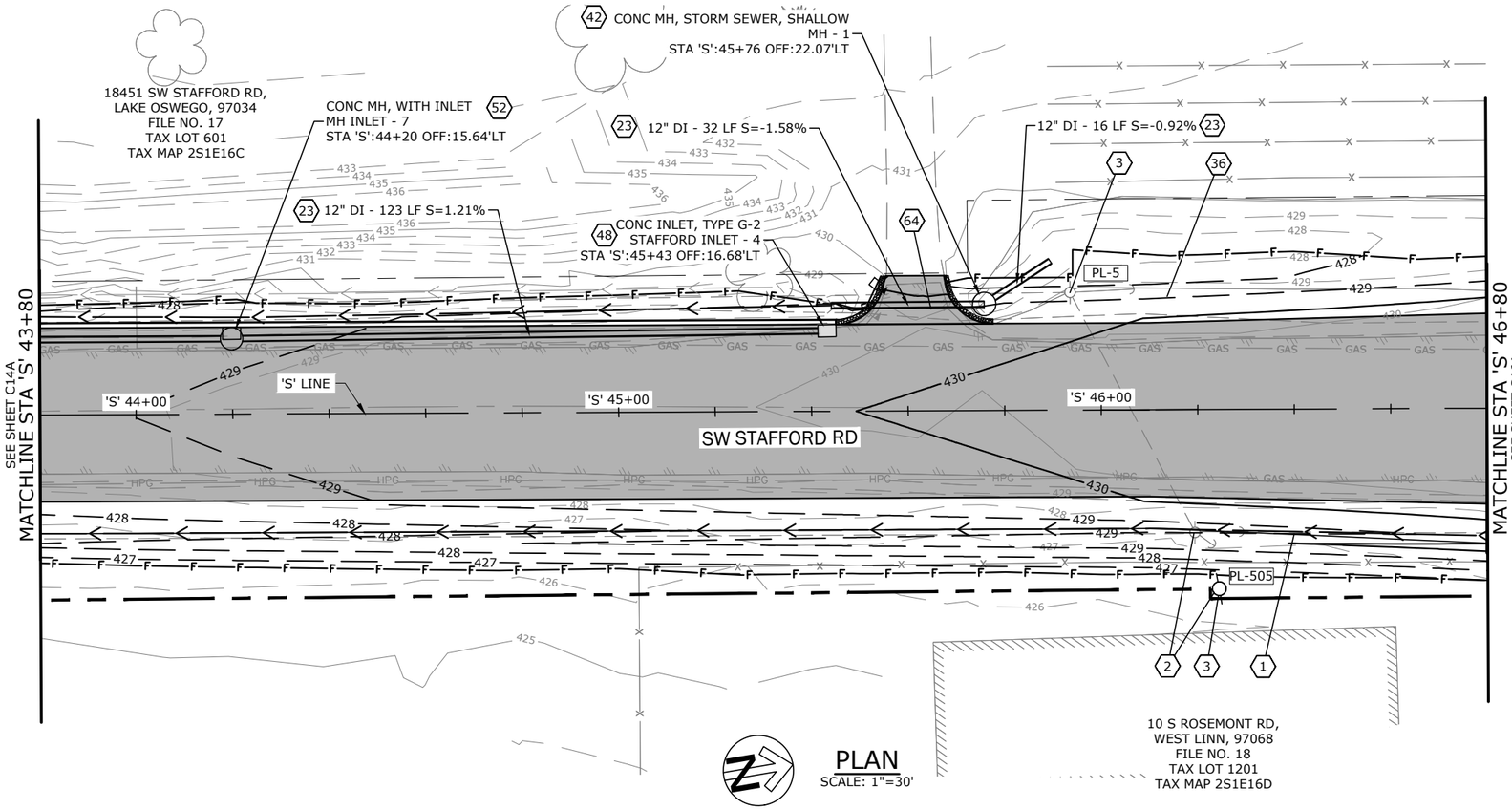
NO.	DATE:

Sheet No. C15

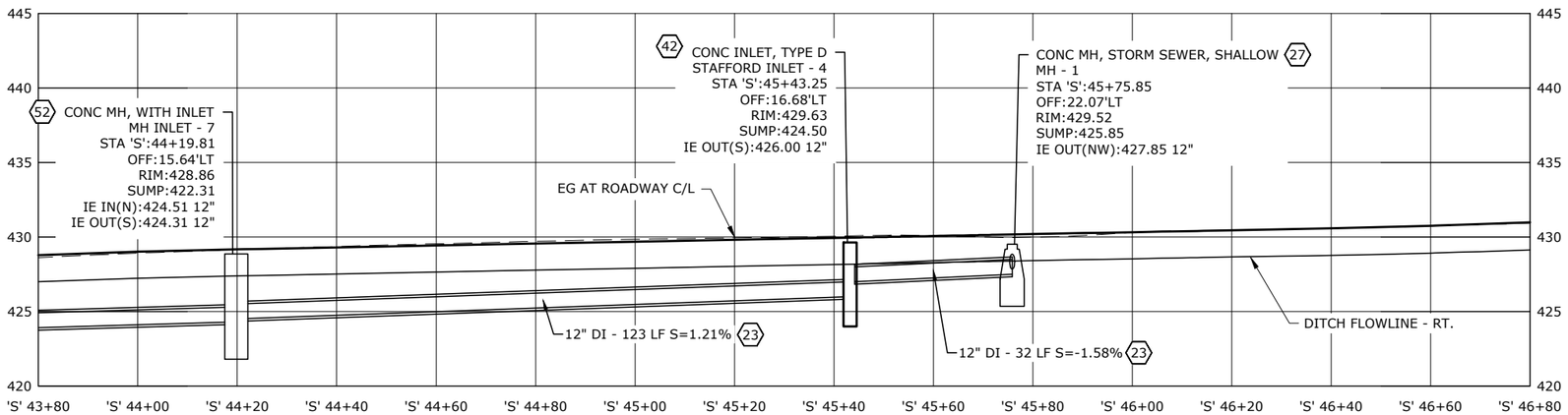
60 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C15 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
13. ABANDON EXIST STRUCTURE, 12" CULVERT PIPE, - 29 LF
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
36. CONSTRUCT WATER QUALITY SWALE, ROSEMONT (PER WES STD DETAIL SWM-06 & SEE TYPICAL SECTIONS)
42. CONSTRUCT SHALLOW STORM SEWER MANHOLE WITH PRECAST FLAT SLAB TOP (PER ODOT STD DWGS RD335 & RD342)
46. INSTALL MOUNTABLE CURB (SEE C15 FOR LIMITS)
48. CONSTRUCT CAST-IN-PLACE TYPE G-2 INLET, 18" MINIMUM SUMP (SEE ODOT STD DWG RD364)
52. CONSTRUCT STORM SEWER MANHOLE WITH INLET TOP (PER ODOT STD DWG RD335 & RD342)
64. REMOVE EXISTING DRIVEWAY CULVERT PIPE - 43 LF

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

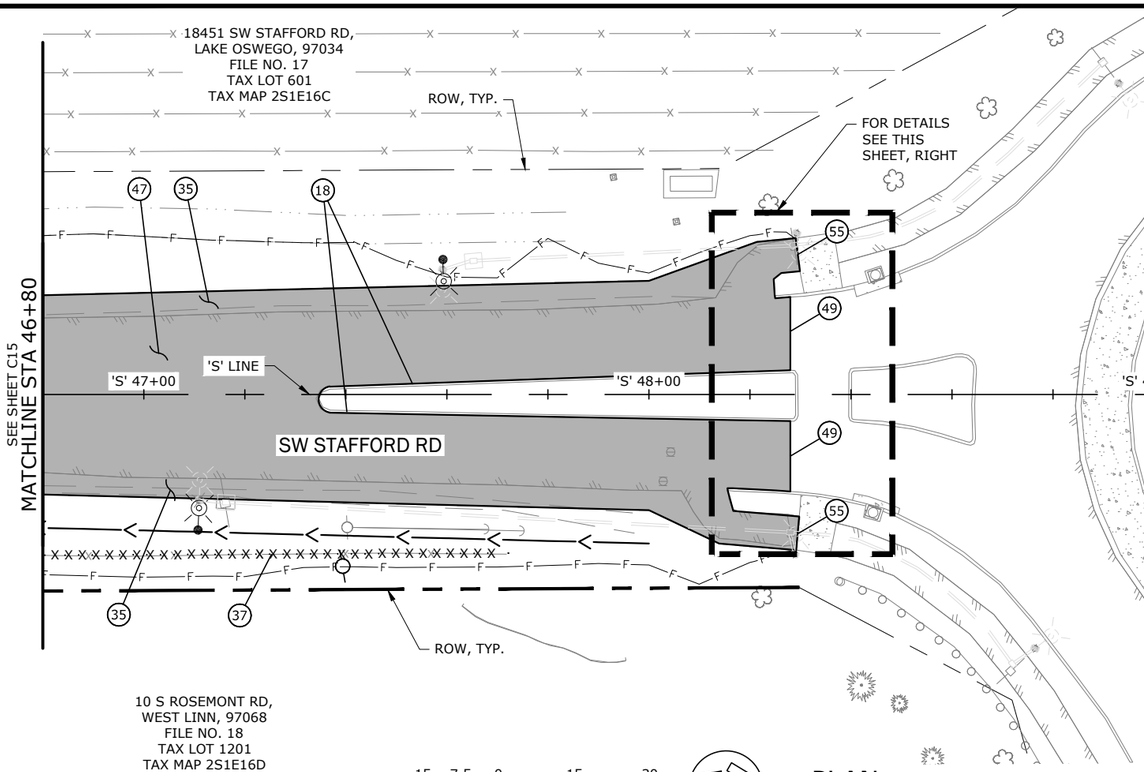
NO.	DATE:

Sheet No.
C15A

61 of 162

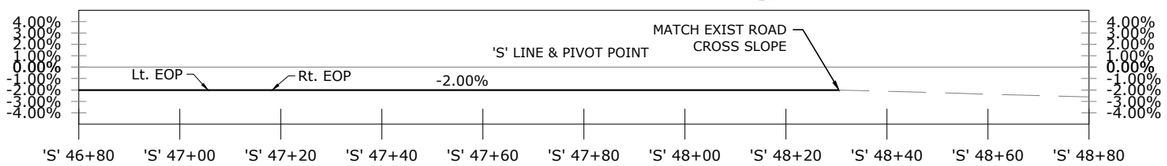
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C15A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)

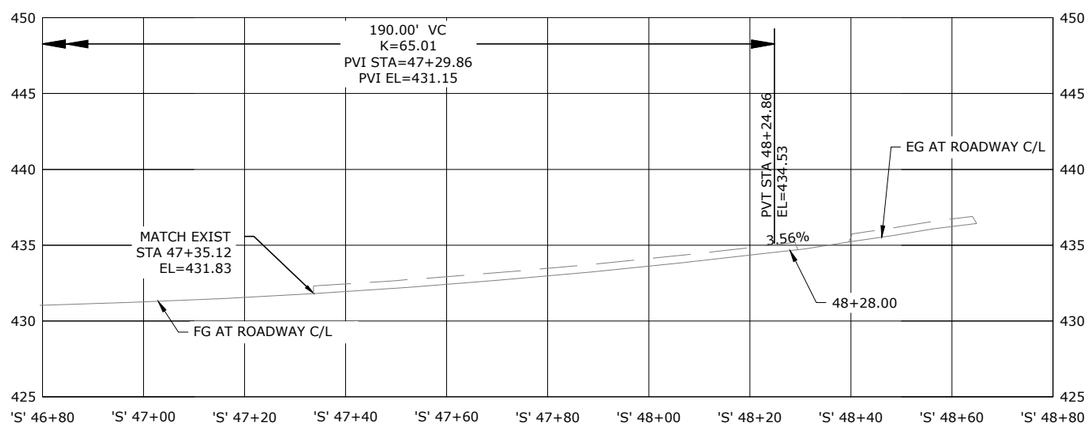


15 7.5 0 15 30
SCALE IN FEET

PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM

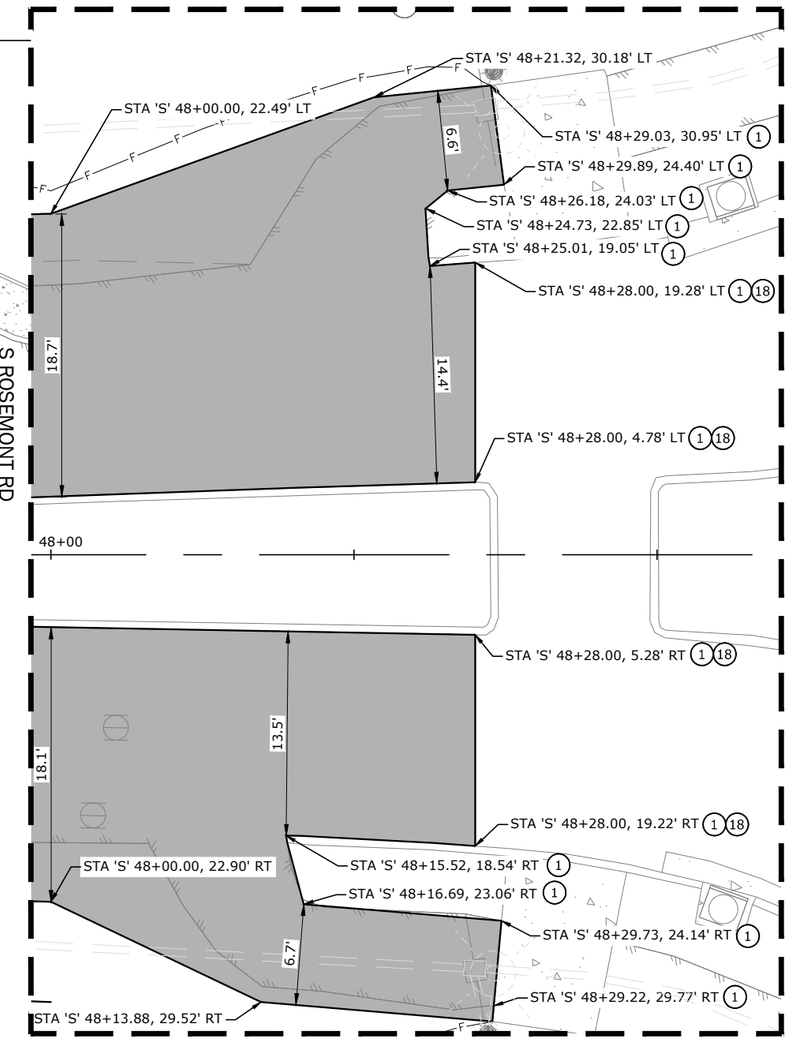


STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1. MATCH EXIST
18. PROTECT EXIST CURB
35. CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)
37. REMOVAL OF FENCE - 92 LF
47. CONSTRUCT ACP PAVEMENT LEVELING (SEE SHTS D01-D04)
49. SAWCUT EXIST PAVEMENT - 28 LF (SEE ODOT STD DWG RD610)
55. PROTECT AND MATCH EXIST SIDEWALK

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25



5 2.5 0 5 10
SCALE IN FEET

PLAN
SCALE: 1"=10'

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

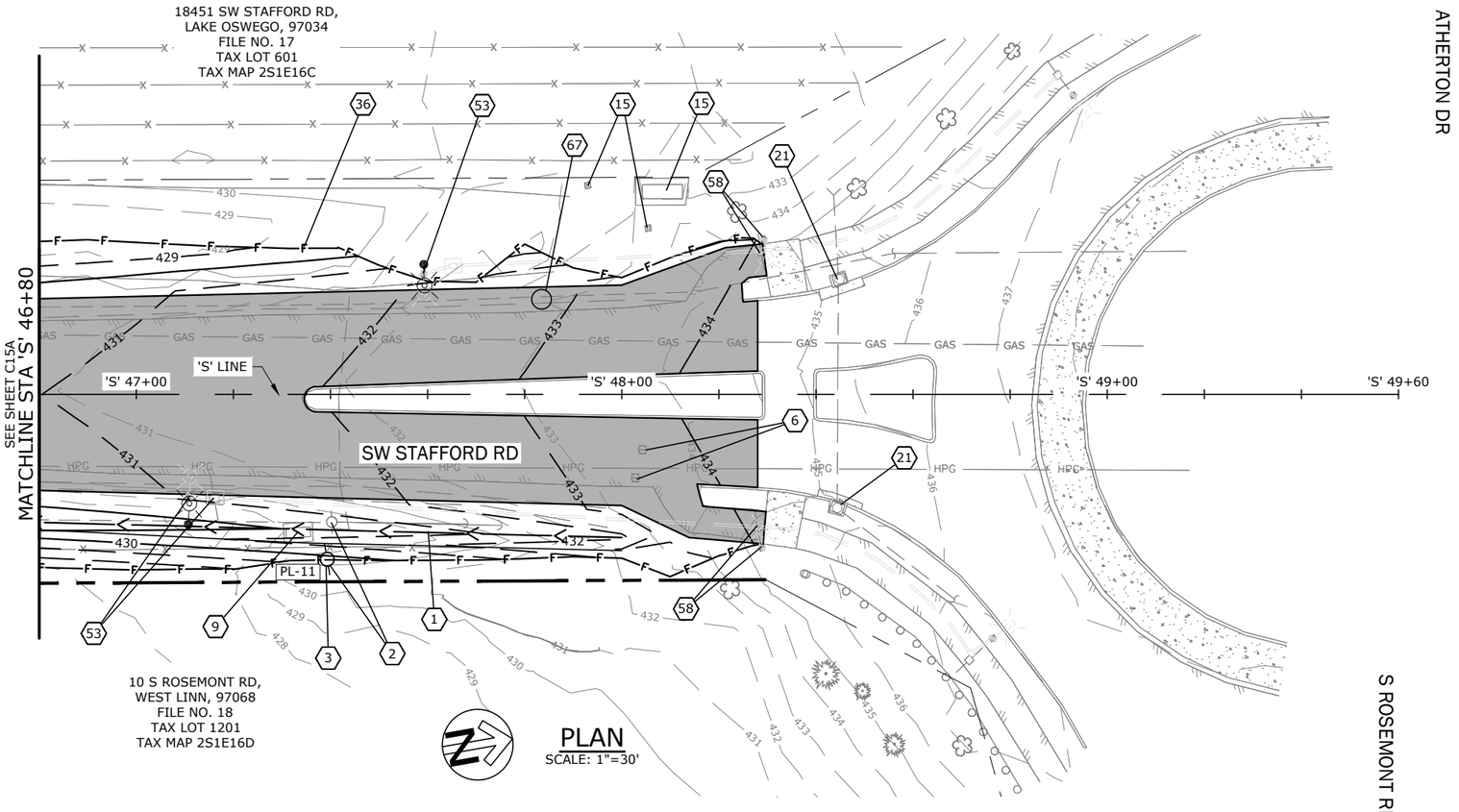
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

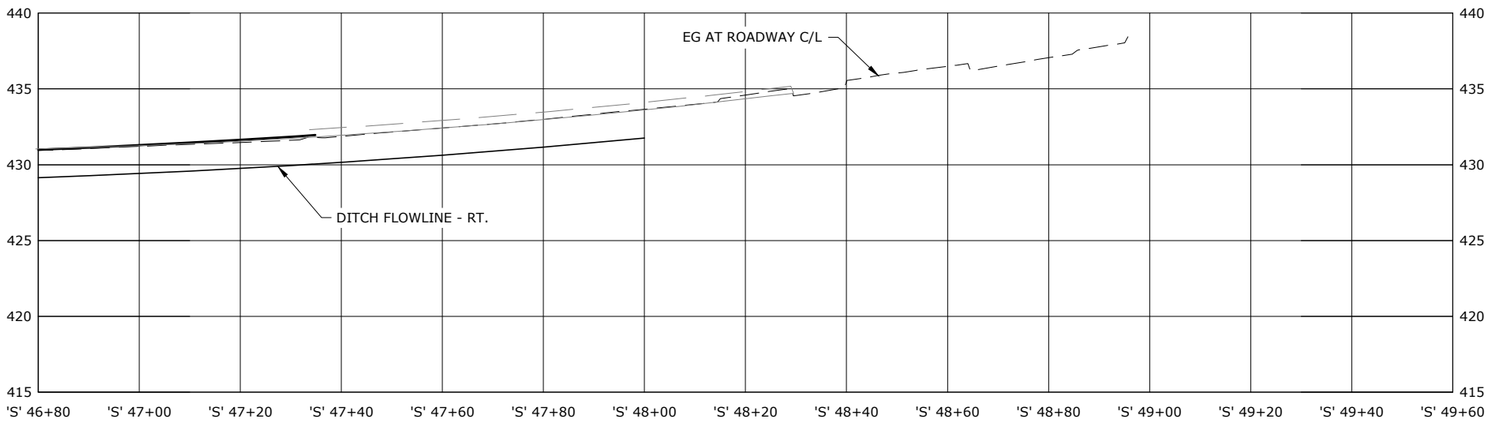
NO.	DATE:

Sheet No. C16

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C16 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



STAFFORD ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
6. ADJUST UTILITY BOX TO FINISHED GRADE - 2
9. RELOCATE EXIST UTILITY VAULT/PEDESTAL (BY OTHERS)
15. PRESERVE & PROTECT EXIST COMMUNICATION BOX IN PLACE
21. PROTECT EXIST INLET
36. CONSTRUCT WATER QUALITY SWALE, ROSEMONT (PER WES STD DETAIL SWM-06 & SEE TYPICAL SECTIONS)
53. RELOCATE EXIST LIGHT POLE & JUNCTION BOX
58. PROTECT EXIST LIGHT POLE
67. ADJUST UTILITY MANHOLE TO FINISHED GRADE (SEE ODOT STD DWG RD360)

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

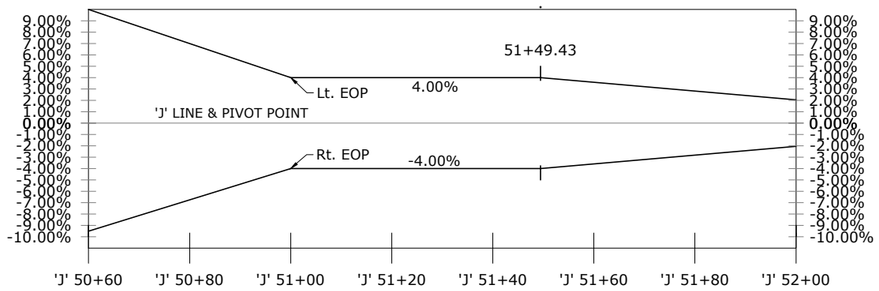
NO.	DATE:

Sheet No. C16A

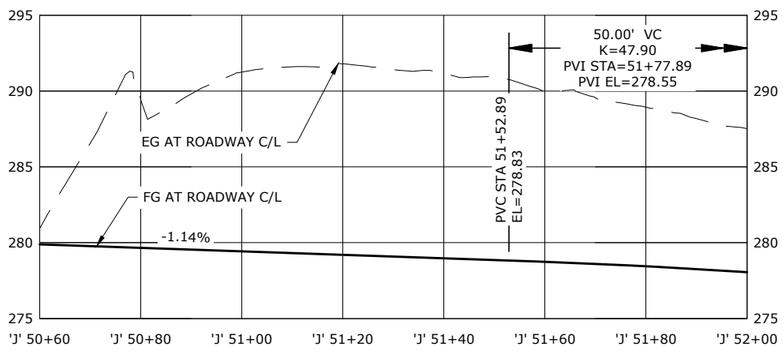
63 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C16A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)

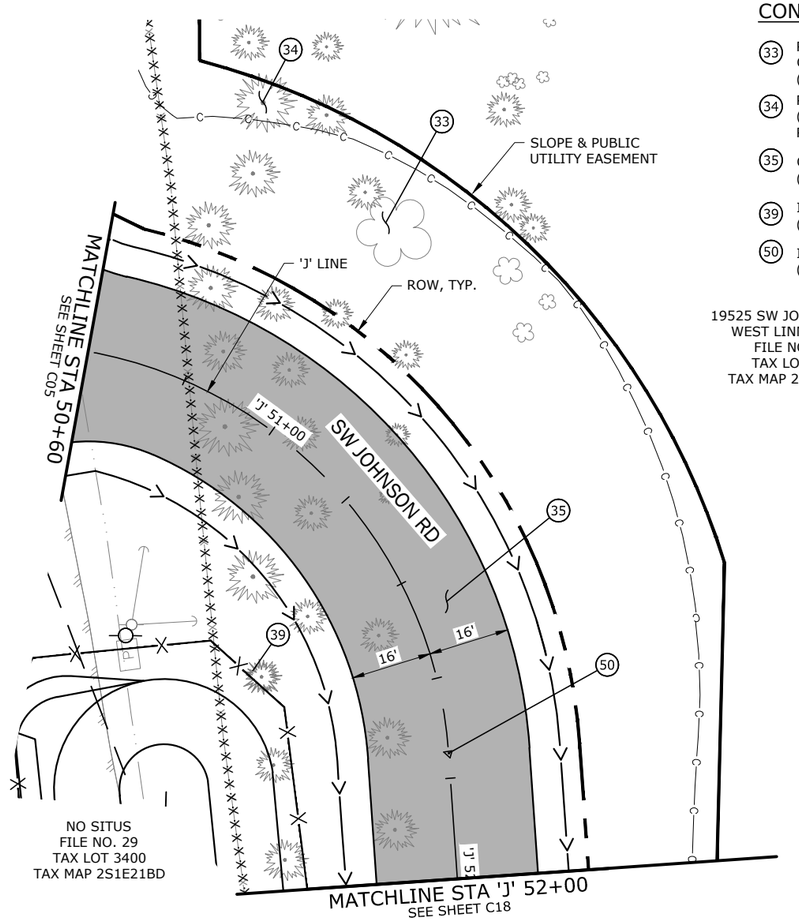


SUPERELEVATION DIAGRAM



JOHNSON ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT



PLAN

SCALE: 1"=30'

CONSTRUCTION KEYNOTES:

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL
(SEE EC SHTS)

(34) PROTECT EXIST TREE
(SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION
(SEE TYPICAL SECTIONS)

(39) INSTALL TYPE CL-6R FENCE (BLACK) - 111 LF
(SEE ODOT STD DWG RD815)

(50) INSTALL MONUMENT BOX - 1 EA
(SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

19525 SW JOHNSON RD,
WEST LINN, 97068
FILE NO. 27
TAX LOT 101
TAX MAP 2S1E21BD

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

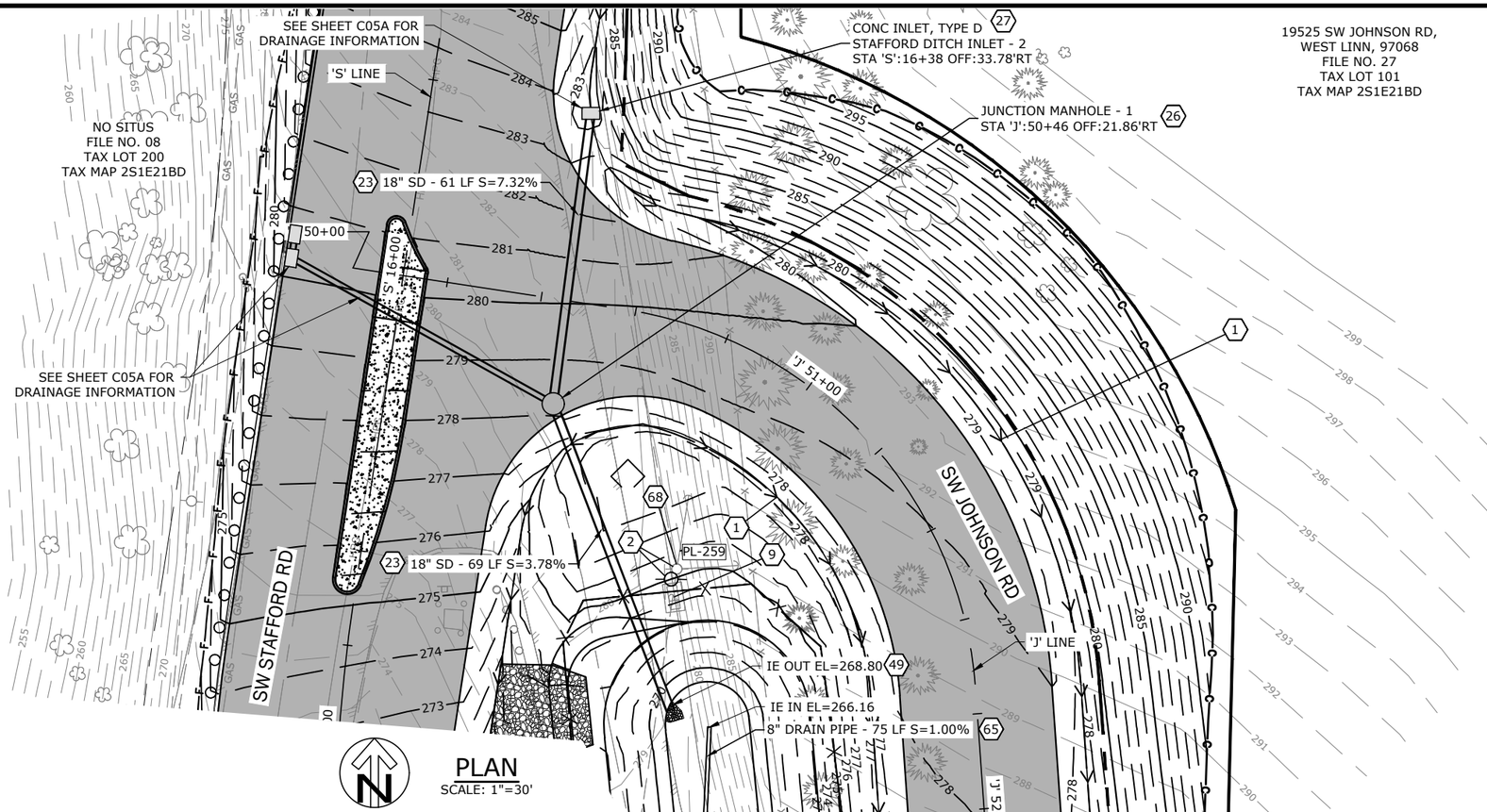
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

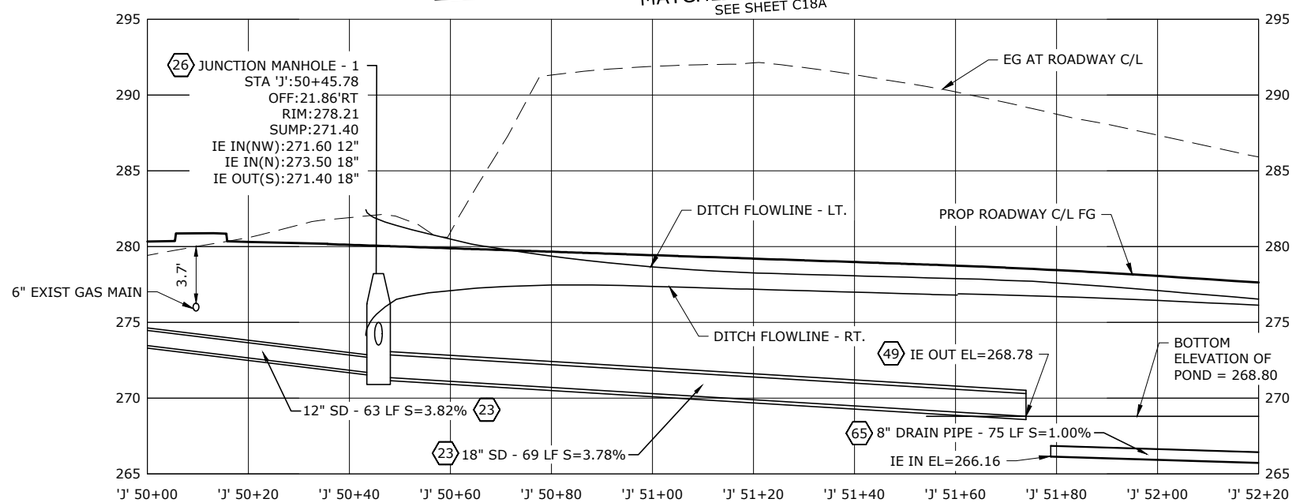
NO.	DATE:

Sheet No.
C17

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C17 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



JOHNSON ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
9. RELOCATE EXIST UTILITY VAULT/PEDESTAL (BY OTHERS)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
26. CONSTRUCT 48" ECCENTRIC MANHOLE (SEE ODOT STD DWG RD366 & WES STD DWG SWM-33)
27. CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 18" MINIMUM SUMP
49. CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
65. INSTALL 6" DRAIN PIPE (PER WES STD DWG SWM-06)
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

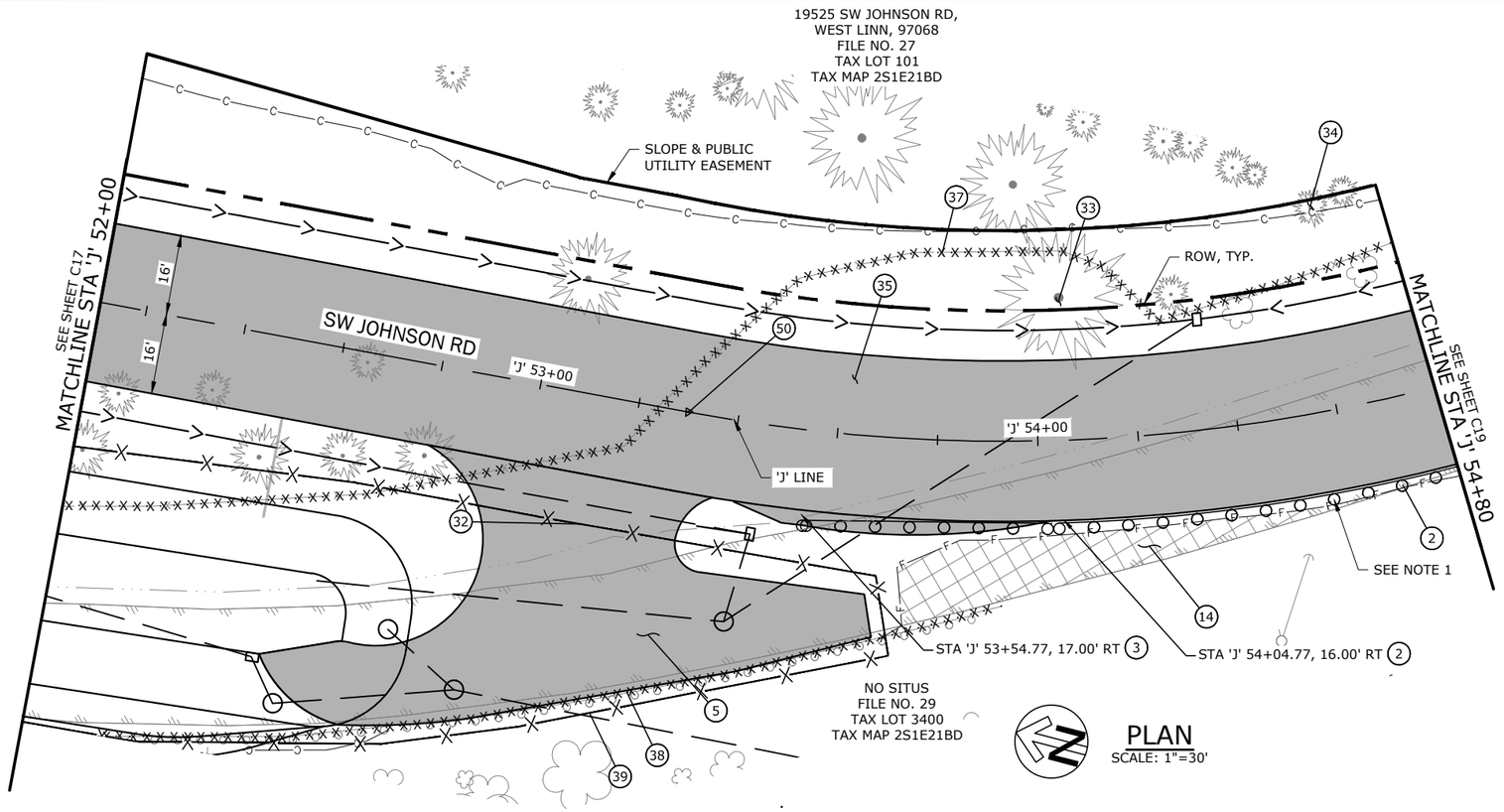
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

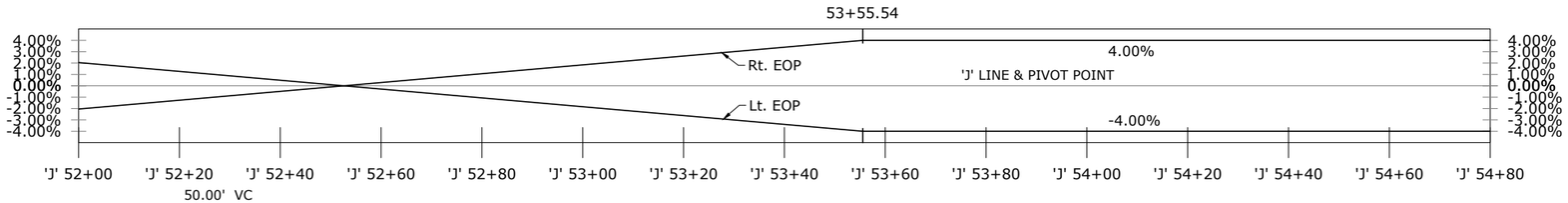
REVISIONS

NO.	DATE:

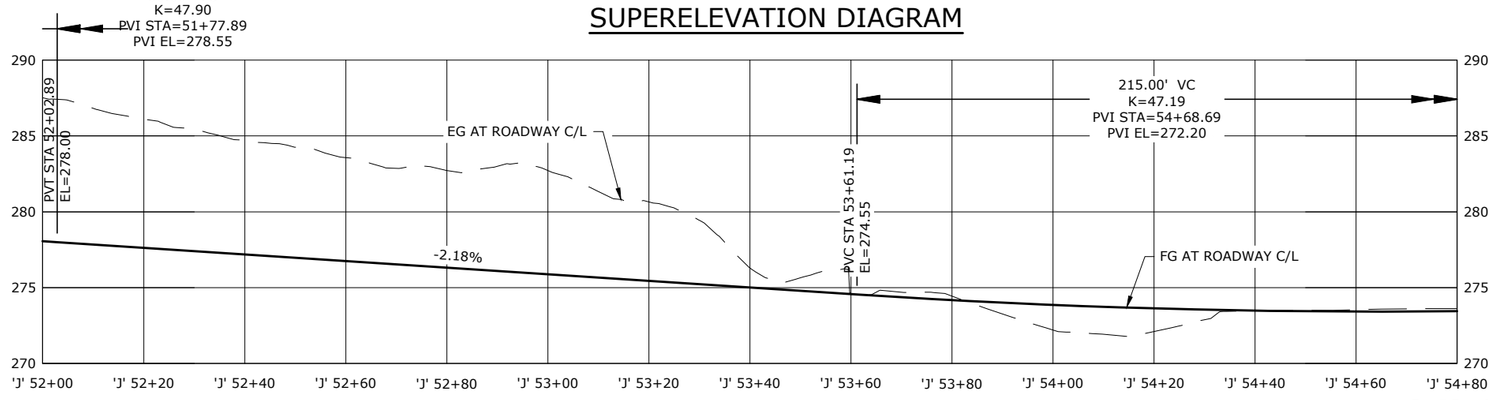
Sheet No.
C17A

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C17A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)





SUPERELEVATION DIAGRAM



JOHNSON ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

(2) INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 79 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 AND RD419)

(3) INSTALL NON-FLARED, TEST LEVEL 2, W=1', GUARDRAIL TERMINAL - 1 EA (SEE ODOT STD DWG RD420)

(5) CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHEETS D06 & D14)

(14) REMOVAL OF SURFACINGS - 128 SY

(32) INSTALL 12-FOOT SINGLE GATE - 1 EA (SEE ODOT STD DWG RD815)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(35) CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)

(37) REMOVAL OF FENCE - 288 LF

(38) REMOVAL OF GUARDRAIL - 183 LF

(39) INSTALL TYPE CL-6R FENCE (BLACK) - 310 LF (SEE ODOT STD DWG RD815)

(50) INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO REACH THE REQUIRED EMBEDMENT DEPTH.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

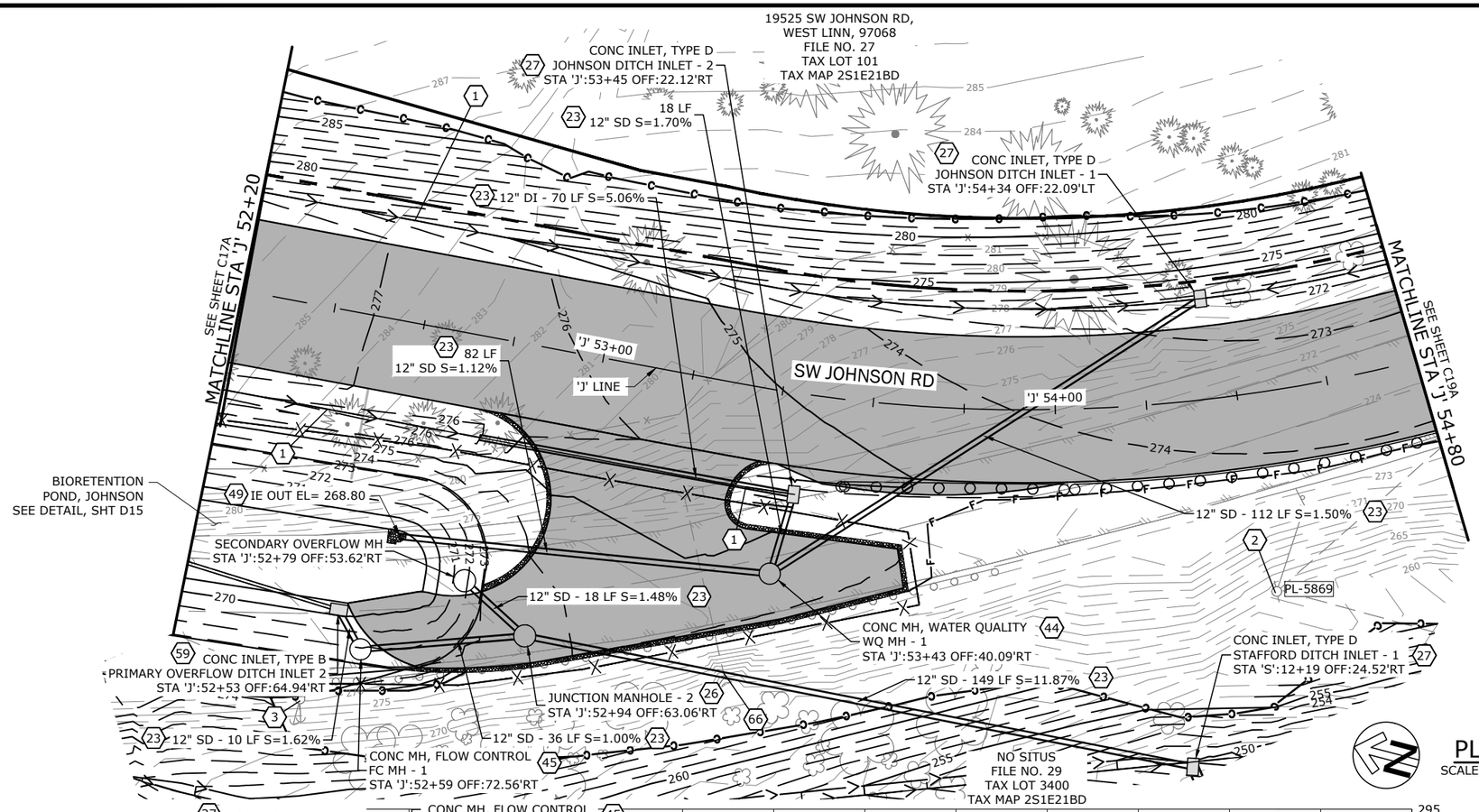
REVISIONS

NO.	DATE:

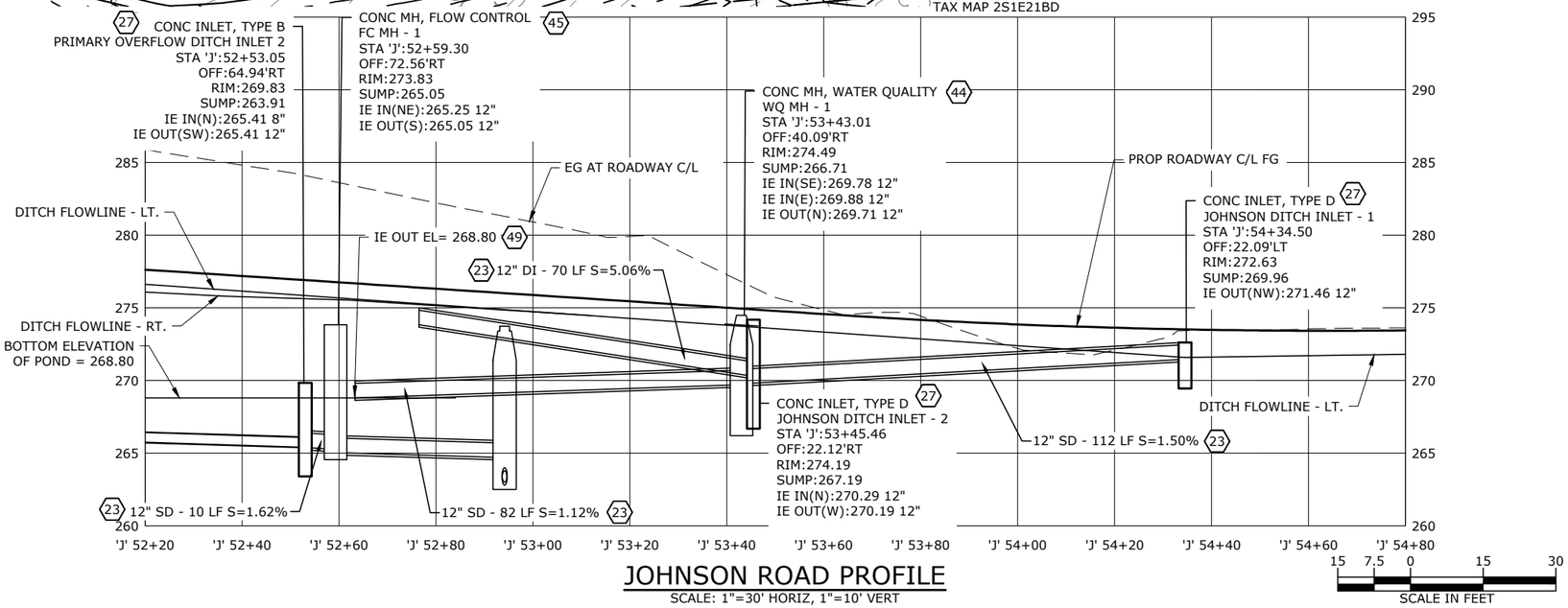
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
C18

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C18 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



JOHNSON ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
26. CONSTRUCT 48" ECCENTRIC MANHOLE (SEE ODOT STD DWG RD366 & WES STD DWG SWM-33)
27. CONSTRUCT CONC INLET, TYPE D (PER ODOT STD DWG RD370) 3' SUMP
44. CONSTRUCT WATER QUALITY MANHOLE (PER ODOT STD DWG RD340)
45. INSTALL STORMWATER FLOW CONTROL MANHOLE (PER WES STD DWG SWM-22)
49. CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
59. CONSTRUCT CONCRETE INLET TYPE B (PER ODOT STD DWG RD368)
66. REMOVE EXISTING CULVERT PIPE - 40 LF

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

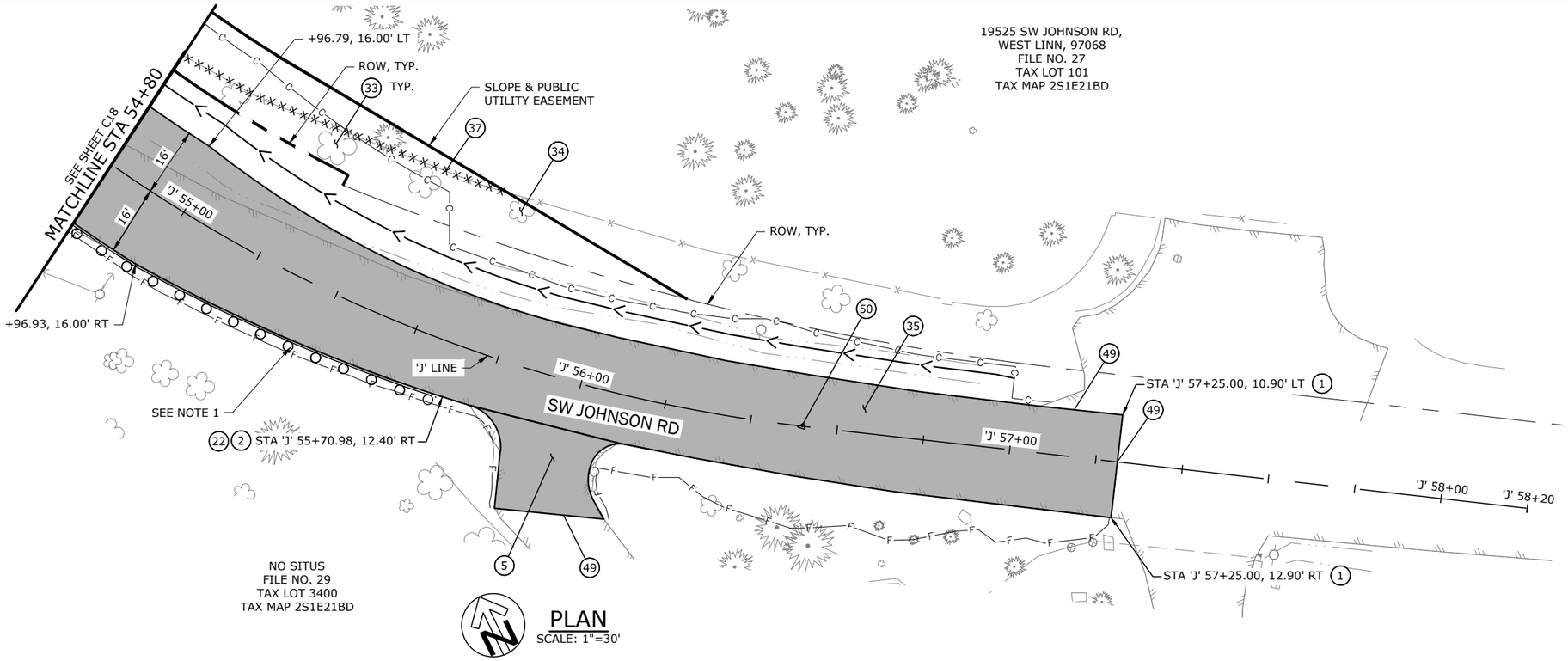
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

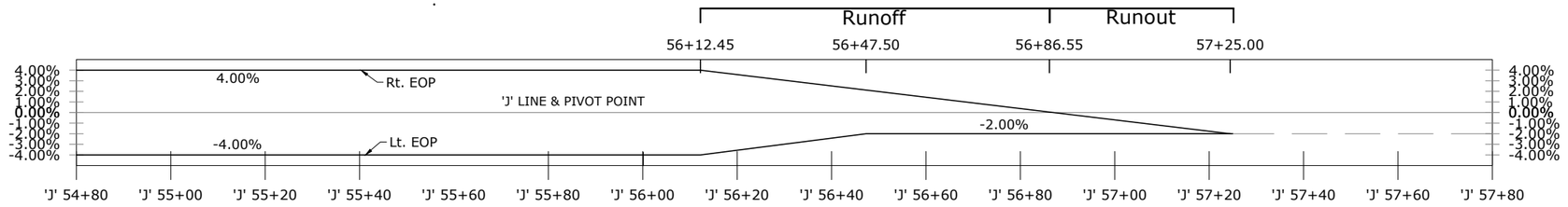
REVISIONS
NO. | DATE:

Sheet No.
C18A

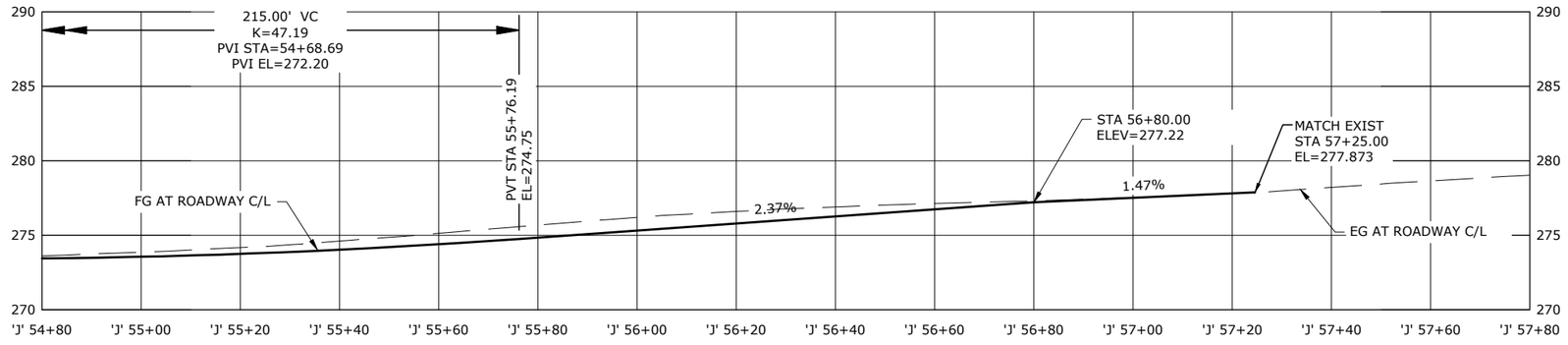
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C18A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



JOHNSON ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

1. MATCH EXIST
2. INSTALL W-BEAM TYPE 2A GUARDRAIL WITH WOOD POSTS, E=0' - 96 LF (SEE ODOT STD DWGS RD402, RD403, RD406, RD407, RD416 & RD419)
5. CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHTS D06 & D08)
22. INSTALL TYPE C GUARDRAIL END PIECE AND TYPE 1 ANCHOR - 1 EA (SEE ODOT STD DWGS RD417, RD450 & RD451)
33. REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)
34. PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)
35. CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)
37. REMOVAL OF FENCE - 82 LF
49. SAWCUT EXIST PAVEMENT - 81 LF (SEE ODOT STD DWG RD610)
50. INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

SHEET NOTES:

1. HAND DIG GUARDRAIL POSTS AS NEEDED TO REACH THE REQUIRED EMBEDMENT DEPTH.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE
STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD
DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

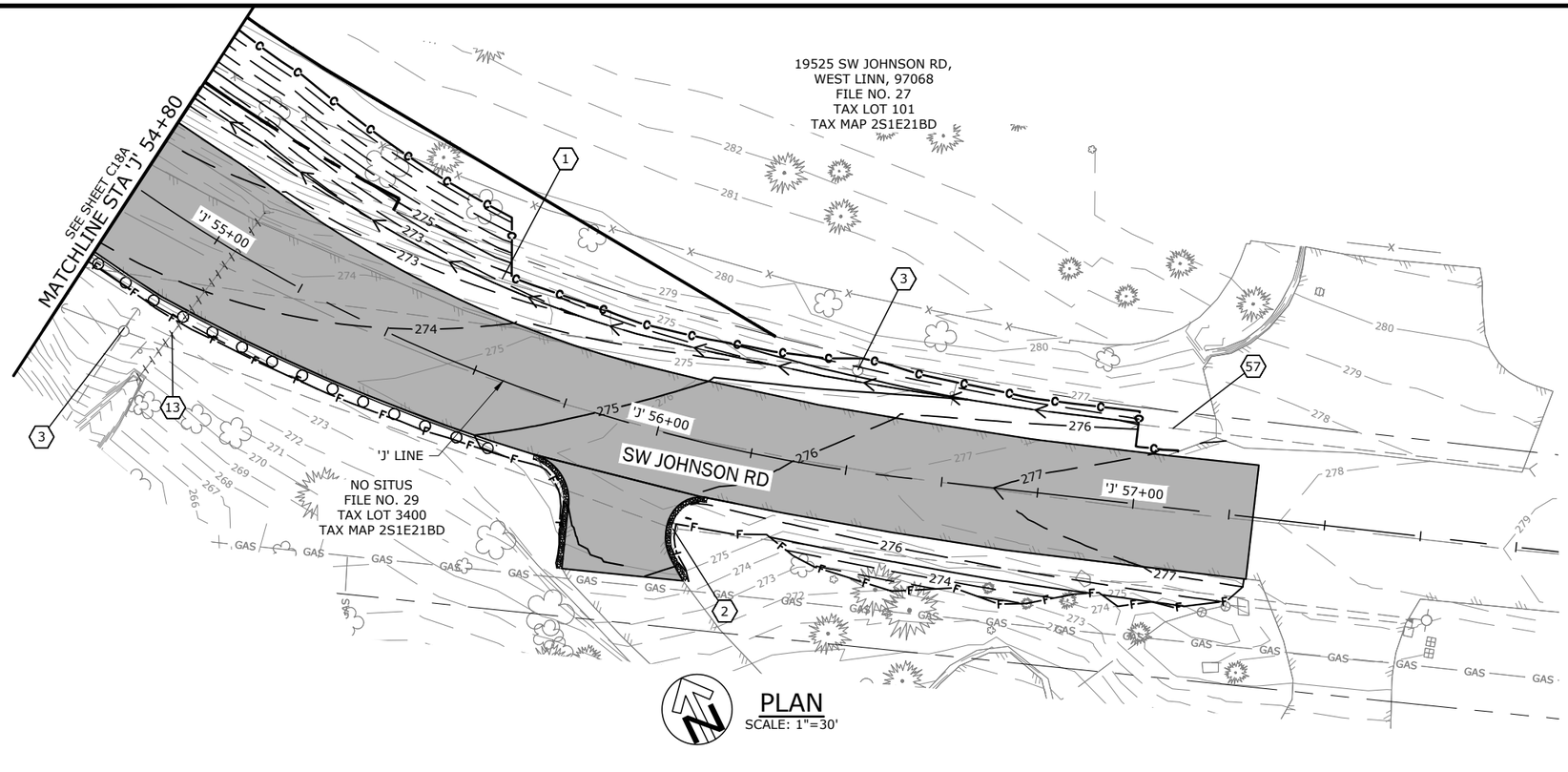
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

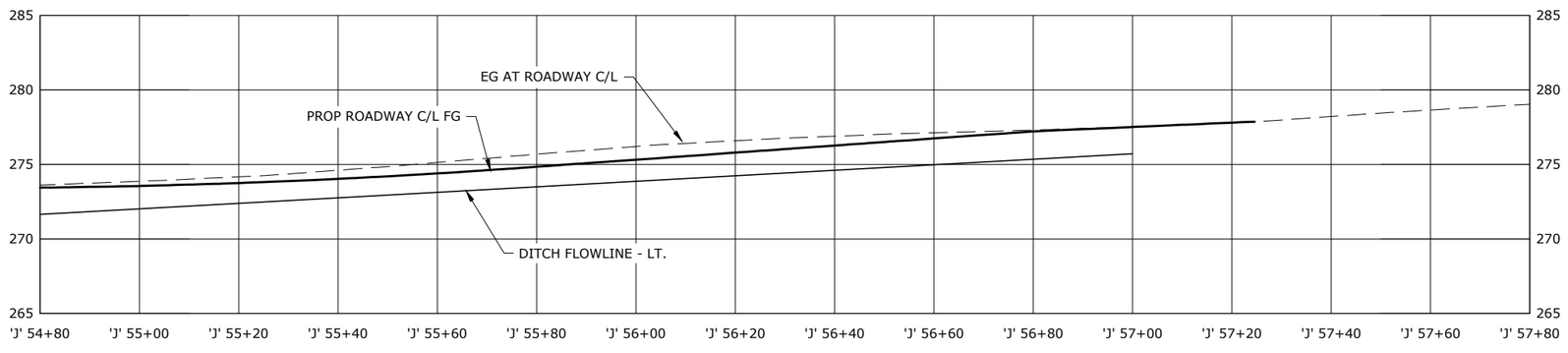
REVISIONS
NO. | DATE:

Sheet No. C19

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C19 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



JOHNSON ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
3. PROTECT EXIST UTILITY POLE & ASSOCIATED GUY WIRE(S)
13. ABANDON EXIST STRUCTURE, 12" CULVERT PIPE, - 44 LF
57. PROTECT EXIST CULVERT

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

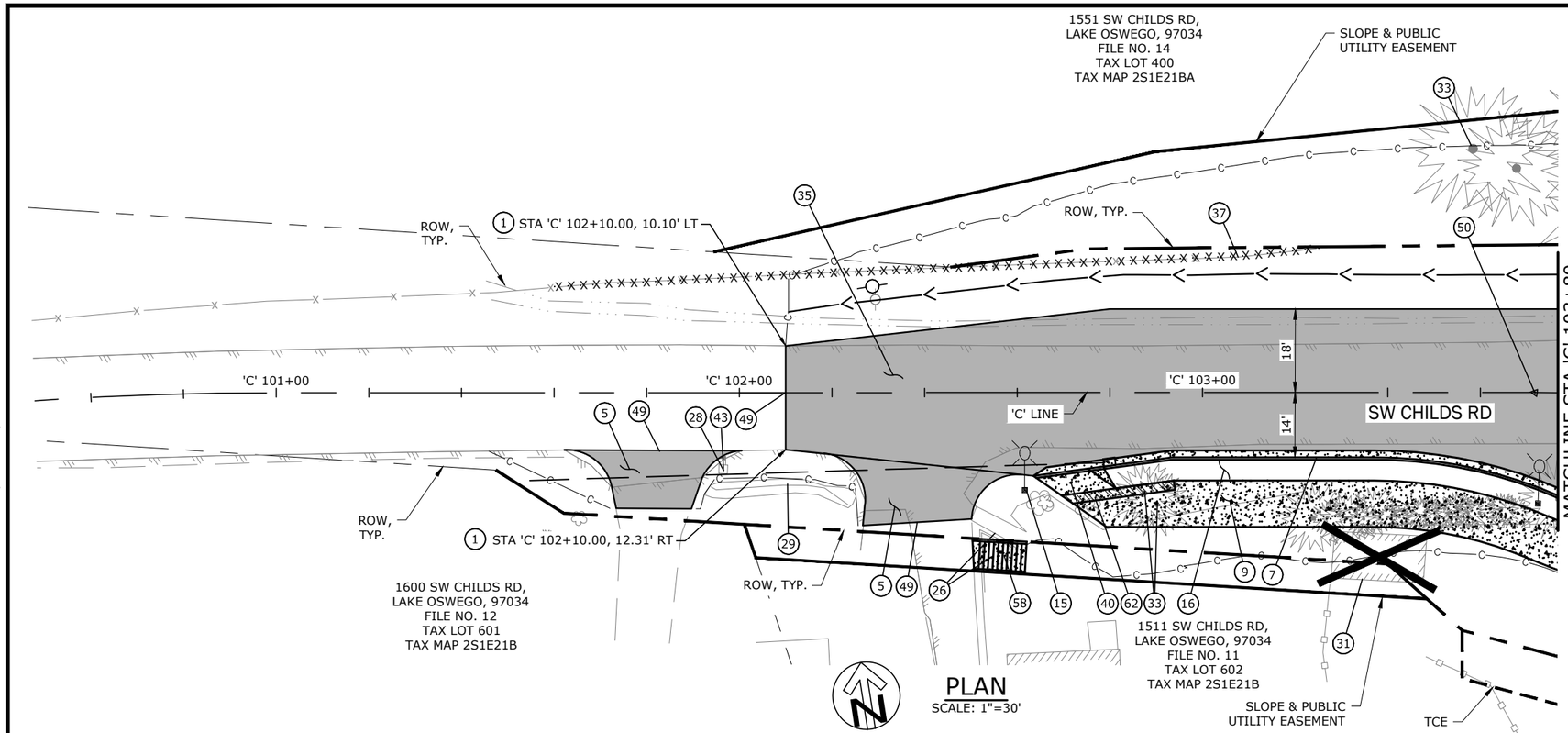
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

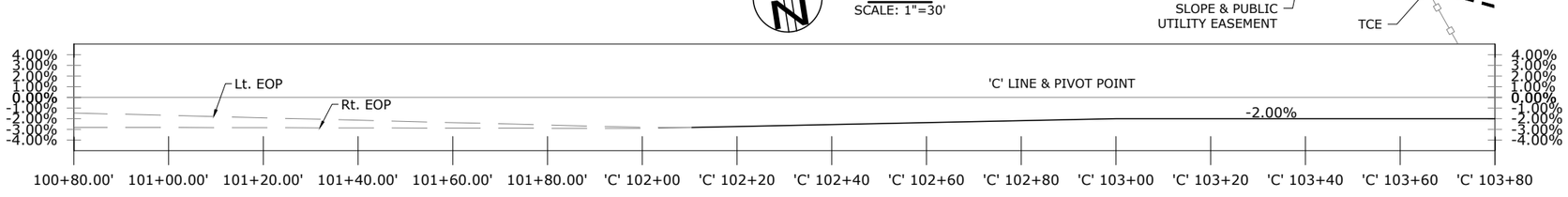
NO.	DATE:

Sheet No.
C19A

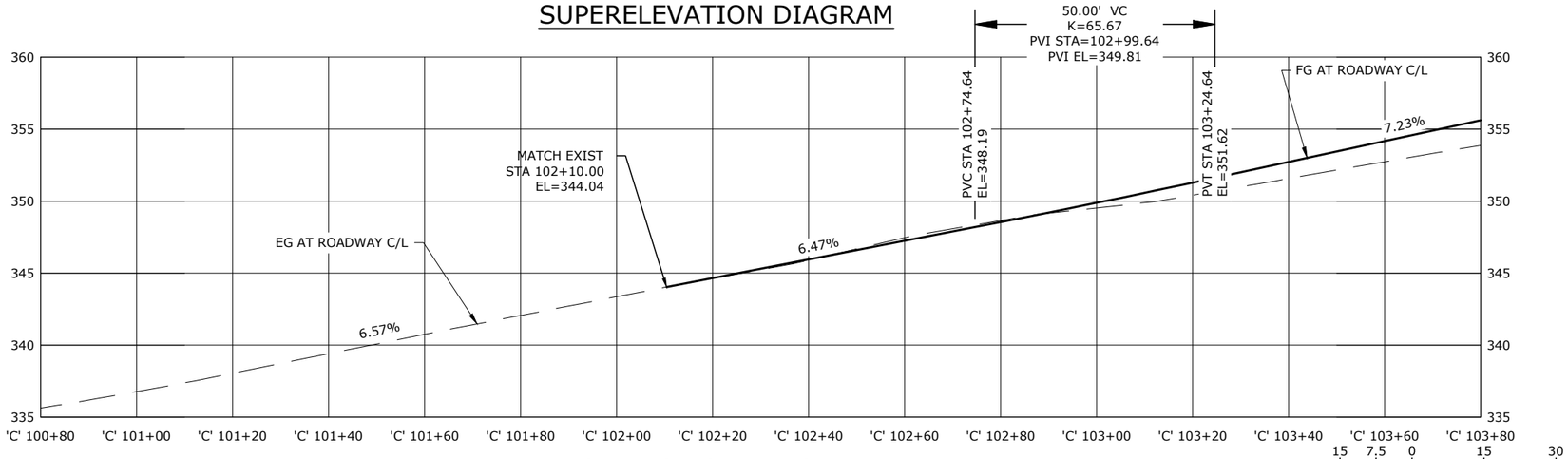
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C19A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



SUPERELEVATION DIAGRAM



CHILDS ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

1. MATCH EXIST
5. CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHEETS D06 & D11)
7. CONSTRUCT STANDARD CURB AND GUTTER (SEE CLACKAMAS COUNTY STD DWG S150)
9. CONSTRUCT STANDARD SIDEWALK (SEE CLACKAMAS COUNTY STD DWG S960)
15. INSTALL ILLUMINATION POLE (SEE IL SHTS)
16. CONSTRUCT PLANTER STRIP (SEE TYPICAL SECTIONS AND LS SHTS FOR DETS)
26. REMOVE EXIST STAIRS AND STACKED STONE RETAINING WALL
28. INSTALL SINGLE MAILBOX SUPPORT - 1 EA (SEE ODOT STD DWGS RD100 & RD101)
29. PROTECT EXIST ROCK WALL
31. REMOVE EXIST STRUCTURE
33. REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)
35. CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)
37. REMOVAL OF FENCE - 166 LF
40. CONSTRUCT BIKE RAMP TRANSITION (SEE CR SHEETS FOR DETAILS)
43. STANDARD MAILBOX, SIZE 1.5 - 1 EA
49. SAWCUT EXIST PAVEMENT - 60 LF (SEE ODOT STD DWG RD610)
50. INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)
58. INSTALL CONCRETE STAIRS (SEE SHT D14 & ODOT STD DWG RD120)
62. INSTALL DETECTABLE GUIDE STRIP - 40 LF (SEE ODOT STD DWG RD909)

SHEET NOTES:

1. SEE CR SHEETS FOR SUPERELEVATION & PROFILE DESIGN WITHIN THE PROPOSED ROUNDABOUT.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

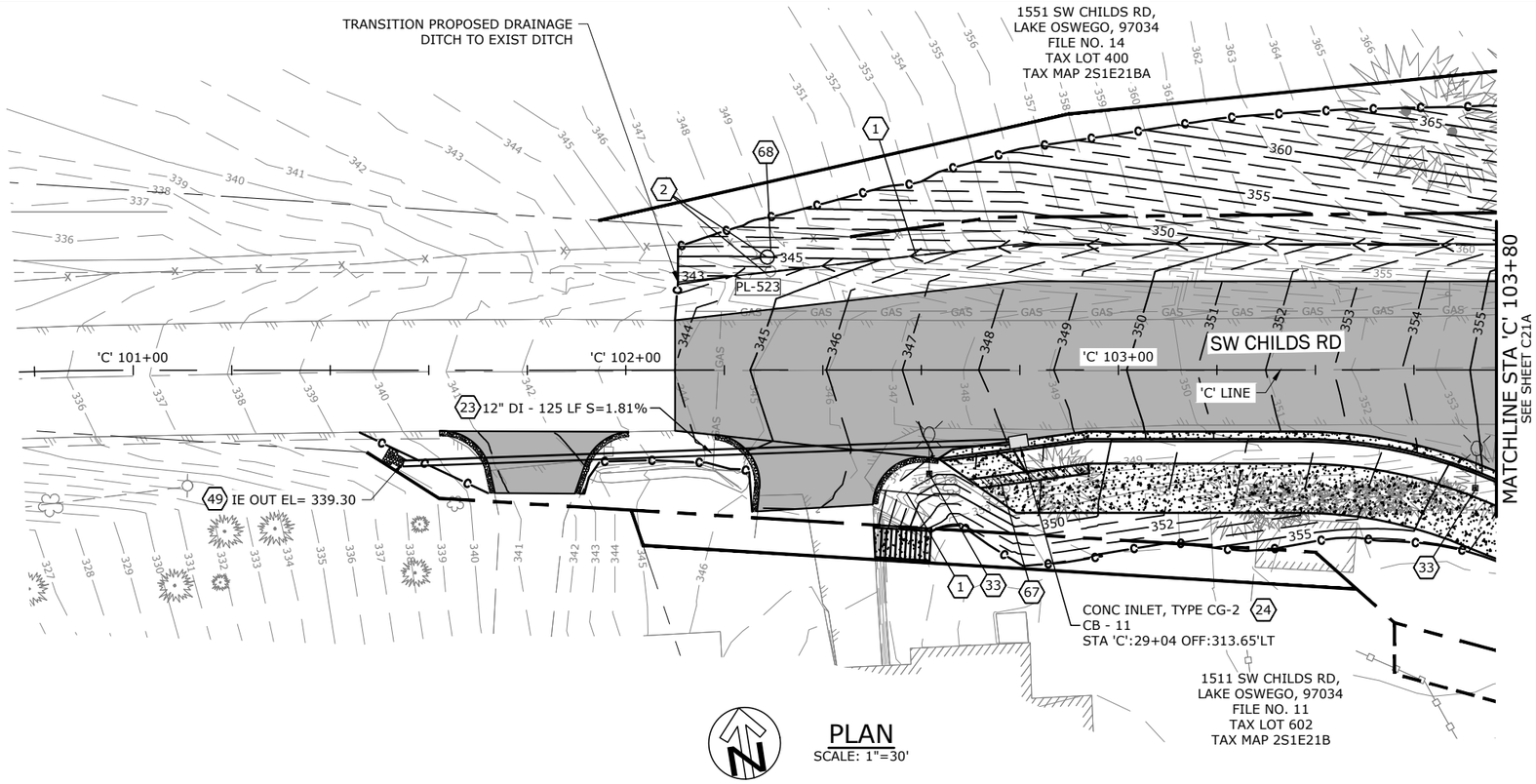
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS
NO. | DATE:

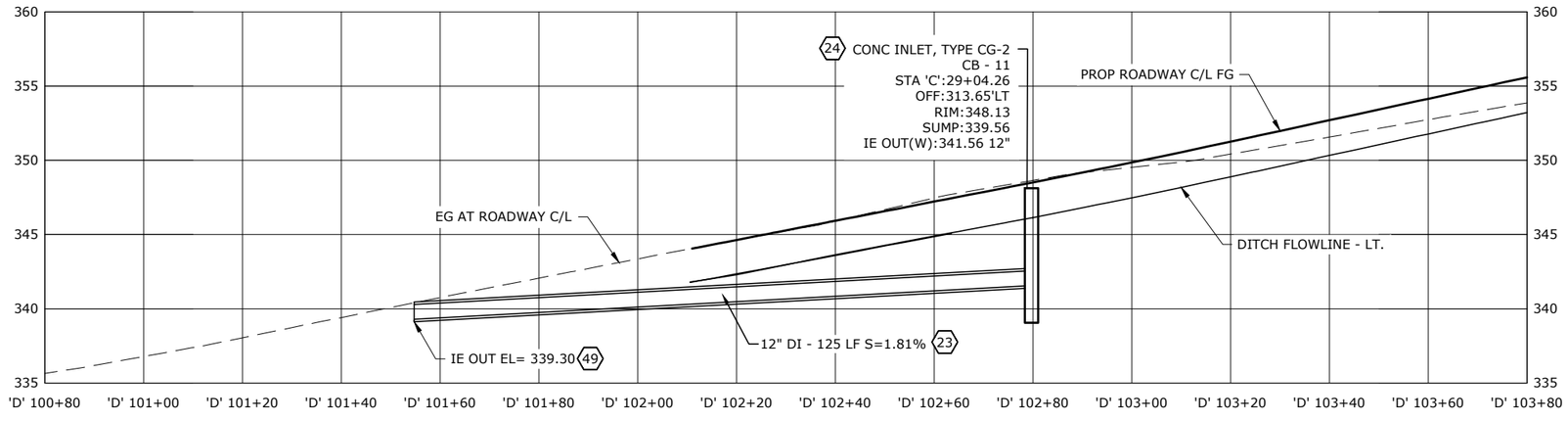
Sheet No.
C20

70 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C20 11/1/2024 2:07 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



CHILDS ROAD PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2. RELOCATE EXIST UTILITY POLE (BY OTHERS)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
24. CONSTRUCT CAST-IN-PLACE TYPE CG-2 INLET 18" MINIMUM SUMP (SEE ODOT STD DWG RD366)
33. INSTALL ILLUMINATION (SEE IL SHEETS)
49. CONSTRUCT RIPRAP OUTFALL (PER WES STD DWG SWM-45)
68. COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

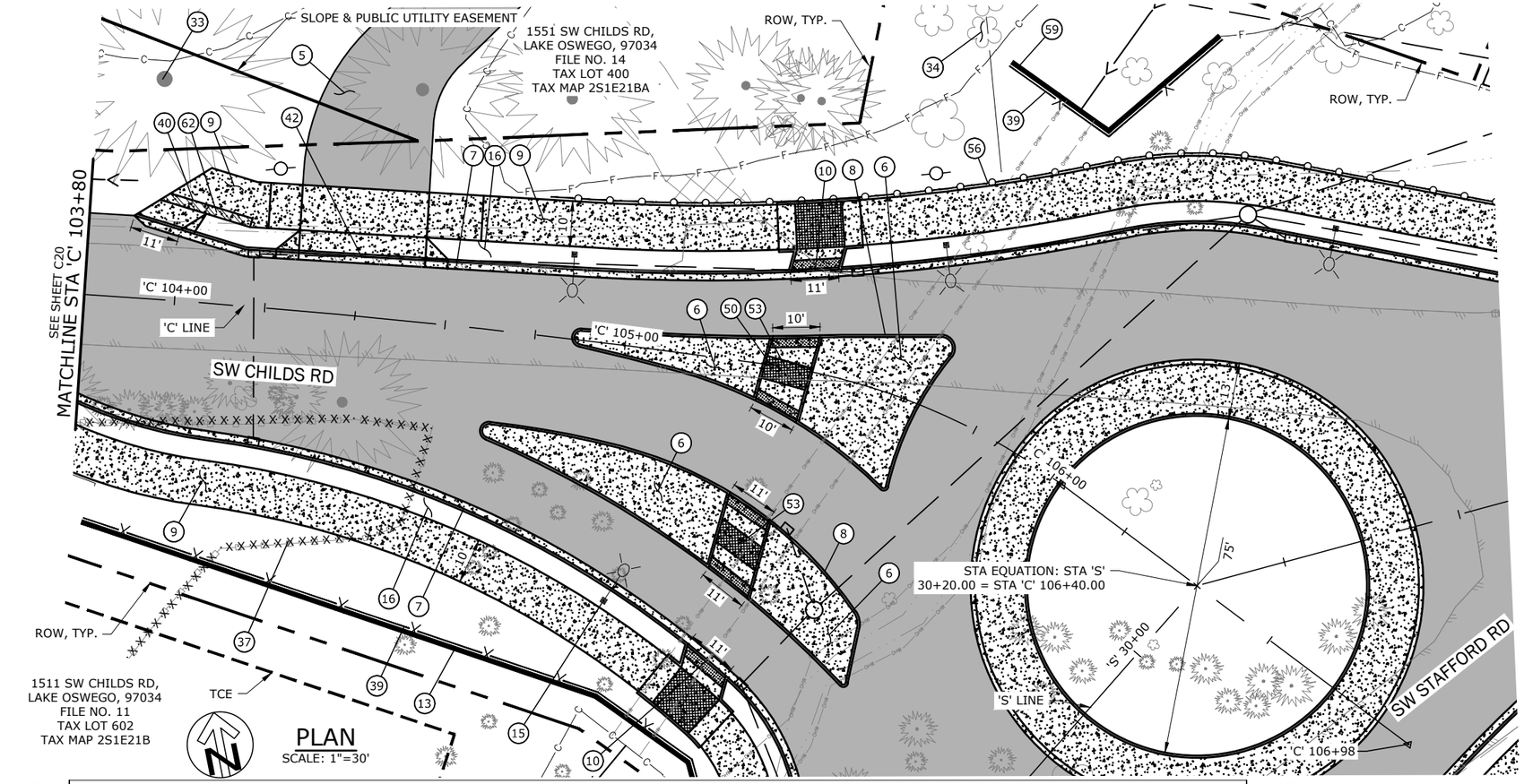
DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RPW/AJR	JSD	NJM

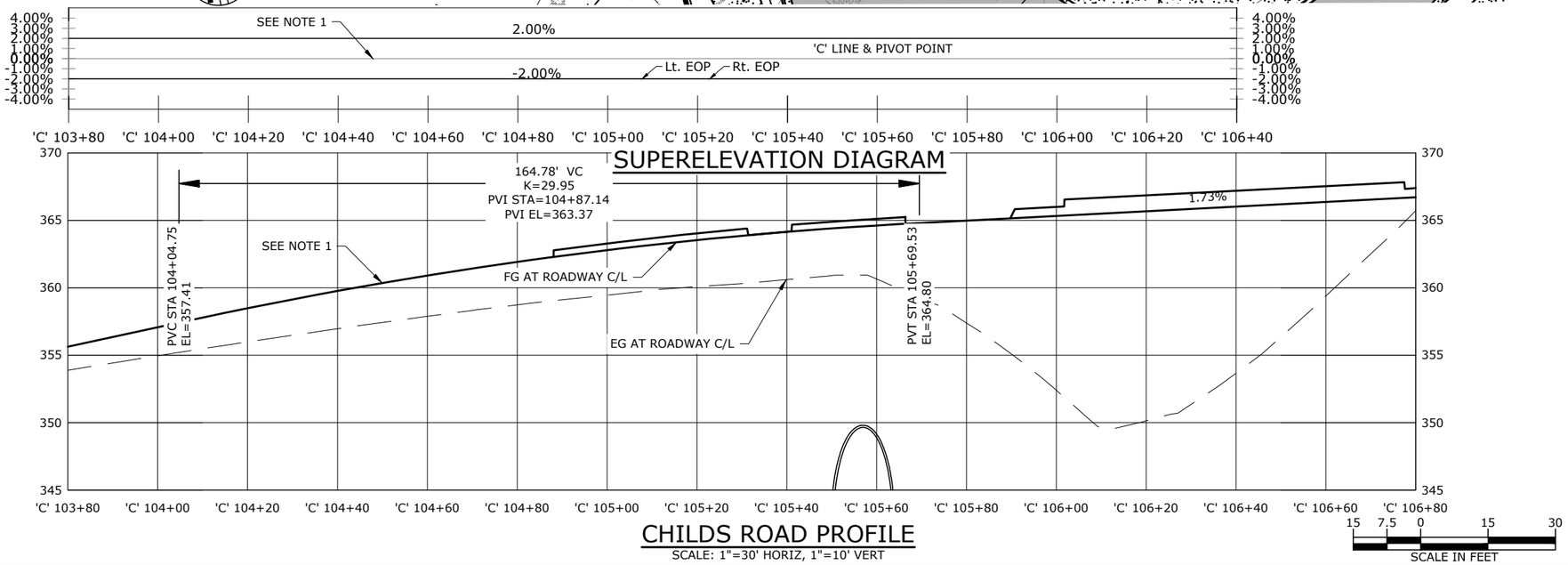
REVISIONS

NO.	DATE:

Sheet No.
C20A

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C20A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)





CHILDS ROAD PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30

SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

CONSTRUCTION KEYNOTES:

(5) CONSTRUCT AC DRIVEWAY APPROACH TRANSITION (SEE SHTS D06 AND D13 FOR DETAILS)

(6) CONSTRUCT CONCRETE ISLAND (SEE ODOT STD DWGS RD705, RD707 & CR SHEETS FOR DETAILS)

(7) CONSTRUCT STANDARD CURB AND GUTTER (SEE CLACKAMAS COUNTY STD DWG S150)

(8) CONSTRUCT STANDARD TYPE C VERTICAL CURB (SEE CLACKAMAS COUNTY STD DWG S100)

(9) CONSTRUCT STANDARD SIDEWALK (SEE CLACKAMAS COUNTY STD DWG S960)

(10) CONSTRUCT PERPENDICULAR CURB RAMP. INSTALL TRUNCATED DOMES (SEE ODOT STD DWG RD902, RD910 & CR SHEETS)

(13) CONSTRUCT 'W1' MSE RETAINING WALL (SEE R SHTS)

(15) INSTALL ILLUMINATION POLE (SEE IL SHTS)

(16) CONSTRUCT PLANTER STRIP (SEE TYPICAL SECTIONS AND LS SHTS FOR DETS)

(33) REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)

(34) PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)

(37) REMOVAL OF FENCE - 173 LF

(39) INSTALL TYPE CL-6R FENCE (BLACK) - 404 LF (SEE ODOT STD DWG RD815)

(40) CONSTRUCT BIKE RAMP TRANSITION (SEE CR SHEETS FOR DETAILS)

(42) CONSTRUCT STANDARD DRIVEWAY APRON, COMMERCIAL (SEE CLACKAMAS COUNTY STD DWG D650 & SHEET D13 FOR DETAILS)

(50) INSTALL MONUMENT BOX - 1 EA (SEE SHT HC02 & CLACKAMAS COUNTY STD DWG M150)

(53) CONSTRUCT ACCESSIBLE ROUTE ISLAND. INSTALL TRUNCATED DOMES (SEE ODOT STD DWGS RD710, RD906 & CR SHEETS FOR DETAILS)

(56) INSTALL METAL HANDRAIL, TWO RAIL - 440 LF (SEE ODOT STD DWGS RD770 & RD771)

(59) CONSTRUCT 'W2' RETAINING WALL (SEE BC SHEETS)

(62) INSTALL DETECTABLE GUIDE STRIP - 30 LF (SEE ODOT STD DWG RD909)

SHEET NOTES:

1. SEE CR SHEETS FOR SUPERELEVATION & PROFILE DESIGN WITHIN THE PROPOSED ROUNDABOUT.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROADWAY PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

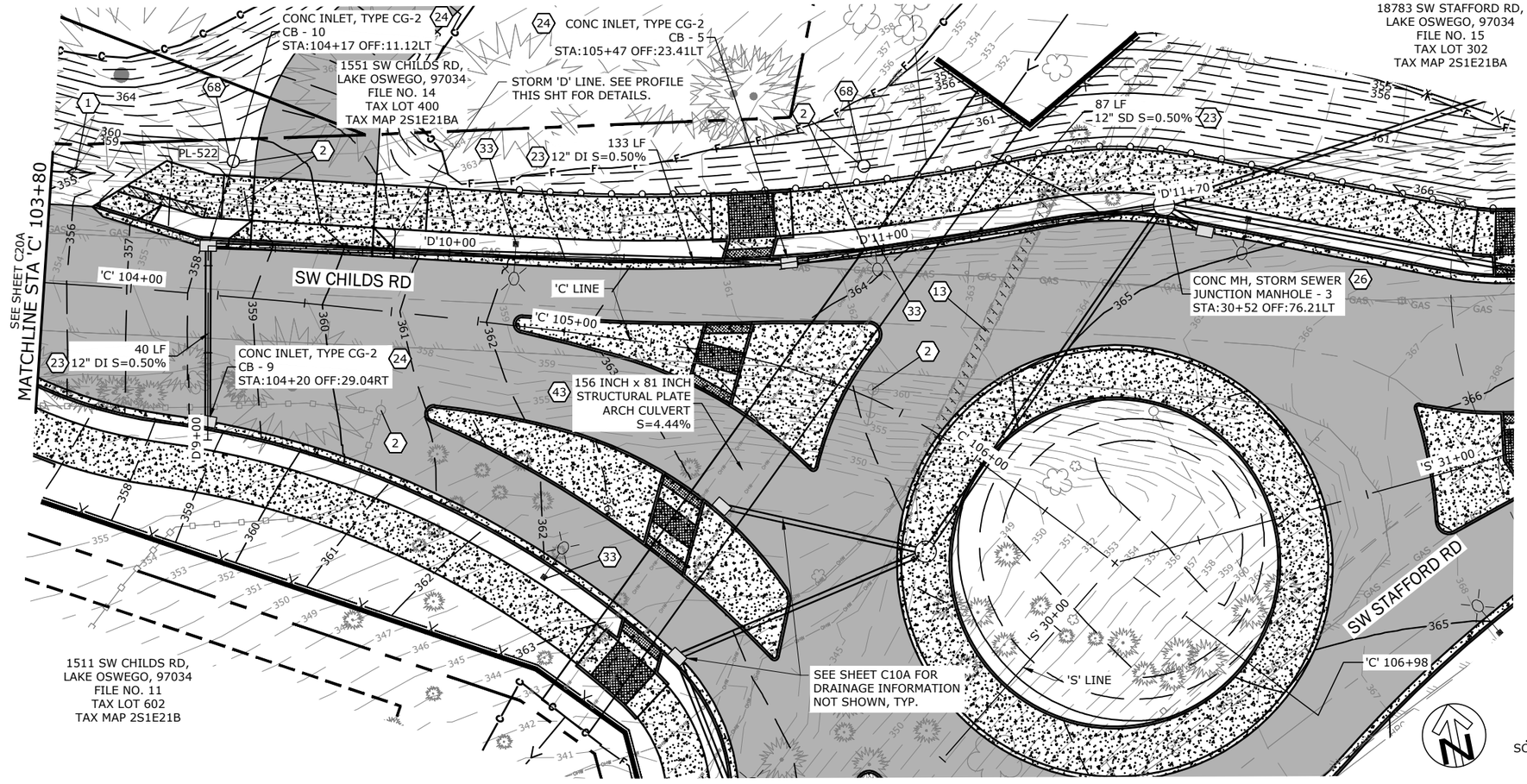
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

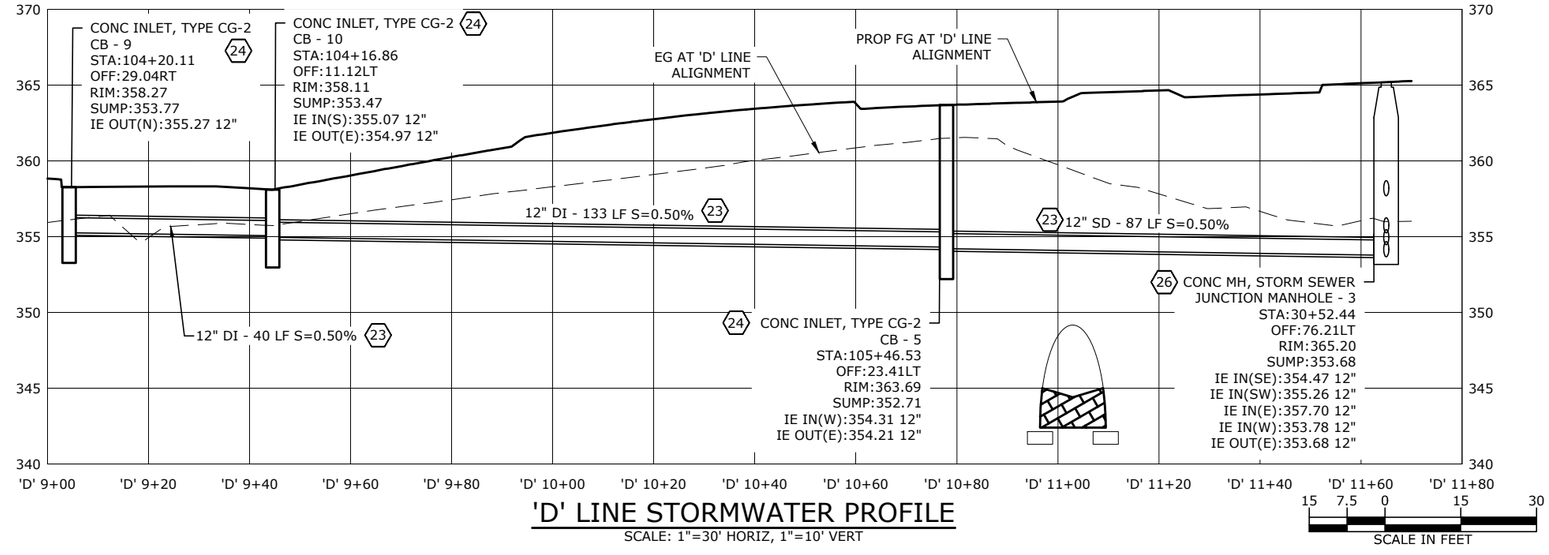
NO.	DATE:

Sheet No. C21

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C21 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



'D' LINE STORMWATER PROFILE

SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1	CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
2	RELOCATE EXIST UTILITY POLE (BY OTHERS)
13	ABANDON EXIST STRUCTURE (SEE SHEET C10A)
23	INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)
24	CONSTRUCT CAST-IN-PLACE TYPE CG-2 INLET 18" MINIMUM SUMP (SEE ODOT STD DWG RD366)
26	CONSTRUCT 48" ECCENTRIC MANHOLE (SEE ODOT STD DWG RD366 & WES STD DWG SWM-33)
33	INSTALL ILLUMINATION (SEE IL SHEETS)
43	SEE BC SHEETS FOR CULVERT INSTALLATION DETAILS
68	COMPLETE GRADING FOR PROPOSED POLE LOCATION ACCORDING TO 00220.40(b).

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

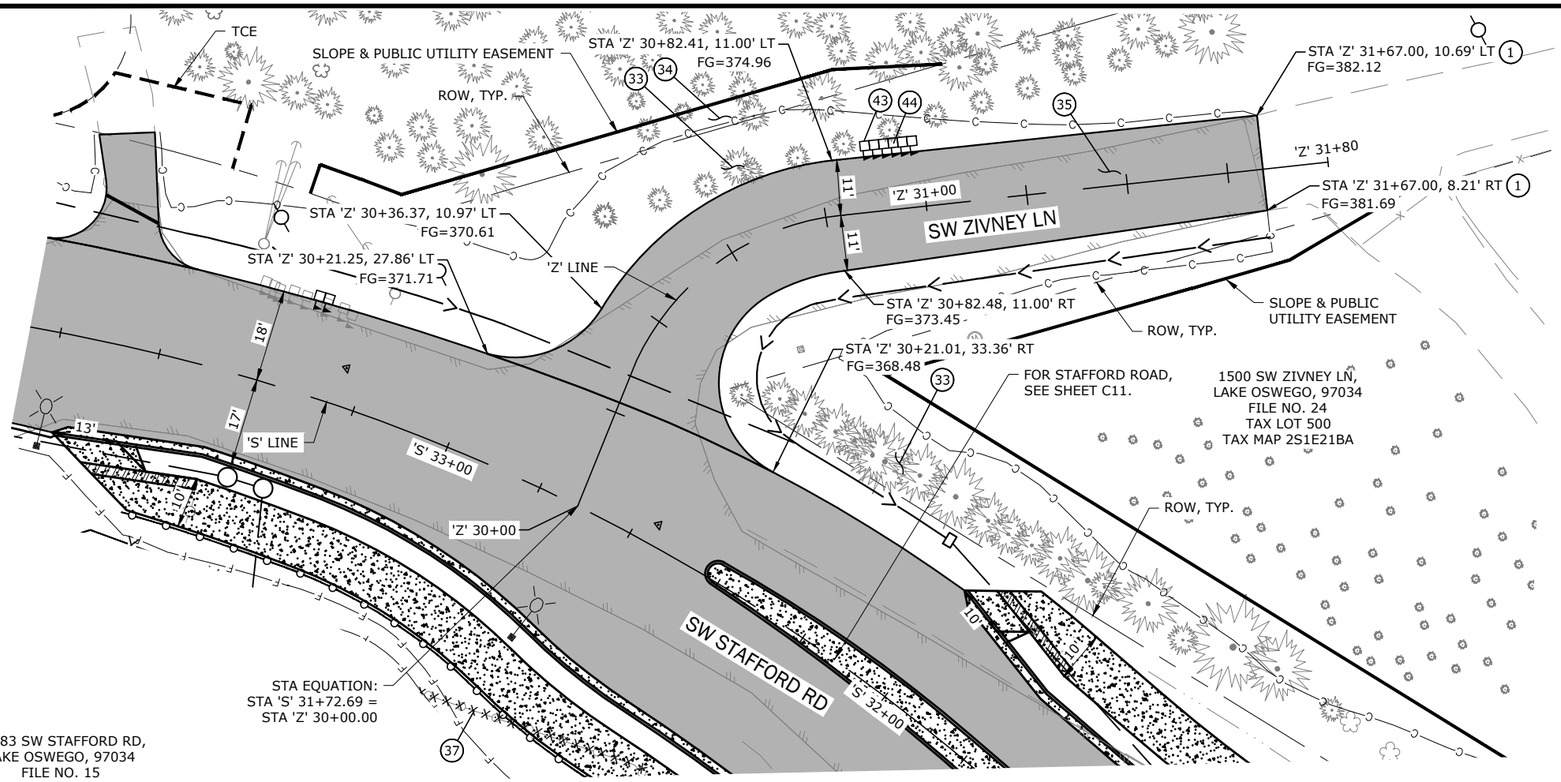
DESIGNED BY: RPW / AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

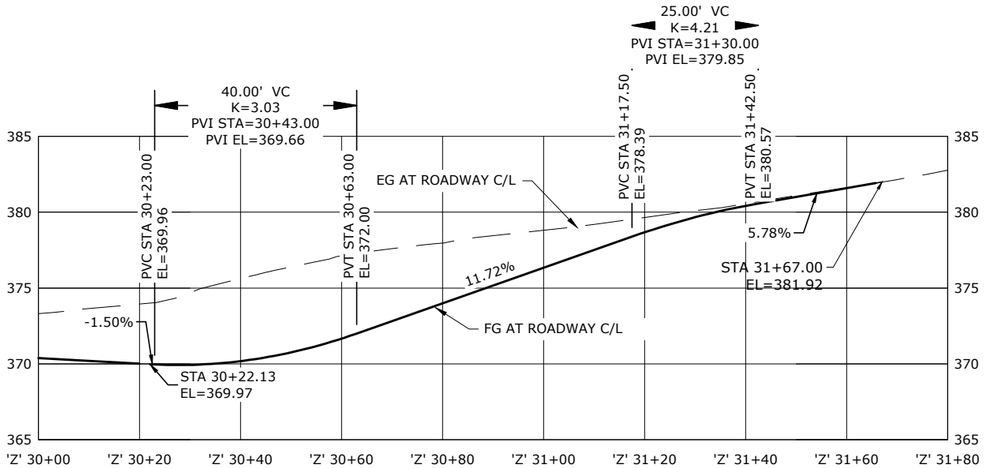
NO.	DATE:

Sheet No.
C21A

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C21A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



ZIVNEY LANE PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

CONSTRUCTION KEYNOTES:

1. MATCH EXIST
33. REMOVE EXIST TREES WITHIN ROW AND ROADWAY CUT/FILL (SEE EC SHTS)
34. PROTECT EXIST TREE (SEE EC SHTS FOR TREE PROTECTION AND/OR REMOVALS)
35. CONSTRUCT FULL-DEPTH ROADWAY RECONSTRUCTION (SEE TYPICAL SECTIONS)
37. REMOVAL OF FENCE - 54 LF
43. STANDARD MAILBOX, SIZE 1.5 - 6 EA
44. INSTALL MULTIPLE MAILBOX SUPPORT - 2 EA (SEE ODOT STD DWGS RD100 & RD101)

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY PLAN AND PROFILE
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

PROJECT MANAGER: JONATHAN HANGARTNER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

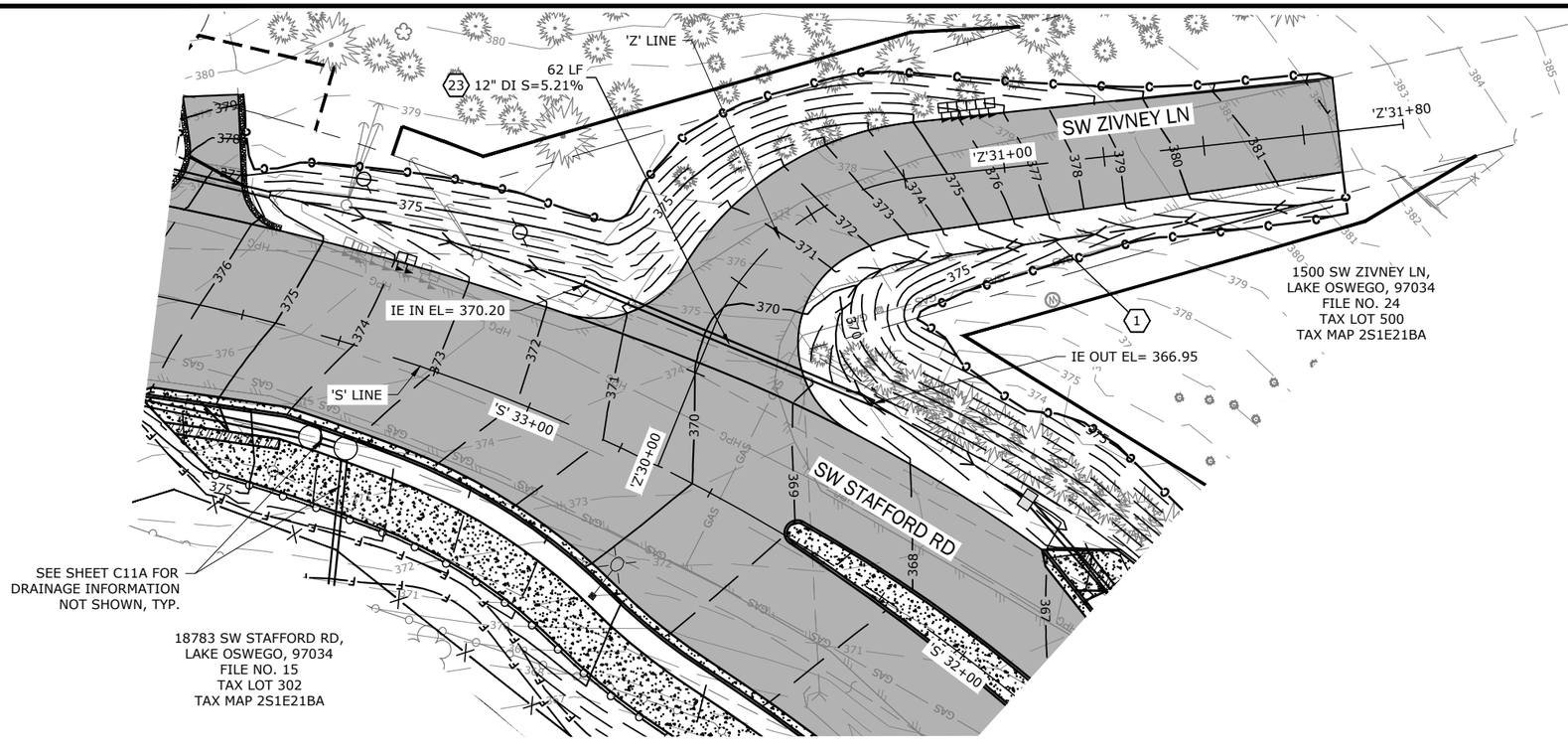
NO.	DATE:

Sheet No. C22

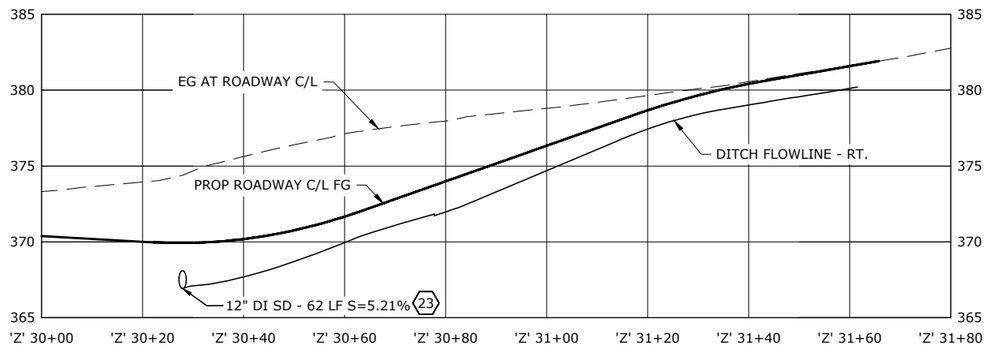
74 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2.dwg C22 10/31/2024 9:57 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



ZIVNEY LANE PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

CONSTRUCTION KEYNOTES:

1. CONSTRUCT V-DITCH (SEE TYPICAL SECTIONS)
23. INSTALL STORM SEWER PIPE & BACKFILL (PER CLACKAMAS COUNTY STD DETAIL U200)

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STORMWATER & UTIL PLAN & PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

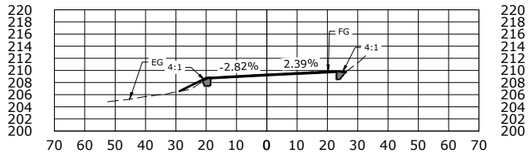
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

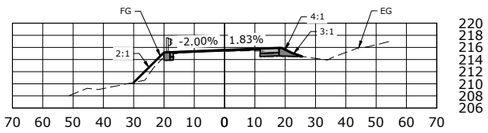
NO.	DATE:

Sheet No.
C22A

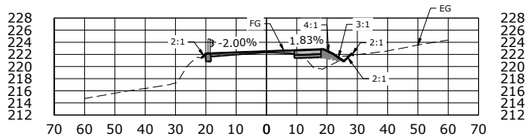
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-2-UTIL.dwg C22A 10/31/2024 4:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



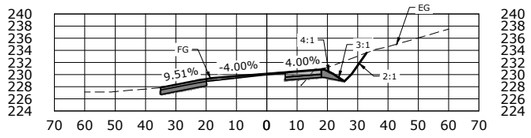
STA 'S' 6+00



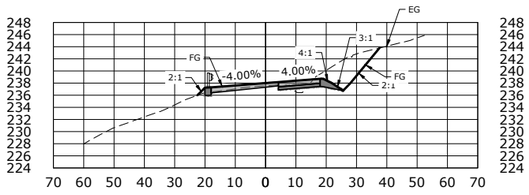
STA 'S' 7+00



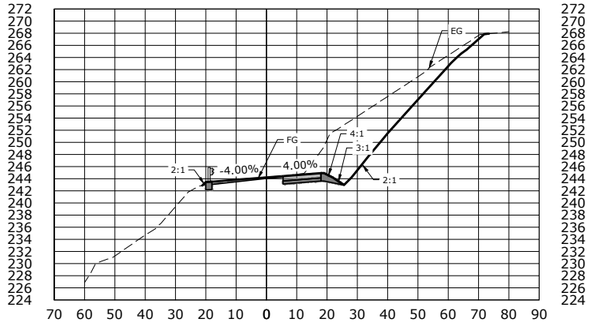
STA 'S' 8+00



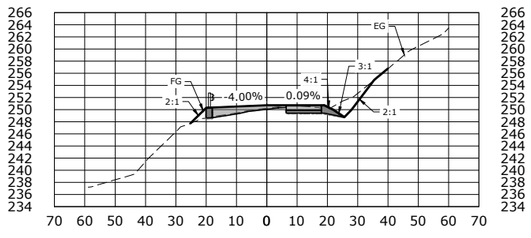
STA 'S' 9+00



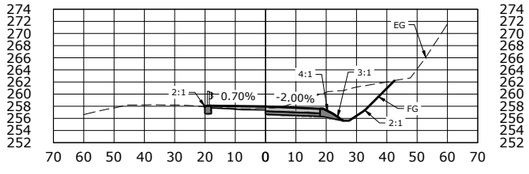
STA 'S' 10+00



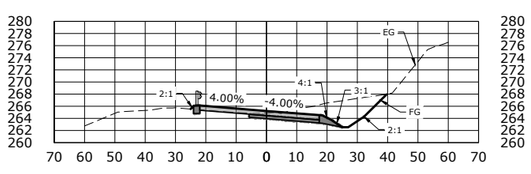
STA 'S' 11+00



STA 'S' 12+00



STA 'S' 13+00



STA 'S' 14+00

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

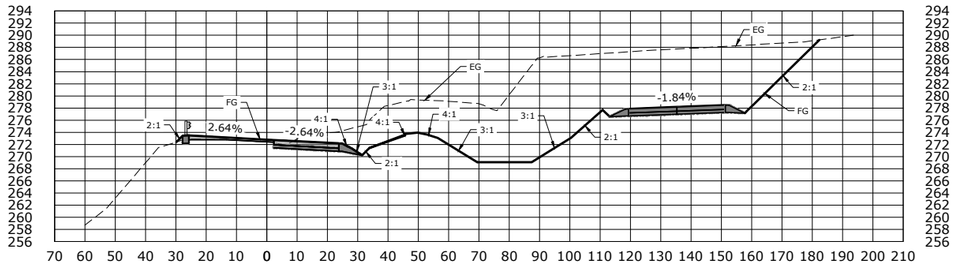
NO.	DATE:

Sheet No.
C23

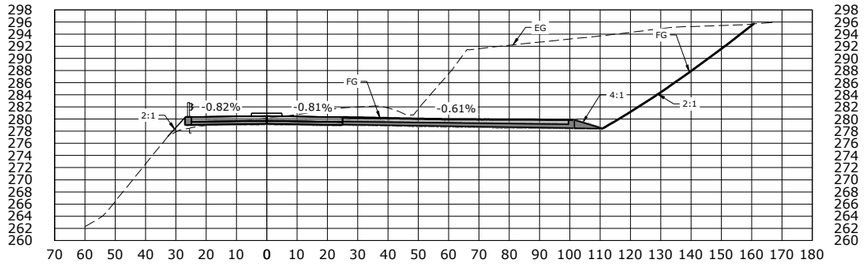
76 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

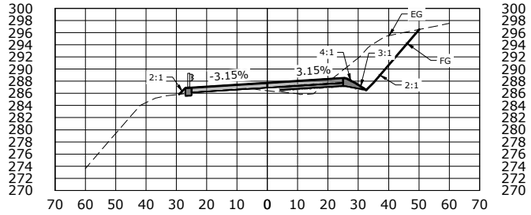
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C23 10/2/2024 11:31 AM RILEY.WIGGINS 24.1s (LMS Tech)



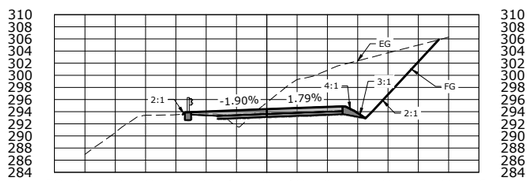
STA 'S' 15+00



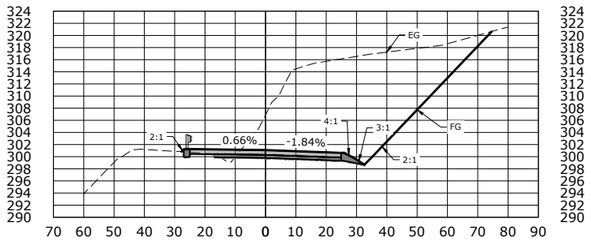
STA 'S' 16+00



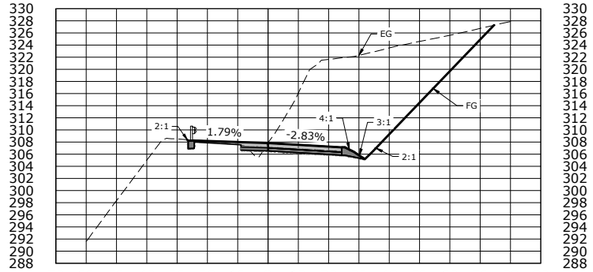
STA 'S' 17+00



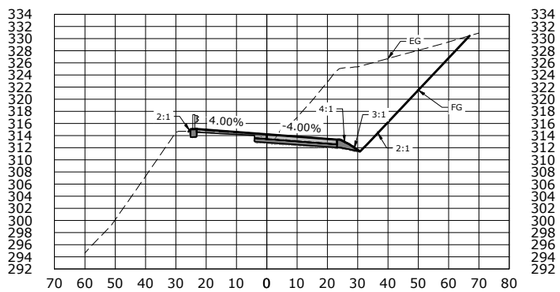
STA 'S' 18+00



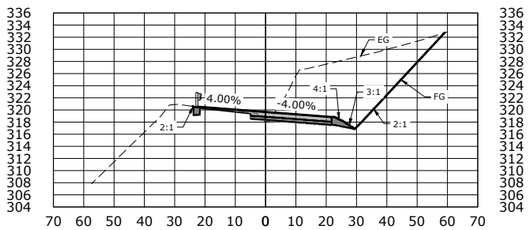
STA 'S' 19+00



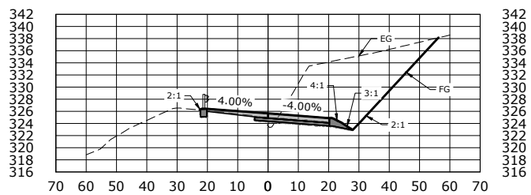
STA 'S' 20+00



STA 'S' 21+00



STA 'S' 22+00



STA 'S' 23+00

William Ray Adams III 2024.10.31

RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

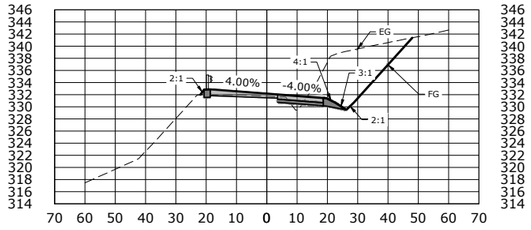
NO.	DATE:

Sheet No. C24

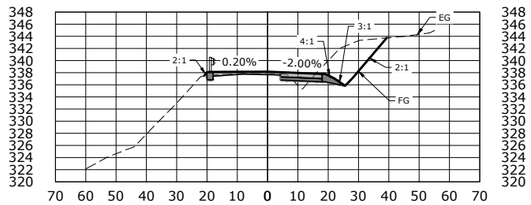
77 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

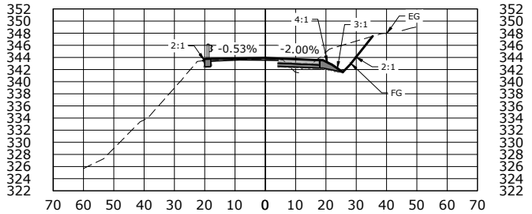
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C24 11/1/2024 2:02 PM RILEY.WIGGINS 24.1s (LMS Tech)



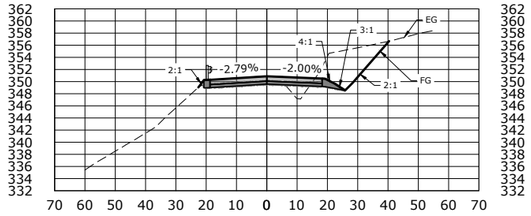
STA 'S' 24+00



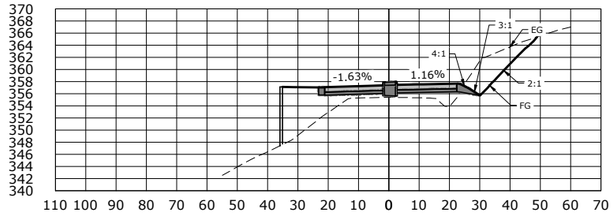
STA 'S' 25+00



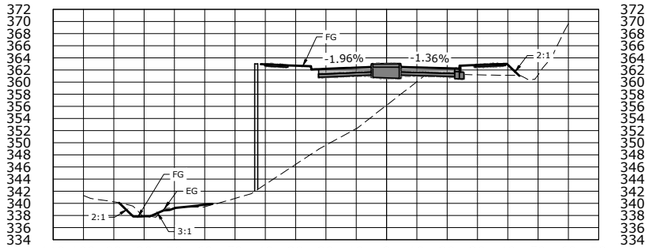
STA 'S' 26+00



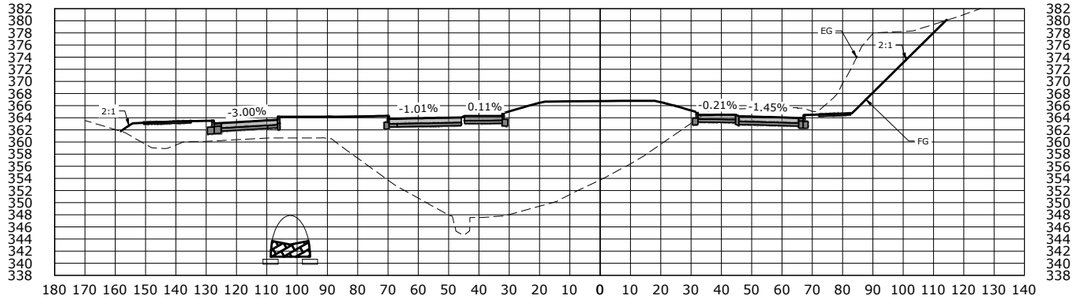
STA 'S' 27+00



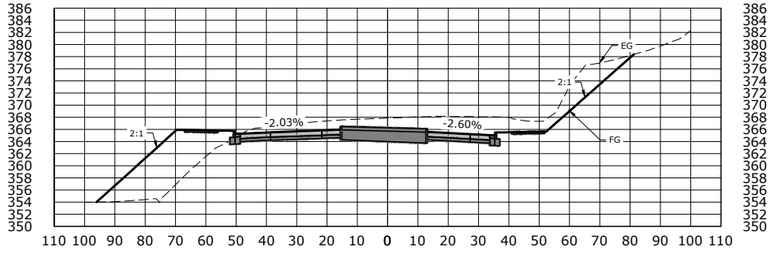
STA 'S' 28+00



STA 'S' 29+00



STA 'S' 30+00



STA 'S' 31+00

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

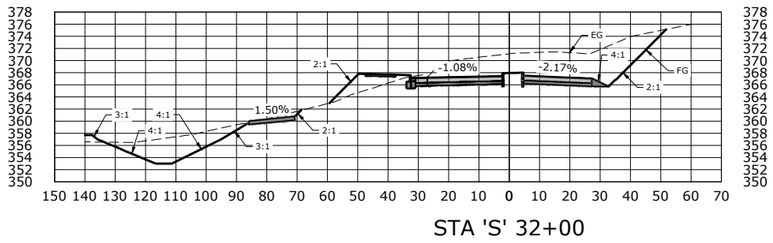
NO.	DATE:

Sheet No.
C25

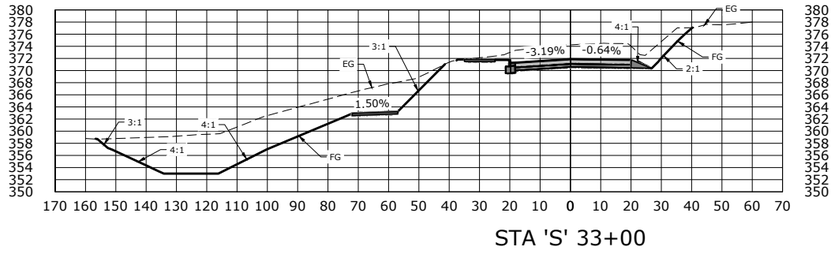
78 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

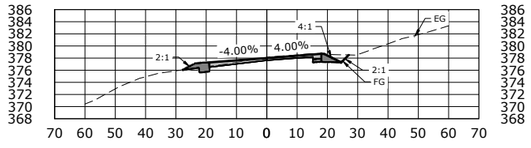
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C25 10/2/2024 11:31 AM RILEY.WIGGINS 24.1s (LMS Tech)



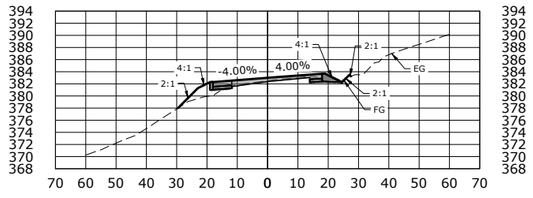
STA 'S' 32+00



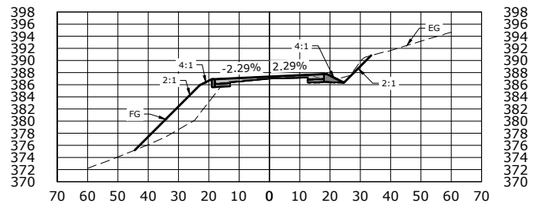
STA 'S' 33+00



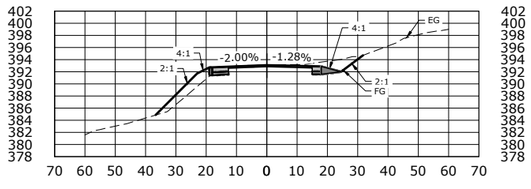
STA 'S' 34+00



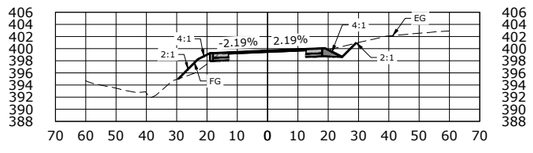
STA 'S' 35+00



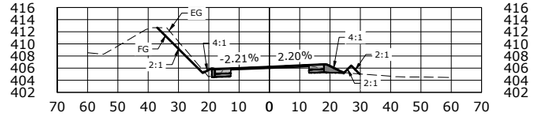
STA 'S' 36+00



STA 'S' 37+00



STA 'S' 38+00



STA 'S' 39+00

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

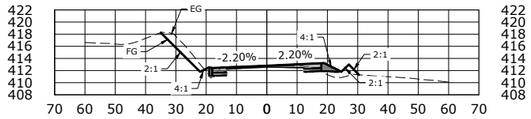
NO.	DATE:

Sheet No.
C26

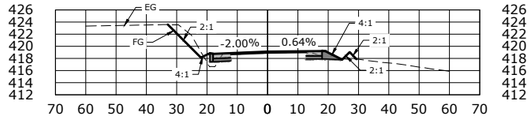
79 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

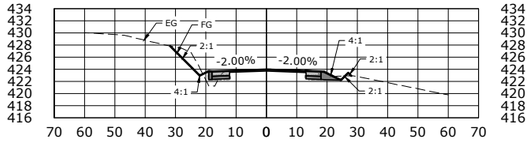
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C26 10/2/2024 11:31 AM RILEY.WIGGINS 24.1s (LMS Tech)



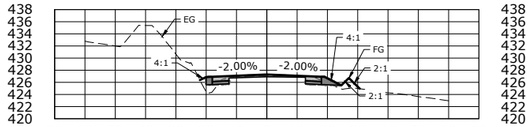
STA 'S' 40+00



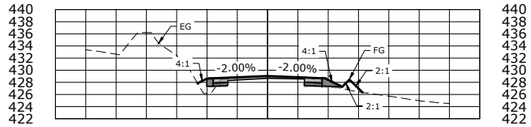
STA 'S' 41+00



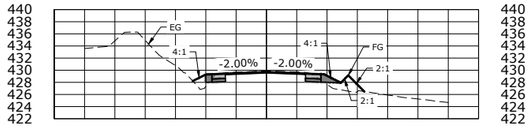
STA 'S' 42+00



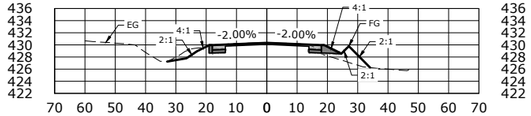
STA 'S' 43+00



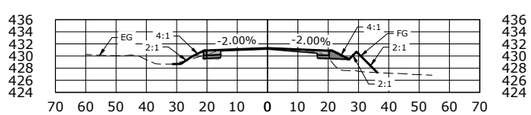
STA 'S' 44+00



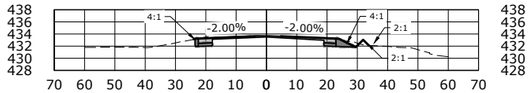
STA 'S' 45+00



STA 'S' 46+00



STA 'S' 47+00



STA 'S' 48+00

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

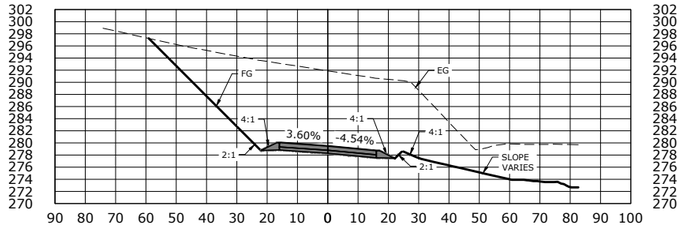
NO.	DATE:

Sheet No.
C27

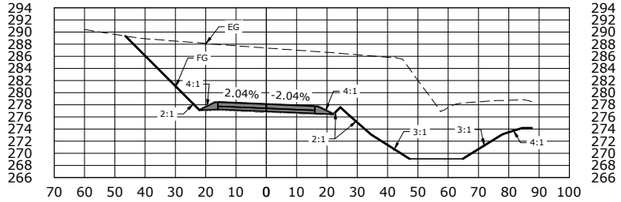
80 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

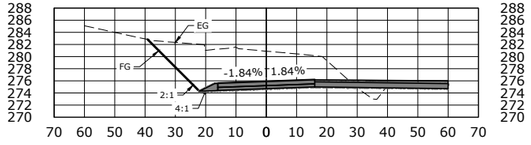
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C27 10/2/2024 11:31 AM RILEY.WIGGINS 24.1s (LMS Tech)



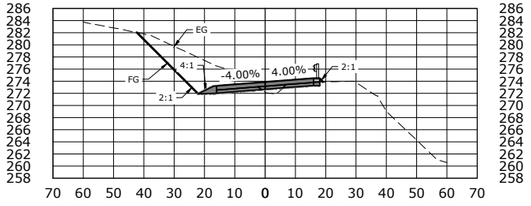
STA 'J' 51+00



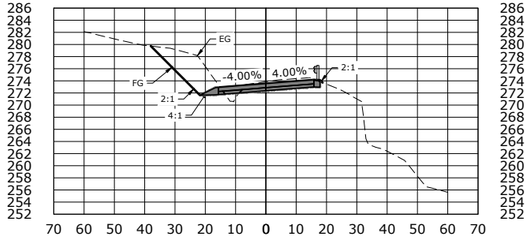
STA 'J' 52+00



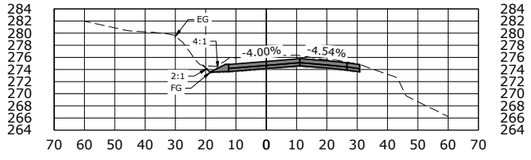
STA 'J' 53+00



STA 'J' 54+00



STA 'J' 55+00



STA 'J' 56+00

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

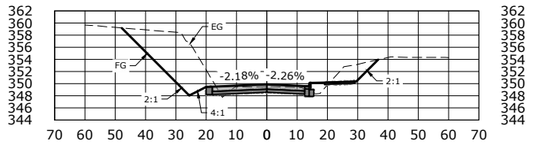
NO.	DATE:

Sheet No.
C28

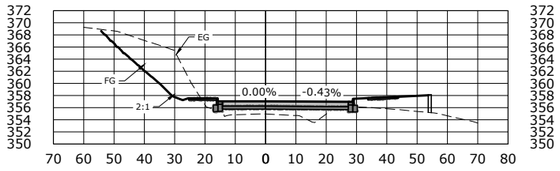
81 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

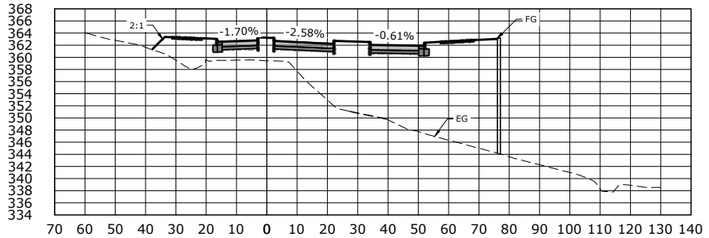
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C28 10/2/2024 11:31 AM RILEY.WIGGINS 24.1s (LMS Tech)



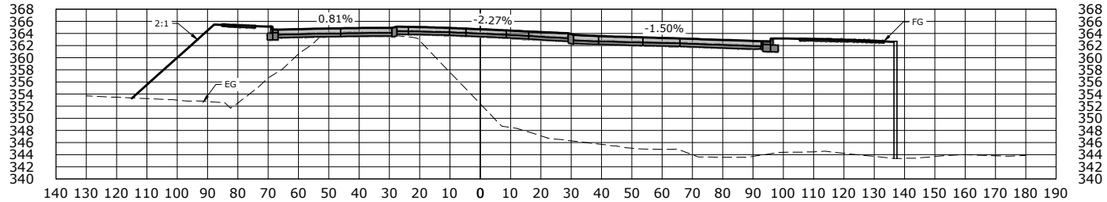
STA 'C' 103+00



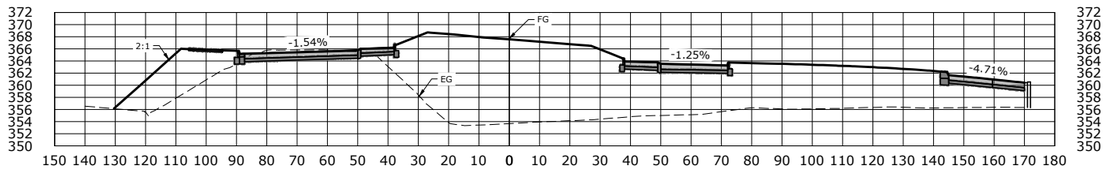
STA 'C' 104+00



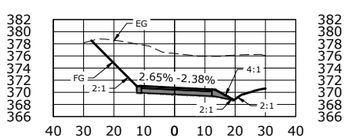
STA 'C' 105+00



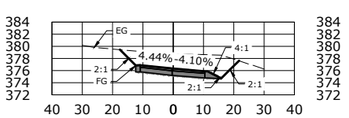
STA 'C' 106+00



STA 'C' 106+40



STA 'Z' 30+50



STA 'Z' 31+00

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

ROADWAY CROSS-SECTIONS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

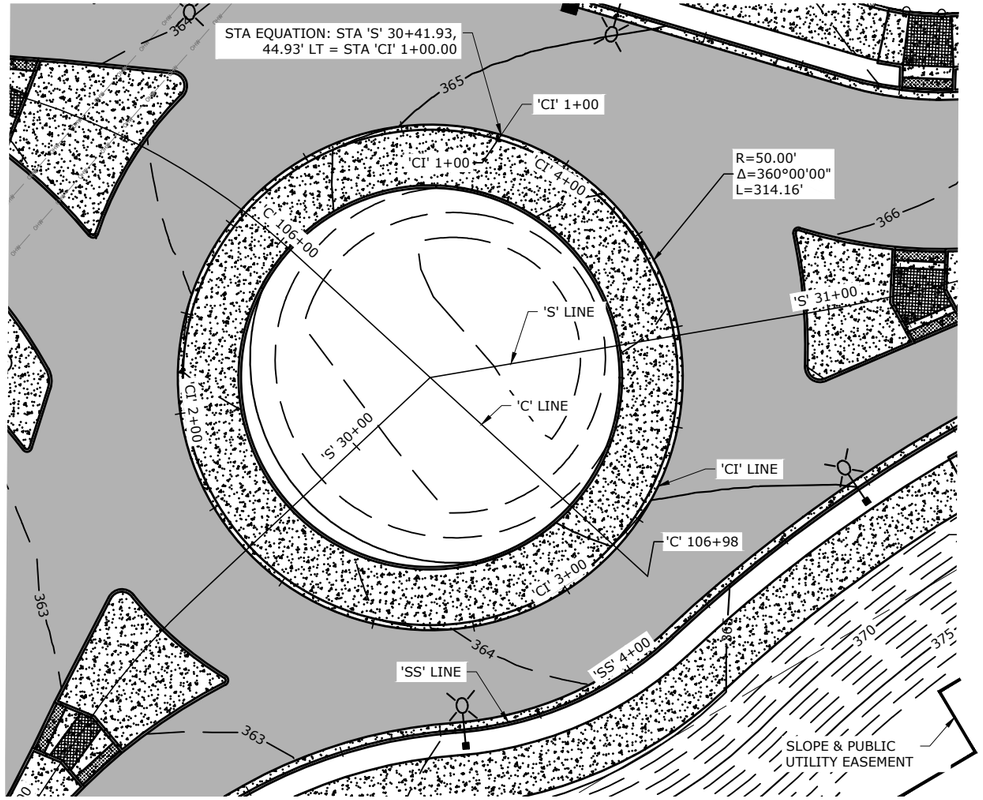
NO.	DATE:

Sheet No.
C29

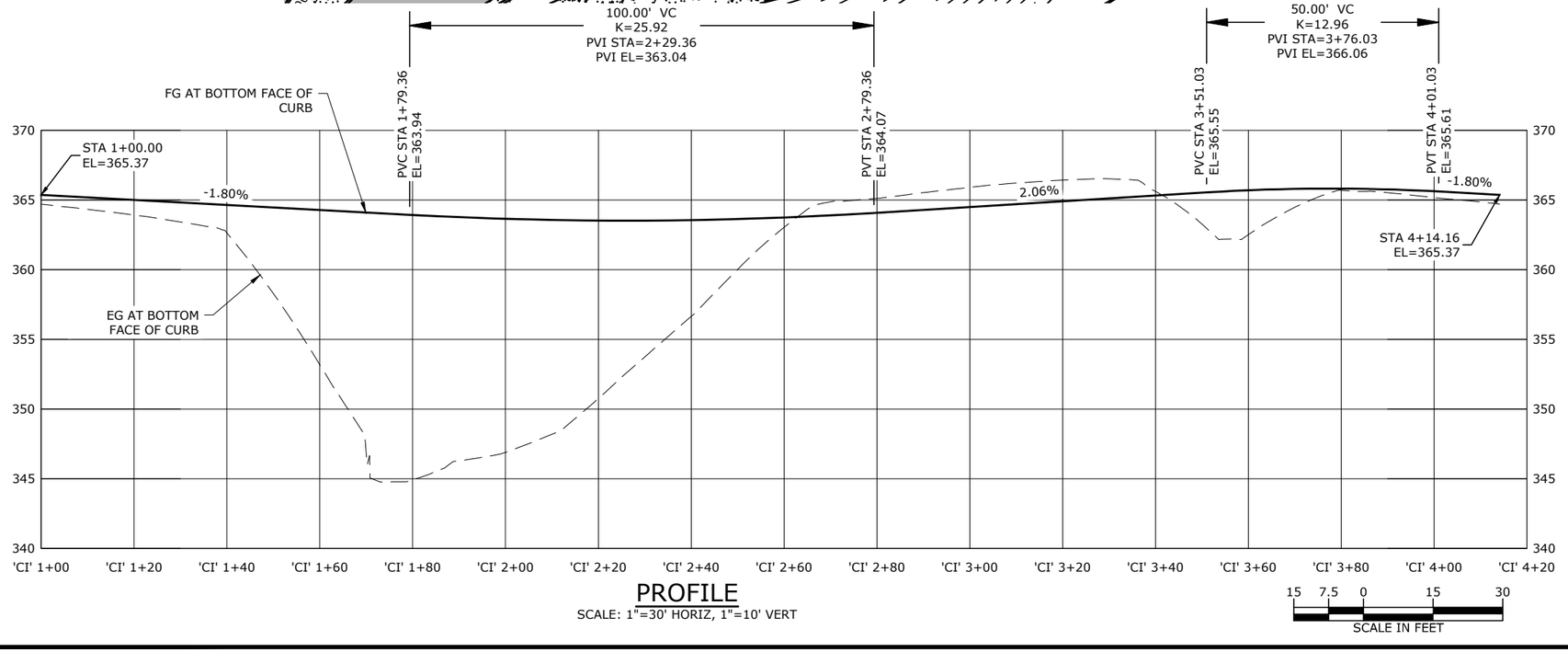
82 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-C-SECTIONS.dwg C29 10/2/2024 11:31 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'CI' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

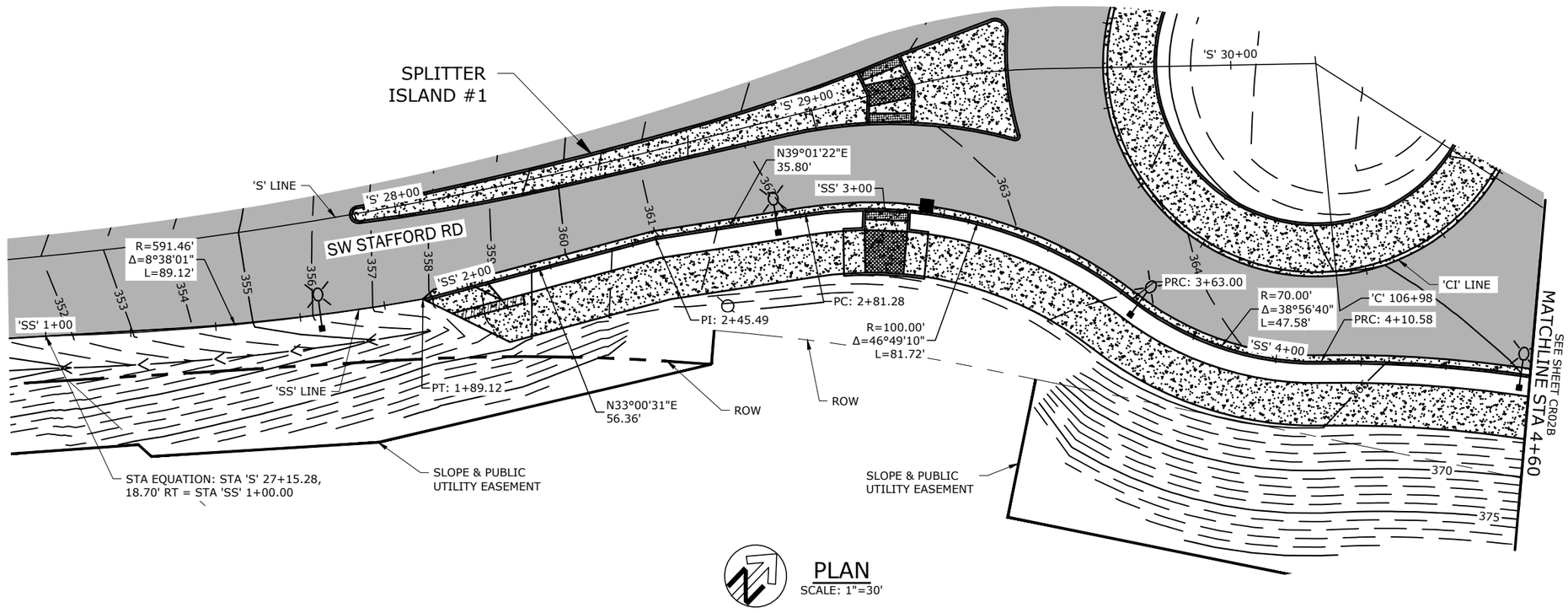
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

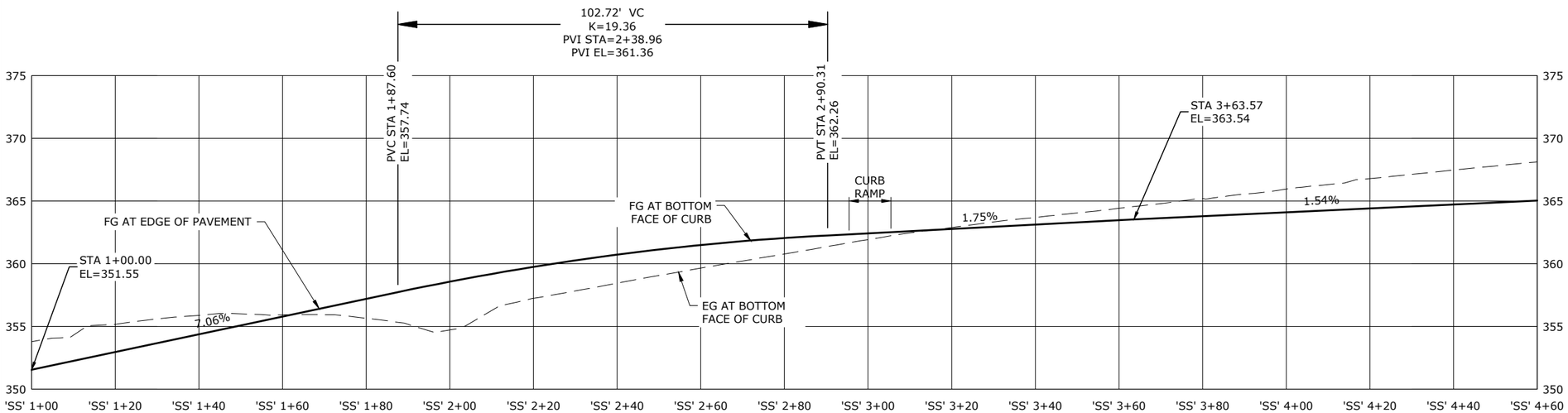
NO.	DATE:

Sheet No.
CR01

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR01 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'SS' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

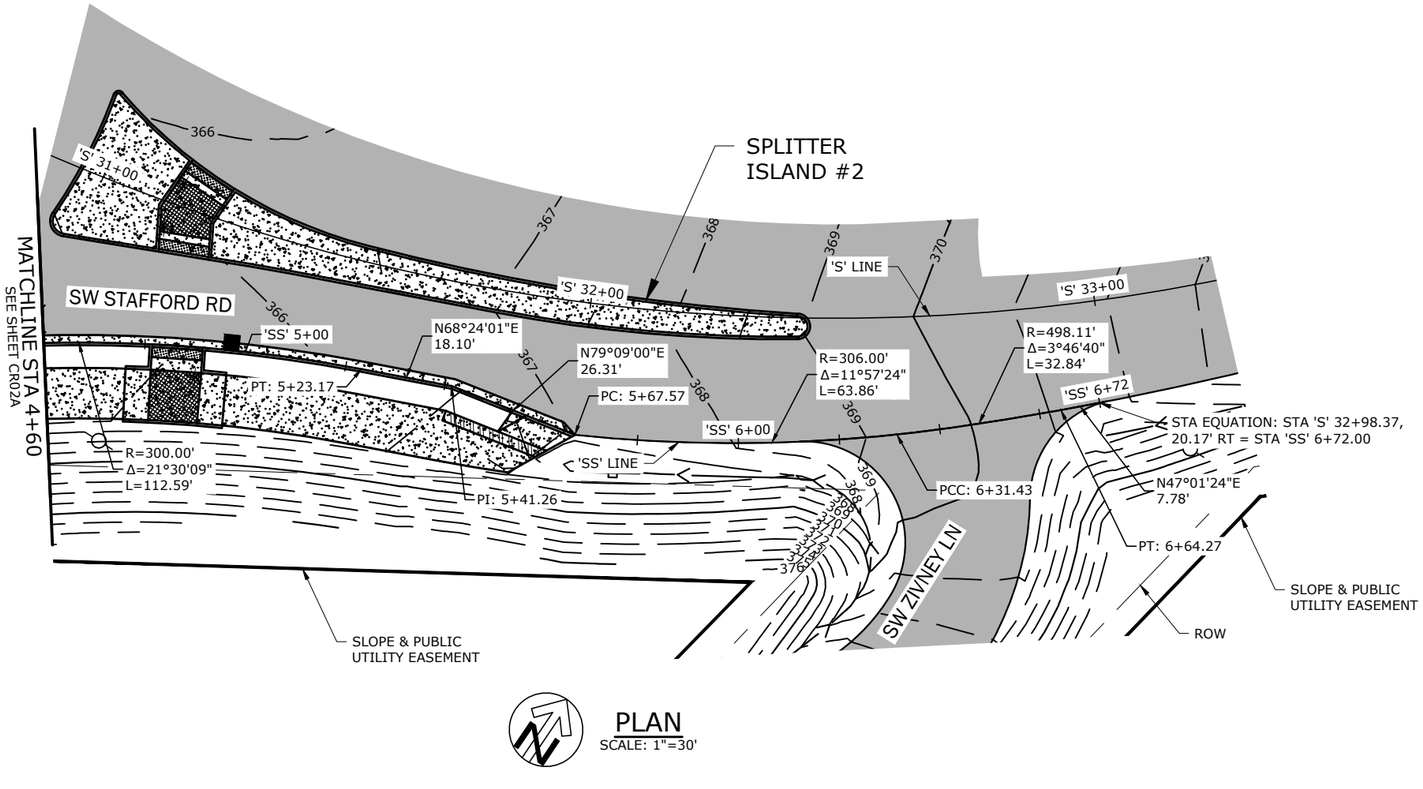
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS
NO. | DATE:

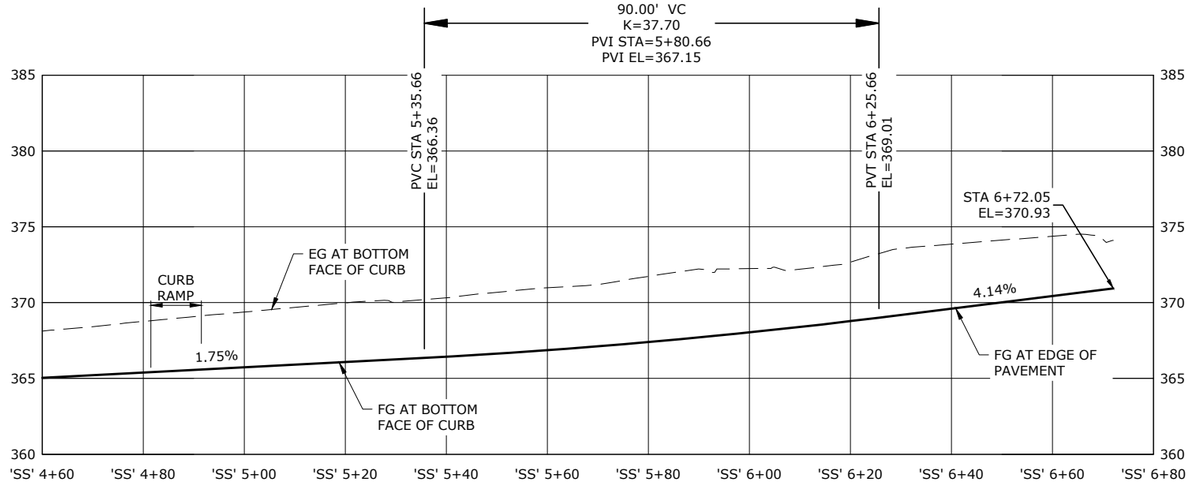
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
CR02A
84 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR02A 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'SS' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS
NO. | DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
CR02B

85 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR02B 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)

SPLITTER ISLAND #1

1 -

SCALE:1:30

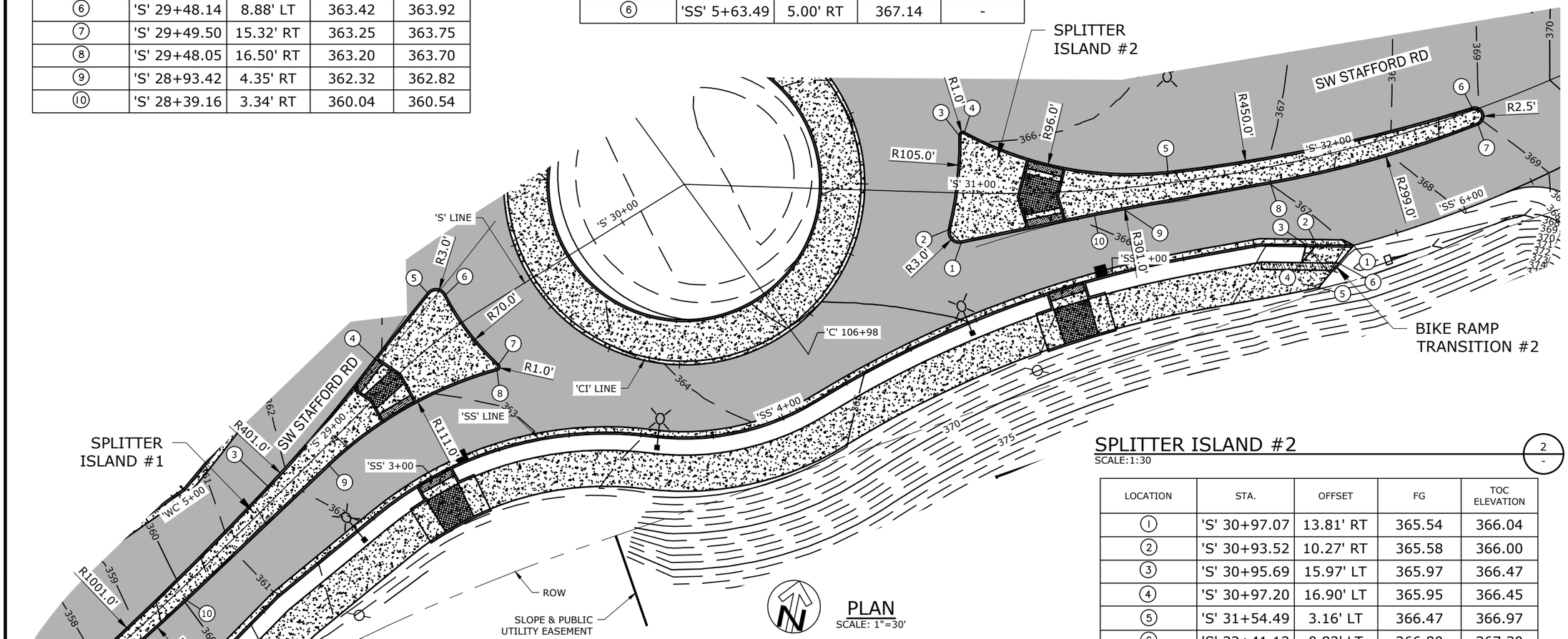
LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'S' 27+91.05	2.32' RT	356.77	357.27
2	'S' 27+91.10	1.68' LT	356.81	357.31
3	'S' 28+75.87	3.51' LT	361.60	362.10
4	'S' 29+23.22	7.69' LT	362.95	363.45
5	'S' 29+44.60	12.17' LT	363.27	363.77
6	'S' 29+48.14	8.88' LT	363.42	363.92
7	'S' 29+49.50	15.32' RT	363.25	363.75
8	'S' 29+48.05	16.50' RT	363.20	363.70
9	'S' 28+93.42	4.35' RT	362.32	362.82
10	'S' 28+39.16	3.34' RT	360.04	360.54

BIKE RAMP TRANSITION #2

2 -

SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'SS' 5+67.57	0.00'	367.05	367.05
2	'SS' 5+57.25	0.00'	366.81	366.81
3	'SS' 5+54.25	0.00'	366.74	367.24
4	'SS' 5+53.18	5.00' RT	367.12	-
5	'SS' 5+57.93	11.75' RT	367.27	-
6	'SS' 5+63.49	5.00' RT	367.14	-



PLAN

SCALE: 1"=30'

BIKE RAMP TRANSITION #1

1 -

SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'SS' 1+89.12	0.00'	357.94	357.94
2	'SS' 2+01.29	0.00'	358.65	358.65
3	'SS' 2+04.91	0.00'	358.88	359.38
4	'SS' 2+07.02	5.00' RT	359.60	-
5	'SS' 2+06.31	15.00' RT	359.89	-
6	'SS' 1+94.85	5.00' RT	358.46	-

SPLITTER ISLAND #2

2 -

SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'S' 30+97.07	13.81' RT	365.54	366.04
2	'S' 30+93.52	10.27' RT	365.58	366.00
3	'S' 30+95.69	15.97' LT	365.97	366.47
4	'S' 30+97.20	16.90' LT	365.95	366.45
5	'S' 31+54.49	3.16' LT	366.47	366.97
6	'S' 32+41.12	0.83' LT	366.80	367.30
7	'S' 32+41.08	4.17' RT	366.87	367.37
8	'S' 31+81.99	4.56' RT	366.86	367.36
9	'S' 31+41.39	6.01' RT	366.19	366.69
10	'S' 31+33.23	6.94' RT	366.06	366.56

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

'SS' LINE - SIDEWALK GRADING PLAN

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

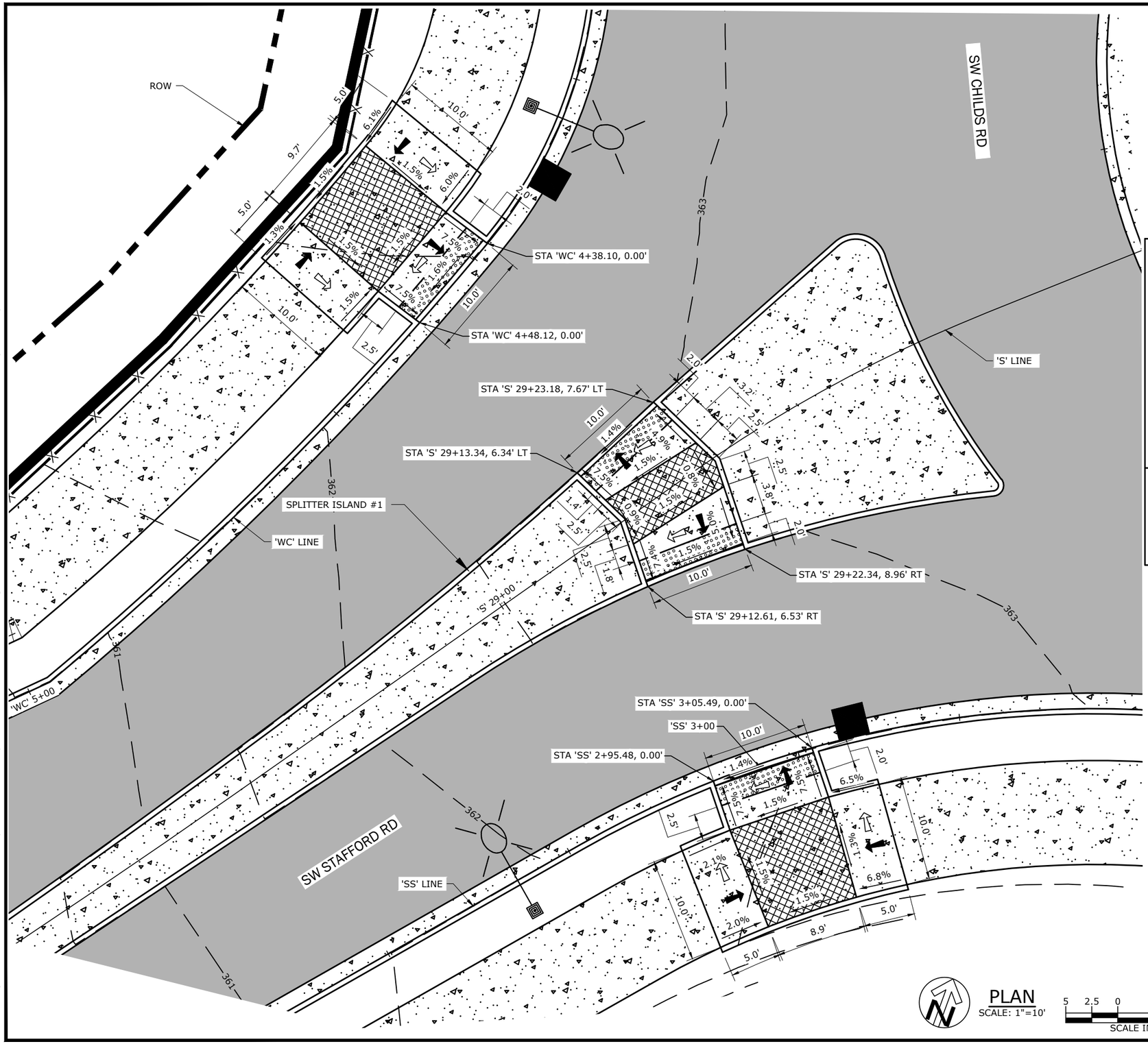
REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
CR02C

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR02C 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

LEGEND

TURNING SPACE
LEVEL AREA 5'x5'
FOR THE PURPOSE OF THIS APPLICATION A MAX. 1.5% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL

TRUNCATED DOME DETECTABLE WARNING SURFACE

SLOPE AS SHOWN
(MAX 1.5% FINISHED SURFACE SLOPE)
(NORMAL SIDEWALK CROSS SLOPE)

SLOPE AS SHOWN
(MAX 7.5% FINISHED SURFACE SLOPE)
(RAMP LENGTH 15' MAX MEASURED ALONG FINISHED SURFACE SLOPE)

CONSTRUCTION NOTES:

1. SEE SHEET CR06 FOR ADDITIONAL SIDEWALK RAMP DETAILS AND REQUIREMENTS.
2. SEE IL SHEETS FOR RRFB LOCATION AND DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

'SS' LINE - ADA CURB RAMP

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

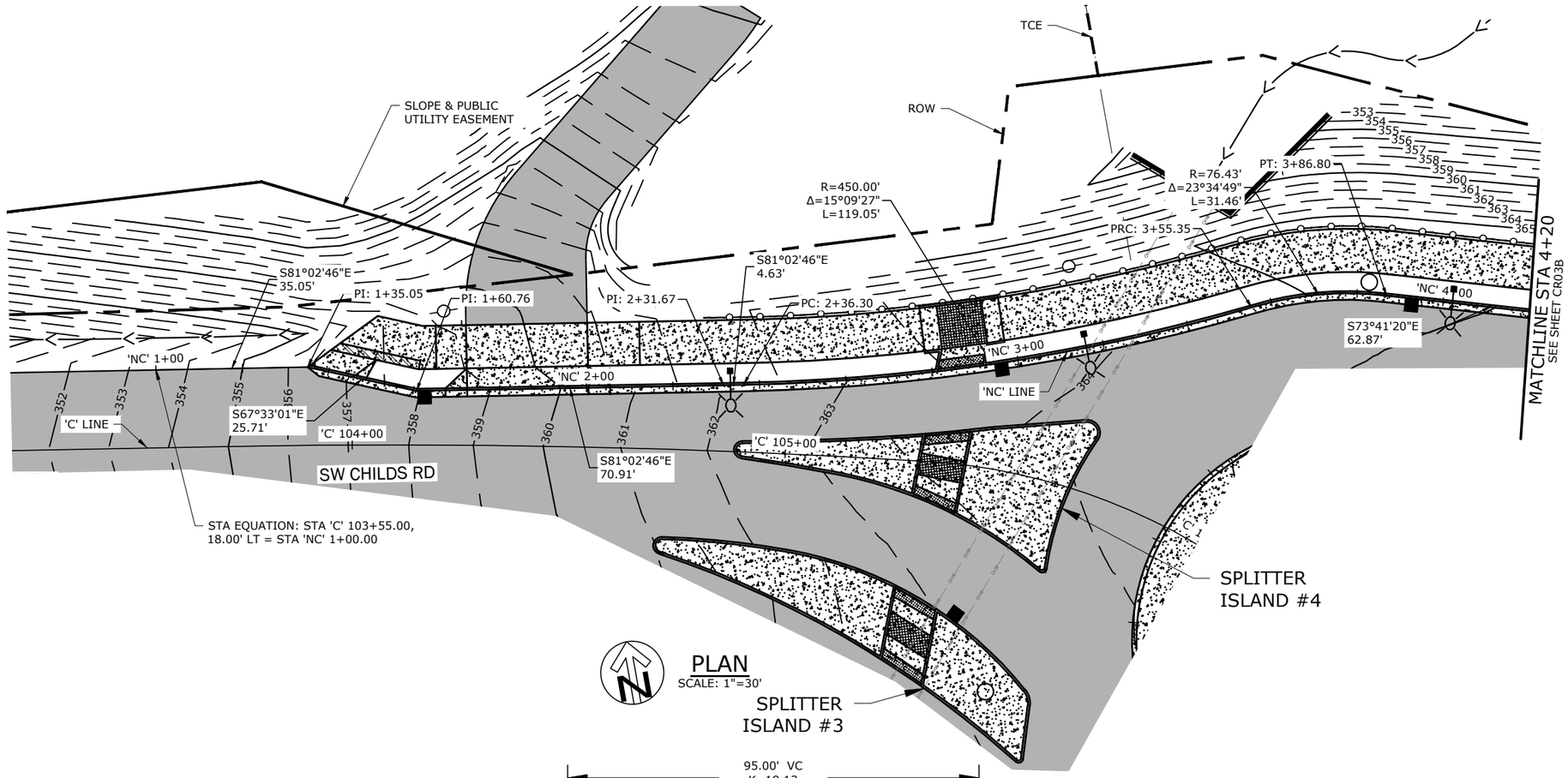
NO.	DATE:

Sheet No.
CR02D

87 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR02D 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'NC' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

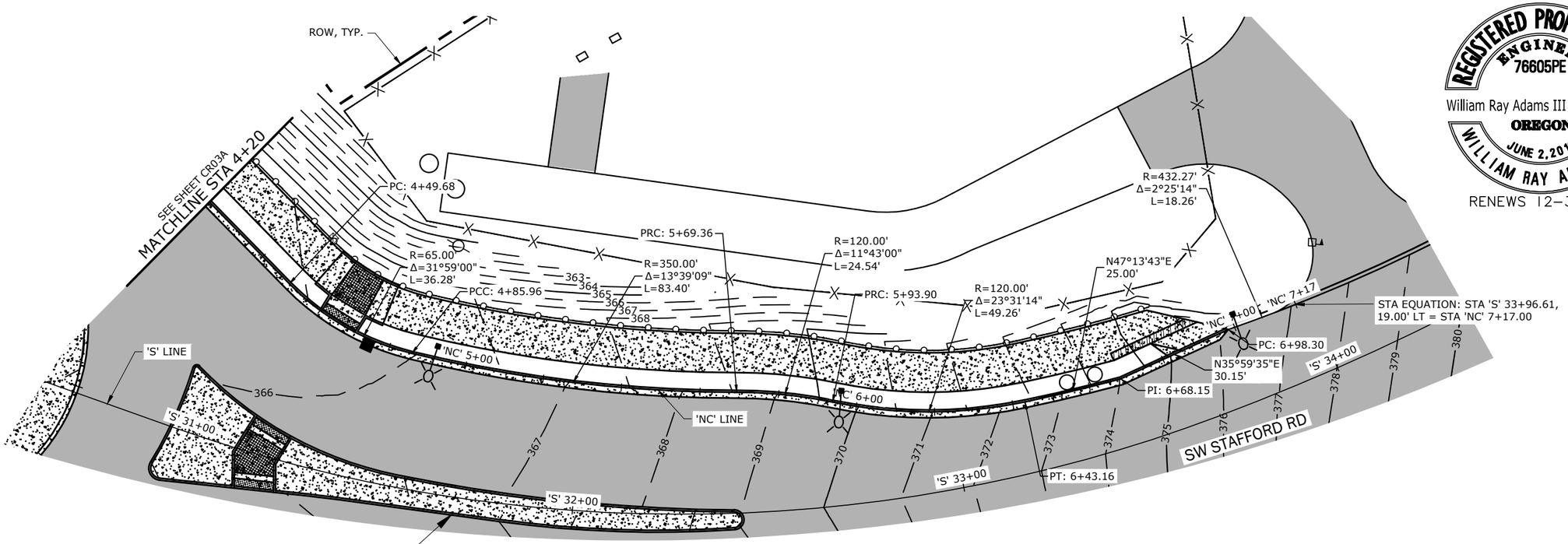
NO.	DATE:

Sheet No.
CR03A

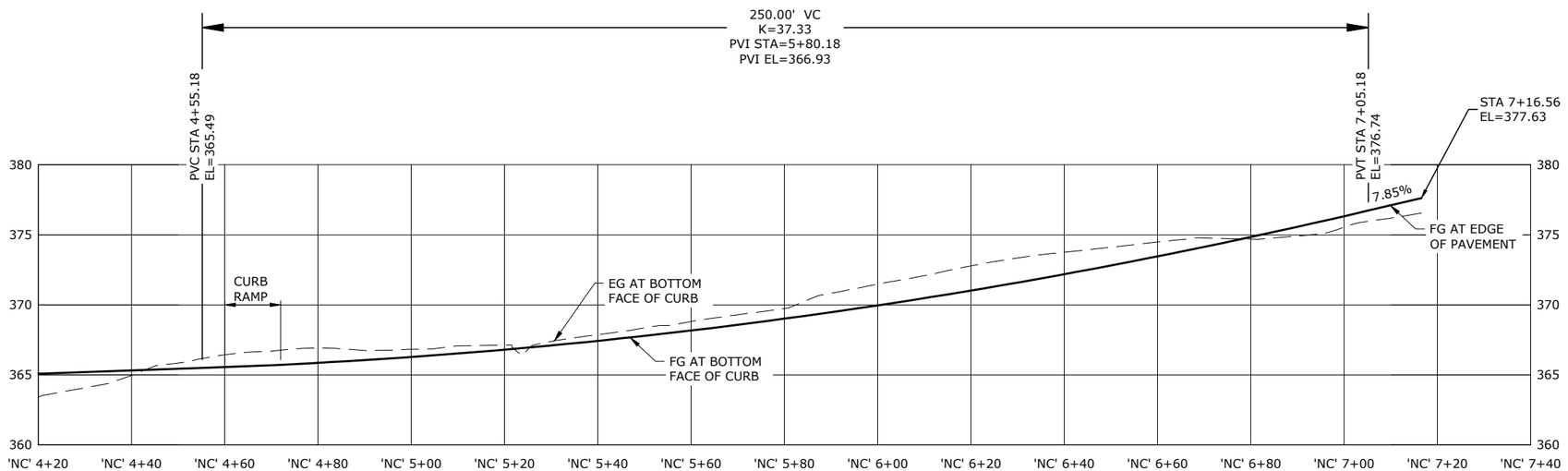
88 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR03A 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12–31–25

'NC' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
CR03B

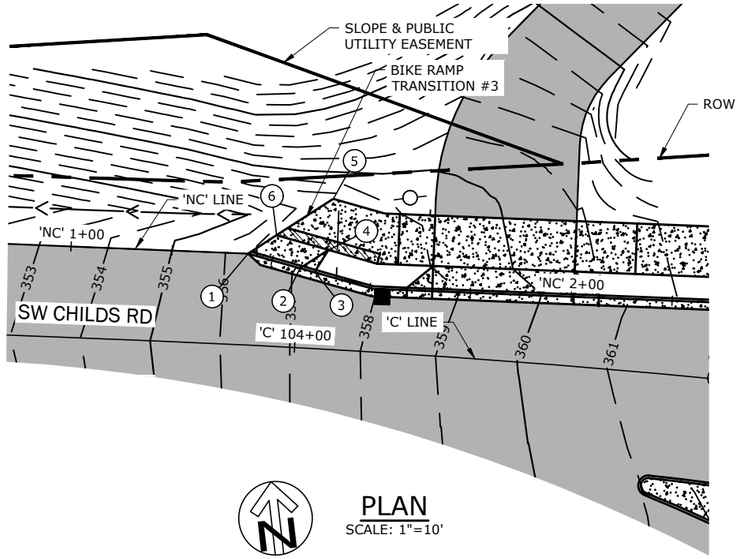
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR03B 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)

BIKE RAMP TRANSITION #3

SCALE:1:30

1

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'NC' 1+35.05	0.00'	356.49	356.49
2	'NC' 1+45.73	0.00'	357.04	357.04
3	'NC' 1+48.84	0.00'	357.25	357.75
4	'NC' 1+50.16	5.00' LT	357.50	-
5	'NC' 1+48.32	15.00' LT	357.82	-
6	'NC' 1+49.37	5.00' LT	356.95	-



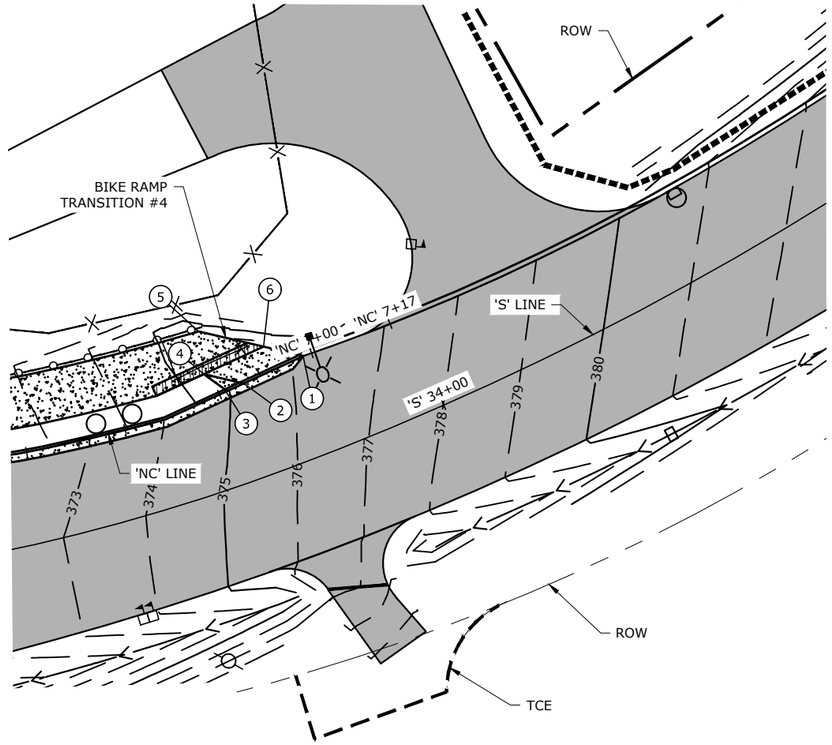
PLAN
SCALE: 1"=10'

BIKE RAMP TRANSITION #4

SCALE:1:30

2

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'NC' 6+98.30	0.00'	376.10	376.10
2	'NC' 6+85.28	0.00'	375.26	375.26
3	'NC' 6+81.38	0.00'	375.00	375.50
4	'NC' 6+78.87	5.00' LT	375.12	-
5	'NC' 6+81.47	13.10' LT	375.21	-
6	'NC' 6+91.88	5.00' LT	375.76	-



PLAN
SCALE: 1"=10'

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS
RENEWS 12-31-25

'NC' LINE - SIDEWALK GRADING PLAN

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

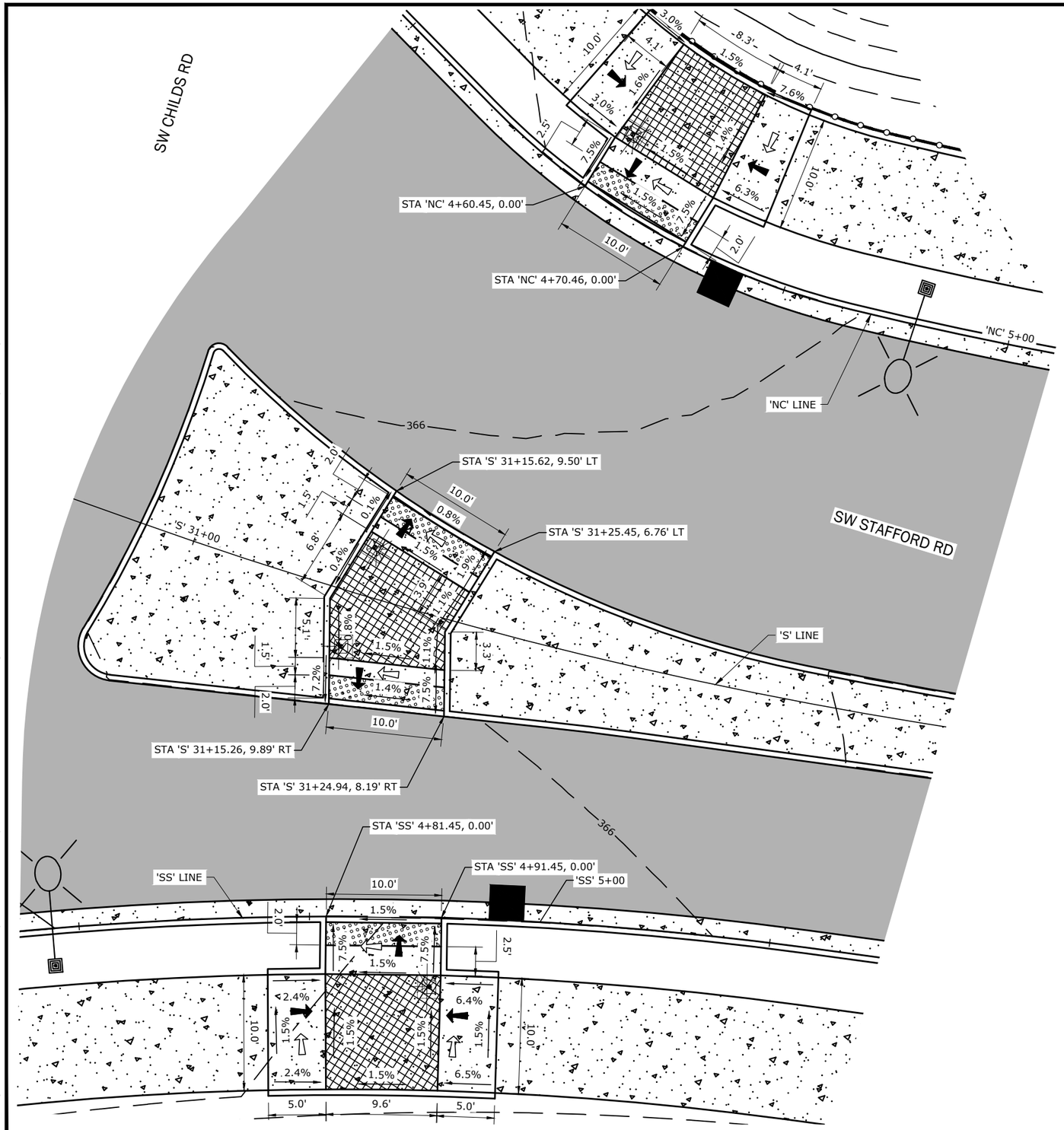
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
CR03C

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR03C 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



LEGEND

TURNING SPACE
LEVEL AREA 5'x5'
FOR THE PURPOSE OF THIS APPLICATION A MAX. 1.5% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL

TRUNCATED DOME DETECTABLE WARNING SURFACE

SLOPE AS SHOWN
(MAX 1.5% FINISHED SURFACE SLOPE)
(NORMAL SIDEWALK CROSS SLOPE)

SLOPE AS SHOWN
(MAX 7.5% FINISHED SURFACE SLOPE)
(RAMP LENGTH 15' MAX MEASURED ALONG FINISHED SURFACE SLOPE)

CONSTRUCTION NOTES:

1. SEE SHEET CR06 FOR ADDITIONAL SIDEWALK RAMP DETAILS AND REQUIREMENTS.
2. SEE IL SHEETS FOR RRFB LOCATION AND DETAILS.

PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'NC' LINE - ADA CURB RAMP

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

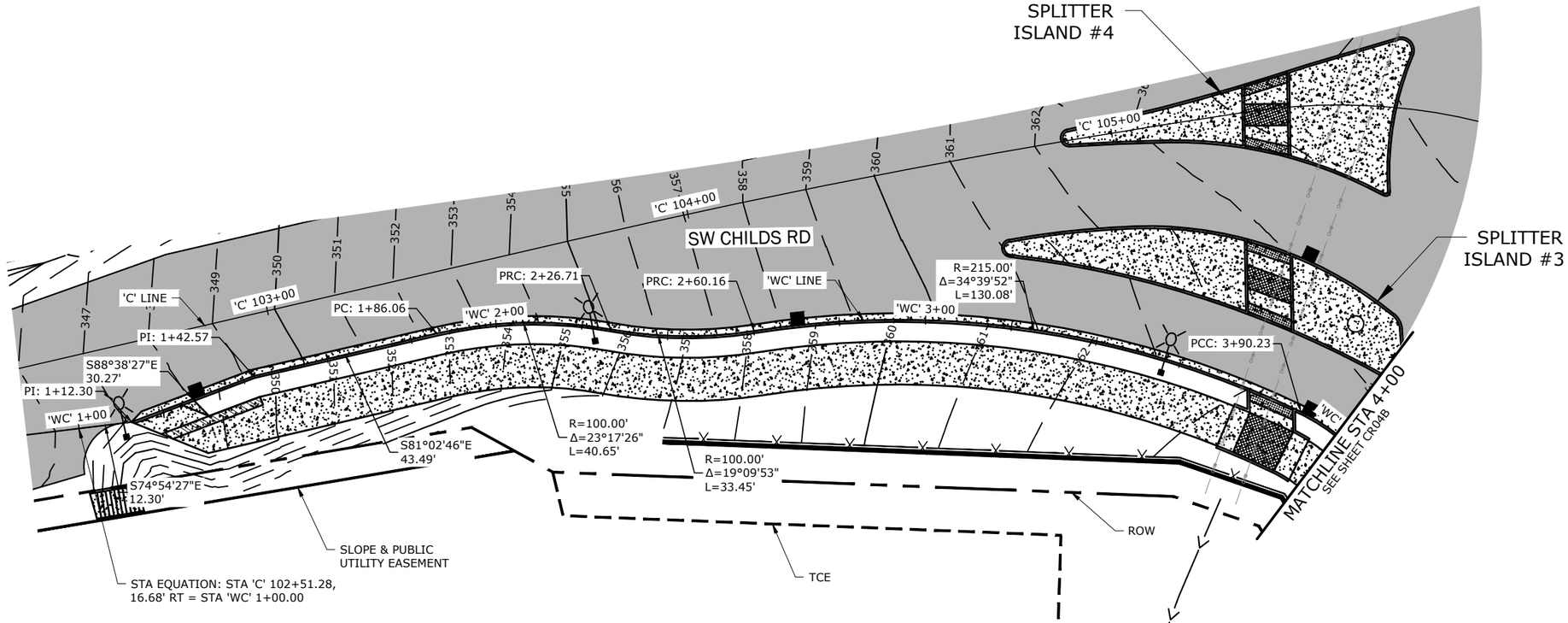
REVISIONS

NO.	DATE:

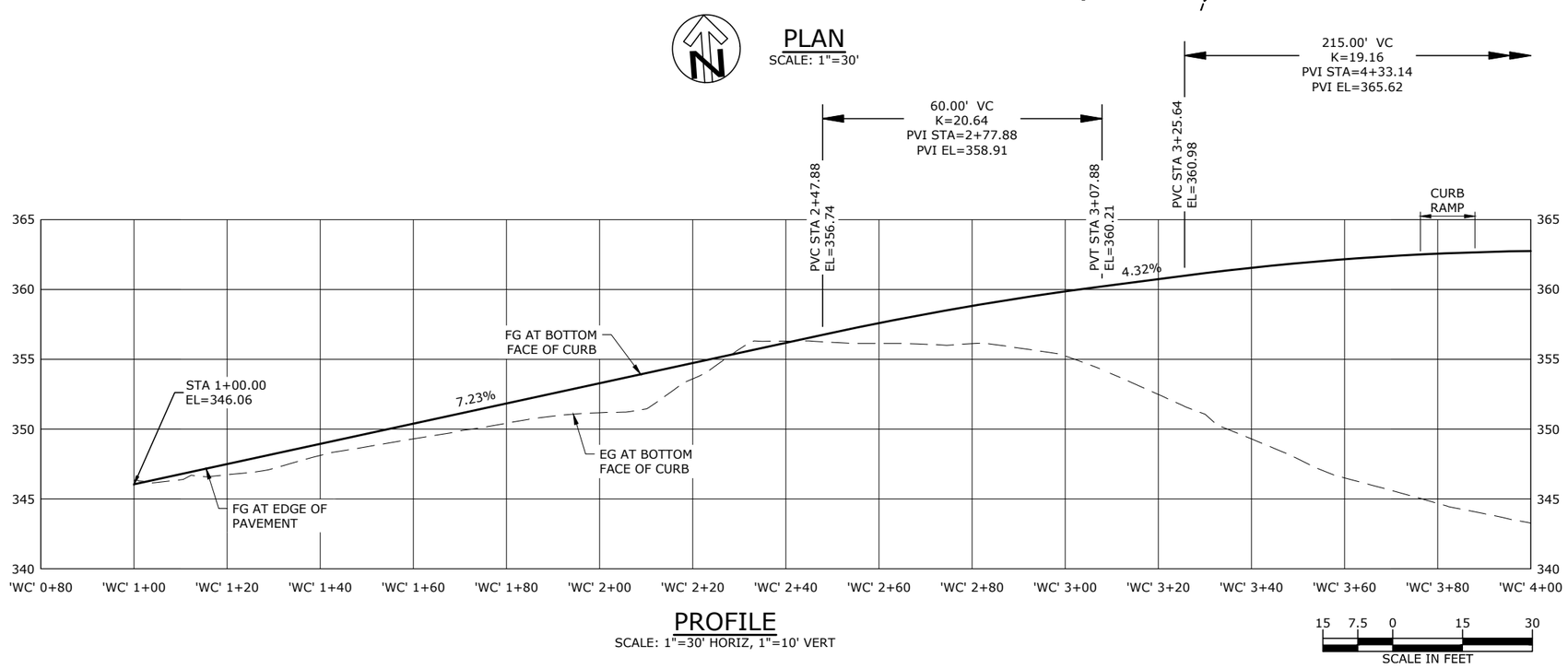
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
CR03D

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR03D 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'WC' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

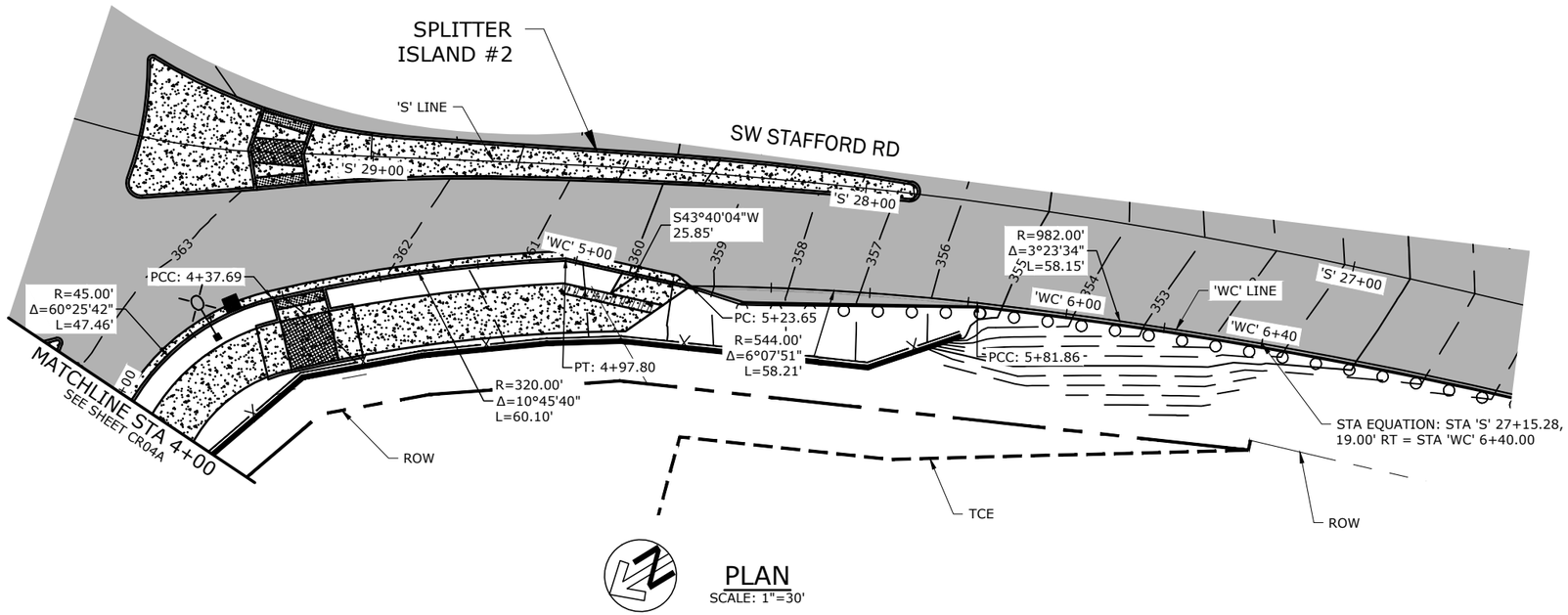
NO.	DATE:

Sheet No.
CR04A

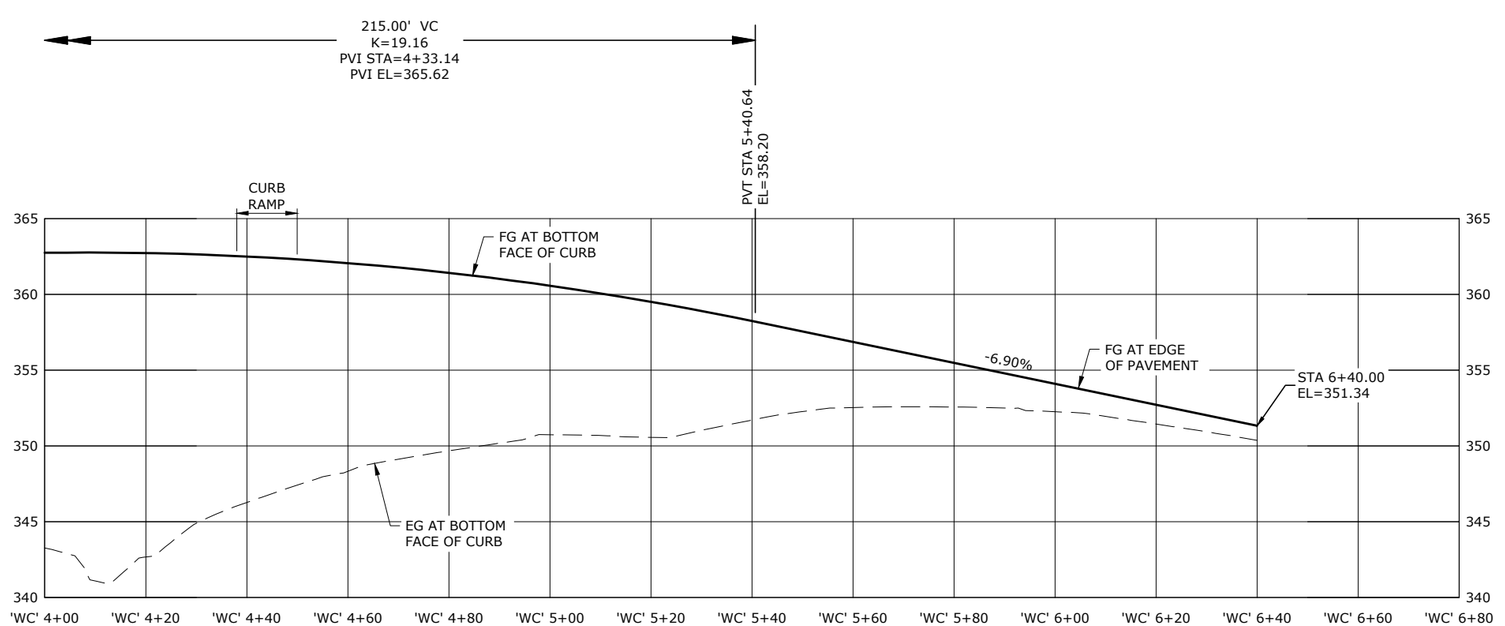
92 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR04A 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

'WC' LINE - CURB PLAN AND PROF

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

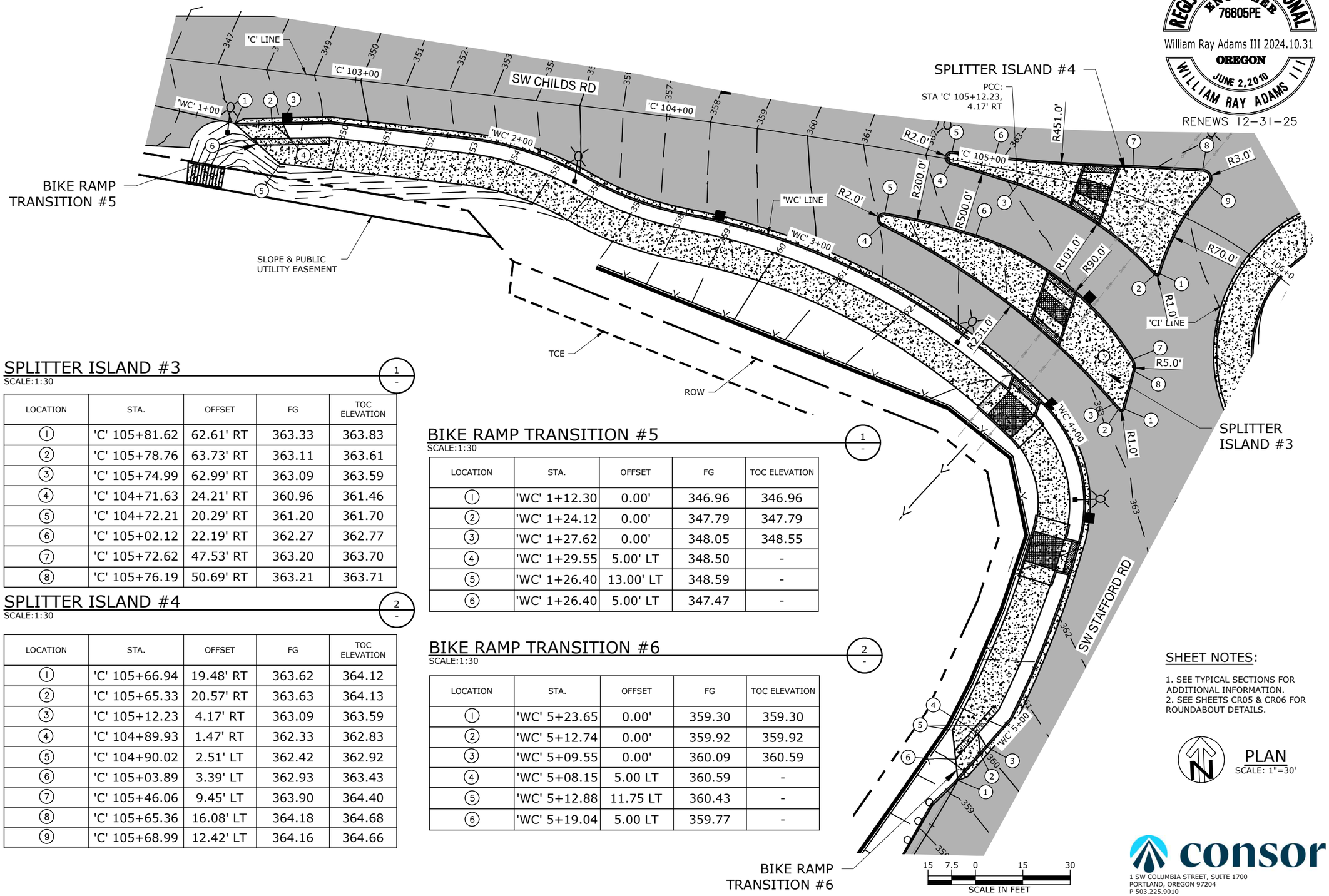
REVISIONS
NO. | DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
CR04B

93 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR04B 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



SPLITTER ISLAND #3

1 - SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'C' 105+81.62	62.61' RT	363.33	363.83
2	'C' 105+78.76	63.73' RT	363.11	363.61
3	'C' 105+74.99	62.99' RT	363.09	363.59
4	'C' 104+71.63	24.21' RT	360.96	361.46
5	'C' 104+72.21	20.29' RT	361.20	361.70
6	'C' 105+02.12	22.19' RT	362.27	362.77
7	'C' 105+72.62	47.53' RT	363.20	363.70
8	'C' 105+76.19	50.69' RT	363.21	363.71

SPLITTER ISLAND #4

2 - SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'C' 105+66.94	19.48' RT	363.62	364.12
2	'C' 105+65.33	20.57' RT	363.63	364.13
3	'C' 105+12.23	4.17' RT	363.09	363.59
4	'C' 104+89.93	1.47' RT	362.33	362.83
5	'C' 104+90.02	2.51' LT	362.42	362.92
6	'C' 105+03.89	3.39' LT	362.93	363.43
7	'C' 105+46.06	9.45' LT	363.90	364.40
8	'C' 105+65.36	16.08' LT	364.18	364.68
9	'C' 105+68.99	12.42' LT	364.16	364.66

BIKE RAMP TRANSITION #5

1 - SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'WC' 1+12.30	0.00'	346.96	346.96
2	'WC' 1+24.12	0.00'	347.79	347.79
3	'WC' 1+27.62	0.00'	348.05	348.55
4	'WC' 1+29.55	5.00' LT	348.50	-
5	'WC' 1+26.40	13.00' LT	348.59	-
6	'WC' 1+26.40	5.00' LT	347.47	-

BIKE RAMP TRANSITION #6

2 - SCALE:1:30

LOCATION	STA.	OFFSET	FG	TOC ELEVATION
1	'WC' 5+23.65	0.00'	359.30	359.30
2	'WC' 5+12.74	0.00'	359.92	359.92
3	'WC' 5+09.55	0.00'	360.09	360.59
4	'WC' 5+08.15	5.00 LT	360.59	-
5	'WC' 5+12.88	11.75 LT	360.43	-
6	'WC' 5+19.04	5.00 LT	359.77	-

SHEET NOTES:

1. SEE TYPICAL SECTIONS FOR ADDITIONAL INFORMATION.
2. SEE SHEETS CR05 & CR06 FOR ROUNDABOUT DETAILS.

PLAN
SCALE: 1"=30'

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS
RENEWS 12-31-25

'WC' LINE - SIDEWALK GRADING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR | DRAFTED BY: JSD | CHECKED BY: WRA

REVISIONS

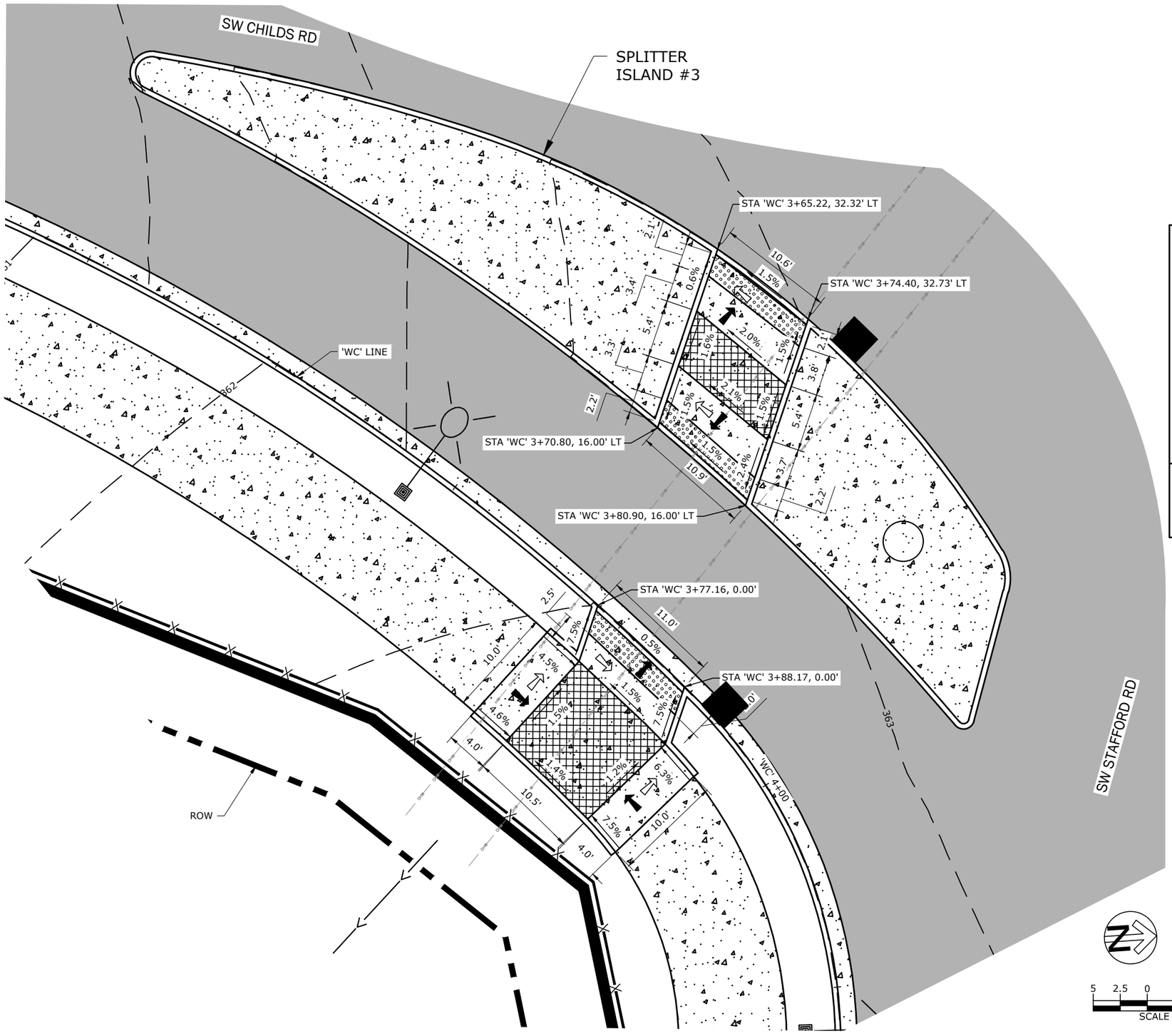
NO.	DATE:

Sheet No. CR04C

94 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR04C 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



LEGEND

TURNING SPACE
LEVEL AREA 5'x5'
FOR THE PURPOSE OF THIS APPLICATION A MAX. 1.5% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL

TRUNCATED DOME DETECTABLE WARNING SURFACE

SLOPE AS SHOWN
(MAX 1.5% FINISHED SURFACE SLOPE)
(NORMAL SIDEWALK CROSS SLOPE)

SLOPE AS SHOWN
(MAX 7.5% FINISHED SURFACE SLOPE)
(RAMP LENGTH 15' MAX MEASURED ALONG FINISHED SURFACE SLOPE)

CONSTRUCTION NOTES:

1. SEE SHEET CR06 FOR ADDITIONAL SIDEWALK RAMP DETAILS AND REQUIREMENTS.
2. SEE IL SHEETS FOR RRFB LOCATION AND DETAILS.

PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

'WC' LINE - ADA CURB RAMP

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

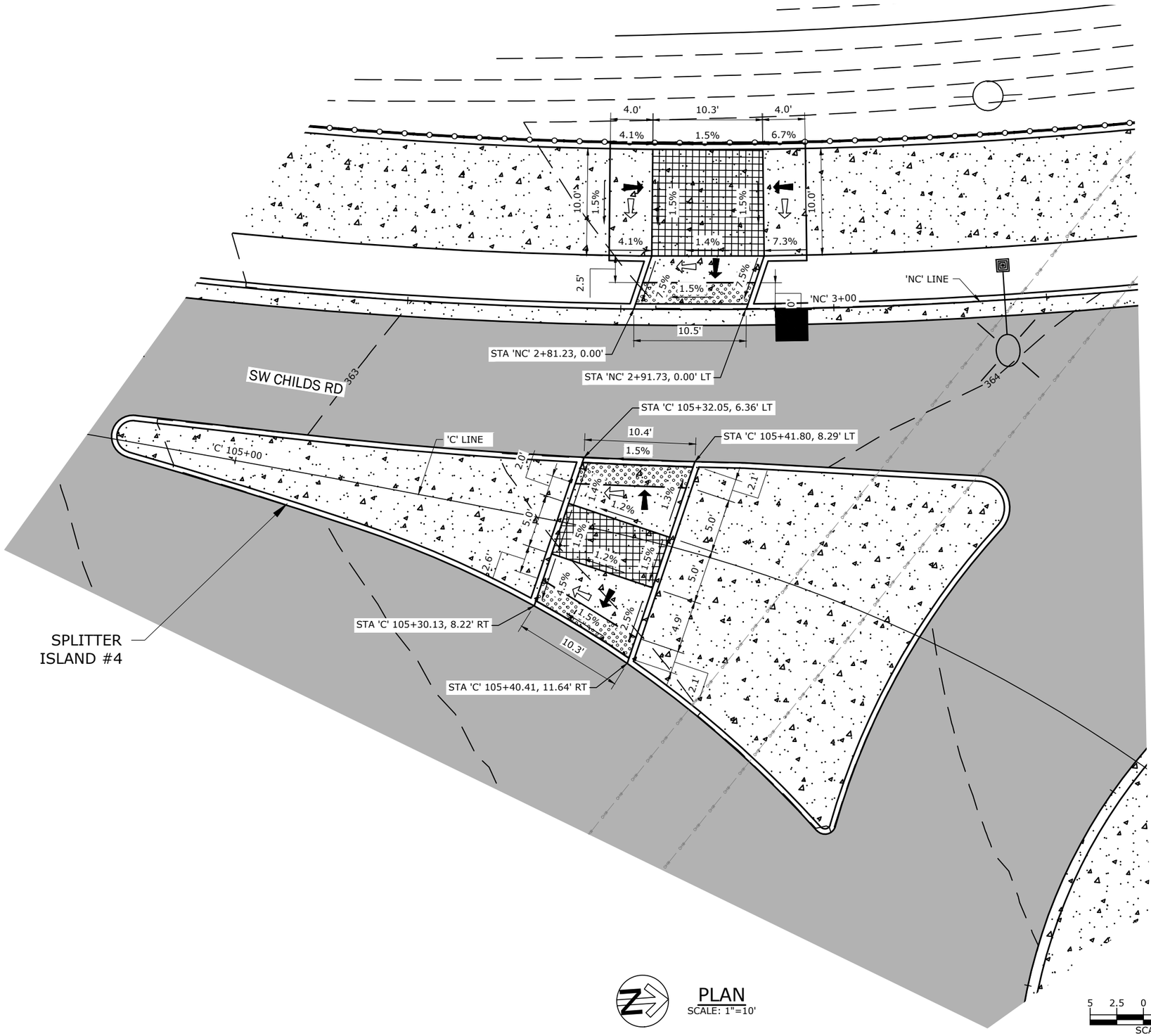
NO.	DATE:

Sheet No.
CR04D

95 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR04D 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=10'

5 2.5 0 5 10
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

LEGEND

TURNING SPACE
MIN. LEVEL AREA 5'x5'
FOR THE PURPOSE OF THIS APPLICATION A MAX. 2.0% FINISHED SURFACE SLOPE (FOR DRAINAGE) IS CONSIDERED LEVEL

TRUNCATED DOME DETECTABLE WARNING SURFACE

SLOPE AS SHOWN
(MAX 2.0% FINISHED SURFACE SLOPE)
(NORMAL SIDEWALK CROSS SLOPE)

SLOPE AS SHOWN
(MAX 8.3% FINISHED SURFACE SLOPE)
(RAMP LENGTH 15' MAX MEASURED ALONG FINISHED SURFACE SLOPE)

CONSTRUCTION NOTES:

1. SEE SHEET CR06 FOR ADDITIONAL SIDEWALK RAMP DETAILS AND REQUIREMENTS.
2. SEE IL SHEETS FOR RRFB LOCATION AND DETAILS.

'WC' LINE - ADA CURB RAMP

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

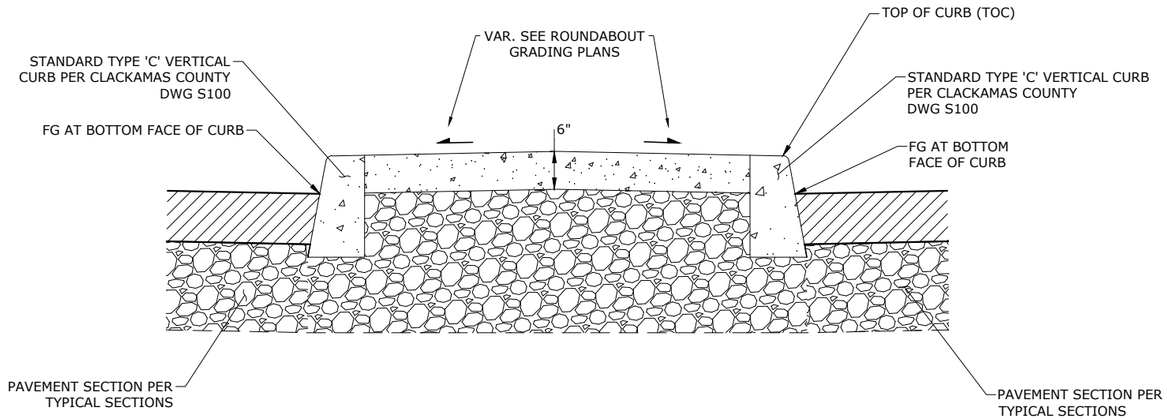
NO.	DATE:

Sheet No.
CR04E

96 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR04E 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)



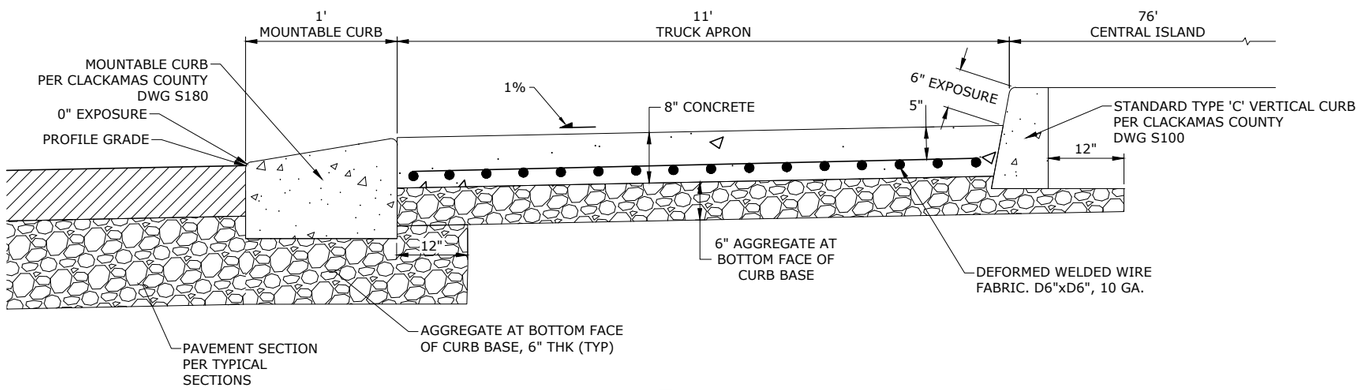
TYPICAL CONCRETE SPLITTER ISLAND

SCALE: NTS

1 CR05

NOTES:

1. FOR ISLAND NOSE TREATMENTS, USE OPTION 'A' (SEE ODOT STD DWG RD707)



TRUCK APRON

SCALE: NTS

2 CR05

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

ROUNDABOUT DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
CR05

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR05 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)

AMERICANS WITH DISABILITIES ACT (ADA) NOTES:

1. WORK WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH THE PROPOSED GUIDELINES FOR PEDESTRIAN FACILITIES IN THE PUBLIC RIGHT-OF-WAY ACCESSIBILITY GUIDELINES (PROWAG), AS PUBLISHED BY THE UNITED STATES ACCESS BOARD.

2. UNLESS OTHERWISE SPECIFIED ON THE PLANS, OR DIRECTED BY THE INSPECTOR, CROSS SLOPES OF SIDEWALKS SHALL BE A NOMINAL 1.5%. CROSS SLOPES SHALL NOT BE LESS THAN 1% NOR EXCEED 2%.

3. MAXIMUM SLOPES SHOWN ON THE PLANS REPRESENT THE MAXIMUM ALLOWABLE SLOPES PERMITTED BY CURRENT ADA REQUIREMENTS. THE CONTRACTOR SHALL TAKE INTO CONSIDERATION CONSTRUCTION TOLERANCES WHEN PLACING SIDEWALKS AND RAMPS TO ENSURE MAXIMUM SLOPES ARE NOT EXCEEDED.

4. DO NO SCORE GUTTER LINE ON RADIUS AT THROAT OF RAMP AT TRUNCATED DOMES.

5. COMPLETE ALL SURVEY STAKING AS NEEDED USING INFORMATION PROVIDED.

6. THE PRIME CONTRACTOR AND CONCRETE SUBCONTRACTOR SHALL ATTEND A PRE-POUR MEETING ON SITE WITH THE INSPECTOR TO DISCUSS THE CURB RAMP CONSTRUCTION PROCESS.

7. FIELD LAYOUT SHALL BE REVIEWED BY THE ENGINEER PRIOR TO CONCRETE PLACEMENT. CONCRETE FOR SIDEWALKS, CURBS, AND RAMPS SHALL BE PLACED NO EARLIER THAN 4 HOURS AFTER FINAL PLACEMENT OF FORMWORK TO ALLOW FOR INSPECTION PRIOR TO POUR AND ADJUSTMENT BY CONTRACTOR IF NEEDED. CONTRACTOR SHALL PROVIDE 24 HOUR NOTICE TO INSPECTOR OF FORMWORK BEING PLACED AS WELL AS NOTIFY INSPECTOR AT THE TIME FORMWORK HAS BEEN FULLY COMPLETED.

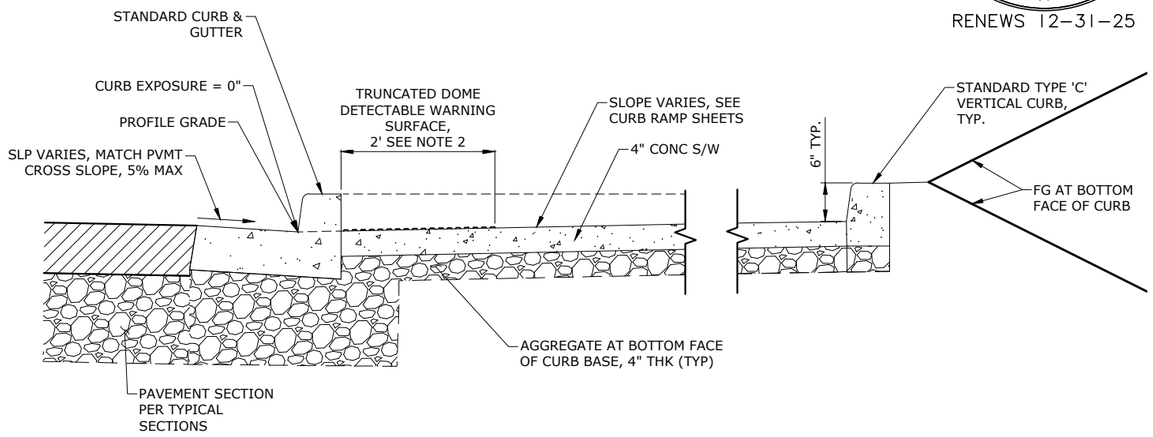
8. INSPECTOR'S PRE-POUR REVIEW DOES NOT CONSTITUTE ACCEPTANCE OF FINAL GRADES; THE CONTRACTOR REMAINS RESPONSIBLE FOR THE FINAL GRADES.

9. SLOPES SHALL BE MEASURED BY THE INSPECTOR BY USING A 2 FOOT DIGITAL LEVEL, WHICH SHALL BE THE OFFICIAL RECORD OF THE SLOPES. IN THE EVENT THAT DIFFERENT READINGS ARE TAKEN BETWEEN THE INSPECTOR'S LEVEL AND THE CONTRACTOR'S, THE INSPECTOR'S SHALL GOVERN.

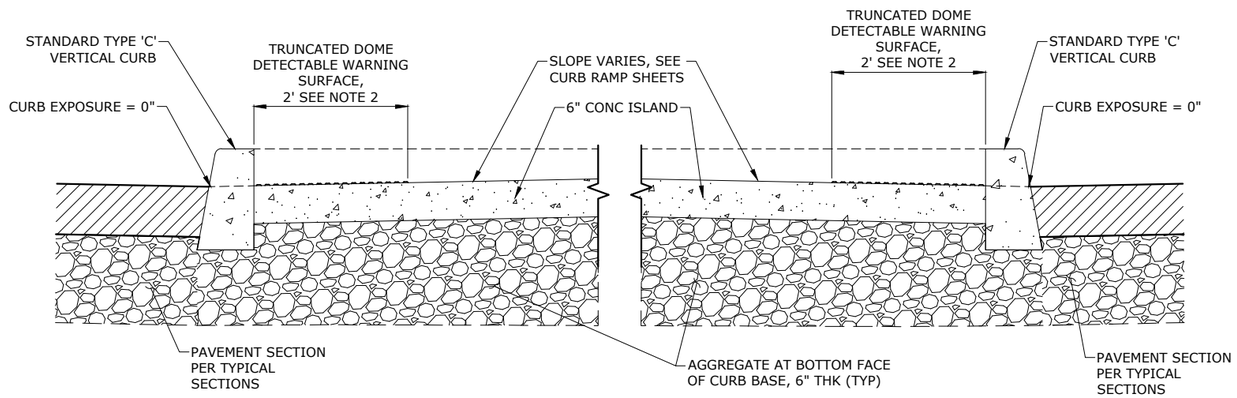
10. MEASUREMENT OF SLOPES SHALL BE PERFORMED ON THE WALKABLE SURFACE AND SHALL NOT TAKE INTO CONSIDERATION THE TOP OF THE CURB.

11. COMPLETED SIDEWALKS OR OTHER HARDSCAPE ELEMENTS THAT EXCEED MAXIMUM SPECIFIED SLOPES OR ARE LESS THAN MINIMUM SPECIFIED SLOPES SHALL BE REMOVED AND REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.

12. PROTECT FRESHLY POURED CONCRETE FROM VANDALISM OR OTHER DAMAGE FOR A MINIMUM OF 24 HOURS OR UNTIL CURED ENOUGH TO SUPPORT TYPICAL USE, WHICHEVER IS LONGER. ANY CONCRETE DAMAGED BY VANDALISM OR OTHER CAUSES SHALL BE REPLACED AT NO COST TO THE PROJECT.



TYPICAL STANDARD CURB AND GUTTER SIDEWALK RAMP (1 / CR06)
SCALE: NTS



TYPICAL ACCESSIBLE ROUTE ISLAND SIDEWALK RAMP (2 / CR06)
SCALE: NTS

NOTES:

1. TOOLED JOINTS ARE REQUIRED AT ALL SIDEWALK RAMP SLOPE BREAK LINES.

2. PLACE TRUNCATED DOME DETECTABLE WARNING SURFACE IN THE LOWER 2 FEET ADJACENT TO TRAFFIC OF THROAT OF RAMP ONLY.

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

ROUNDABOUT DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
CR06

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-CR.dwg CR06 10/9/2024 7:47 PM RILEY.WIGGINS 24.1s (LMS Tech)

PROJECT OWNER

OWNER: CLACKAMAS COUNTY DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
CONTACT: JONATHAN HANGARTNER, PE
ADDRESS 1: 150 BEAVERCREEK ROAD, ROOM 320
ADDRESS 2: ODOT CITY, OR 97045
PHONE: 971-804-2825

PLANNING / ENGINEERING / SURVEYING FIRM

ENGINEERING FIRM: CONSOR NORTH AMERICA, INC.
CONTACT: NICK MCMURTREY, PE
ADDRESS 1: ONE SW COLUMBIA STREET, SUITE 1700
ADDRESS 2: PORTLAND, OR 97204
PHONE: 503-225-9010

NARRATIVE DESCRIPTIONS

EXISTING SITE CONDITIONS

TWO-LANE RURAL ARTERIAL WITH VARIABLE WIDTH SHOULDERS AND SUBSTANDARD INTERSECTION WITH LIMITED SIGHT DISTANCE.

DEVELOPED CONDITIONS

WIDENING OF EXISTING ROADWAY SECTION WITH ROUNDABOUT INTERSECTION IMPROVEMENTS AT CHILDS ROAD AND TURN LANE AND ALIGNMENT INTERSECTION IMPROVEMENTS AT JOHNSON ROAD. SIDEWALK AND BIKE LANE IMPROVEMENTS AT CHILDS ROAD ROUNDABOUT. SHOULDER AND DRAINAGE IMPROVEMENTS WITH STORMWATER MANAGEMENT FACILITIES.

NATURE OF CONSTRUCTION ACTIVITY AND ESTIMATED TIME TABLE

* CLEARING	FEB 2025 - APR 2025
* UTILITY INSTALLATION	APR 2025 - JUN 2026
* STREET CONSTRUCTION	SEPT 2025 - SEPT 2026
* FINAL STABILIZATION	SEPT 2026 - NOV 2026

TOTAL SITE AREA = 266,000 SF = 6.1 ACRES

TOTAL DISTURBED AREA = 405,500 SF = 9.3 ACRES

RECEIVING WATER BODIES WITHIN 1/4 MILE RADIUS:

PECAN CREEK | 303(d) IMPAIRMENT: NONE

SAUM CREEK & TUALATIN RIVER | 303(d) IMPAIRMENT: COPPER, ZINC, ENTEROCOCCI, E. COLI, DISSOLVED OXYGEN, CHLOROPHYLL-A

SITE SOIL CLASSIFICATION:

7B - BORGES SILTY CLAY LOAM, 0 TO 8 PERCENT SLOPES
13B - CASCADE SILT LOAM, 3 TO 8 PERCENT SLOPES
13C - CASCADE SILT LOAM, 8 TO 15 PERCENT SLOPES
13D - CASCADE SILT LOAM, 15 TO 30 PERCENT SLOPES
48B - KINTON SILT LOAM, 3 TO 8 PERCENT SLOPES

ON-SITE SOILS HAVE A MODERATE TO HIGH EROSION POTENTIAL. ALL FILL MATERIAL SHALL BE GENERATED ON-SITE FROM GRADING EXCAVATION AND UTILITY TRENCH SPOILS.

RAIN GAUGE LOCATION:

TUALATIN RIVER AT OSWEGO DAM, NEAR WEST LINN, OR - 14707200

https://waterdata.usgs.gov/monitoring-location/14707200/#parameterCode=00010&period=P7D&showMedian=true

ENVIRONMENTAL MANAGEMENT PLAN:

THERE ARE NO EXPECTED CONTAMINATED SOILS, GROUNDWATER OR HAZMAT TO BE ENCOUNTERED ON-SITE DURING CONSTRUCTION. THERE ARE NO AUTHORIZED NON-STORMWATER DISCHARGES EXPECTED NOR ACTIVE TREATMENT SYSTEM PLANNED TO BE IMPLEMENTED AT THIS PROJECT SITE.

INSPECTION FREQUENCY:

SITE CONDITION	MINIMUM FREQUENCY
1. ACTIVE PERIOD	ON INITIAL DATE THAT LAND DISTURBANCE ACTIVITIES COMMENCE. WITHIN 24 HOURS OF ANY STORM EVENT, INCLUDING RUNOFF FROM SNOW MELT, THAT RESULTS IN DISCHARGE FROM THE SITE. WEEKLY, REGARDLESS OF WHETHER STORMWATER RUNOFF IS OCCURRING.
2. INACTIVE PERIODS GREATER THAN FOURTEEN (14) CONSECUTIVE CALENDAR DAYS	THE INSPECTOR MAY REDUCE THE FREQUENCY OF INSPECTIONS IN ANY AREA OF THE SITE WHERE THE STABILIZATION STEPS IN SECTION 2.2.20 HAVE BEEN COMPLETED TO TWICE PER MONTH FOR THE FIRST MONTH, NO LESS THAN 14 CALENDAR DAYS APART, THEN ONCE PER MONTH.
3. PERIODS DURING WHICH THE SITE IS INACCESSIBLE DUE TO INCLEMENT WEATHER	IF SAFE, ACCESSIBLE AND PRACTICAL, INSPECTIONS MUST OCCUR DAILY AT A RELEVANT DISCHARGE POINT OR DOWNSTREAM LOCATION OF THE RECEIVING WATERBODY.
4. PERIODS DURING WHICH CONSTRUCTION ACTIVITIES ARE SUSPENDED AND RUNOFF IS UNLIKELY DUE TO FROZEN CONDITIONS.	VISUAL MONITORING INSPECTIONS MAY BE TEMPORARILY SUSPENDED. IMMEDIATELY RESUME MONITORING UPON THAWING, OR WHEN WEATHER CONDITIONS MAKE DISCHARGES LIKELY.
5. PERIODS DURING WHICH CONSTRUCTION ACTIVITIES ARE CONDUCTED AND RUNOFF IS UNLIKELY DURING FROZEN CONDITIONS.	VISUAL MONITORING INSPECTIONS MAY BE REDUCED TO ONCE A MONTH. IMMEDIATELY RESUME MONITORING UPON THAWING, OR WHEN WEATHER CONDITIONS MAKE DISCHARGES LIKELY.

THE PERMITTEE IS REQUIRED TO MEET ALL THE CONDITIONS OF THE 1200-CA PERMIT. THIS ESCP AND GENERAL CONDITIONS HAVE BEEN DEVELOPED TO FACILITATE COMPLIANCE WITH THE 1200-CA PERMIT REQUIREMENTS. IN CASES OF DISCREPANCIES OR OMISSIONS, THE 1200-CA PERMIT REQUIREMENTS SUPERCEDE REQUIREMENTS OF THIS PLAN.

RATIONALE STATEMENT

A COMPREHENSIVE LIST OF AVAILABLE BEST MANAGEMENT PRACTICES (BMP) OPTIONS BASED ON DEQ's GUIDANCE MANUAL HAS BEEN REVIEWED TO COMPLETE THIS EROSION AND SEDIMENT CONTROL PLAN. SOME OF THE ABOVE LISTED BMP's WERE NOT CHOSEN BECAUSE THEY WERE DETERMINED TO NOT EFFECTIVELY MANAGE EROSION PREVENTION AND SEDIMENT CONTROL FOR THIS PROJECT BASED ON SPECIFIC SITE CONDITIONS, INCLUDING SOIL CONDITIONS TOPOGRAPHIC CONSTRAINTS, ACCESSIBILITY TO THE SITE, AND OTHER RELATED CONDITIONS, AS THE PROJECT PROGRESSES AND THERE IS A NEED TO REVISE THE ESC PLAN, AN ACTION PLAN WILL BE SUBMITTED.

INITIAL *NJM*

SHEET INDEX

EROSION AND SEDIMENT CONTROL PLANS

DETAILS ACCOMPANIED BY THE STANDARD DRAWINGS REFERENCED HEREIN

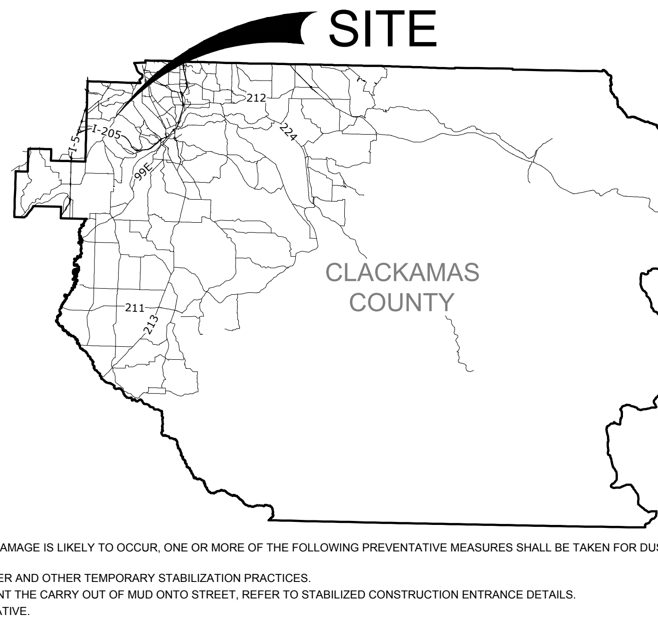
STANDARD EROSION AND SEDIMENT CONTROL PLAN DRAWING NOTES:

1. ONCE KNOWN, INCLUDE A LIST OF ALL CONTRACTORS THAT WILL ENGAGE IN CONSTRUCTION ACTIVITIES ON SITE, AND THE AREAS OF THE SITE WHERE THE CONTRACTOR(S) WILL ENGAGE IN CONSTRUCTION ACTIVITIES. REVISE THE LIST AS APPROPRIATE UNTIL PERMIT COVERAGE IS TERMINATED (SECTION 4.4.C.I). IN ADDITION, INCLUDE A LIST OF ALL PERSONNEL (BY NAME AND POSITION) THAT ARE RESPONSIBLE FOR THE DESIGN, INSTALLATION AND MAINTENANCE OF STORMWATER CONTROL MEASURES (E.G. ESCP DEVELOPER, BMP INSTALLER (SEE SECTION 4.10), AS WELL AS THEIR INDIVIDUAL RESPONSIBILITIES. (SECTION 4.4.C.II)
2. VISUAL MONITORING INSPECTION REPORTS MUST BE MADE IN ACCORDANCE WITH DEQ 1200-CA PERMIT REQUIREMENTS. (SECTION 6.5)
3. INSPECTION LOGS MUST BE KEPT IN ACCORDANCE WITH DEQ'S 1200-CA PERMIT REQUIREMENTS. (SECTION 6.5.Q)
4. RETAIN A COPY OF THE ESCP AND ALL REVISIONS ON SITE AND MAKE IT AVAILABLE ON REQUEST TO DEQ, AGENT, OR THE LOCAL MUNICIPALITY. (SECTION 4.7)
5. THE PERMIT REGISTRANT MUST IMPLEMENT THE ESCP. FAILURE TO IMPLEMENT ANY OF THE CONTROL MEASURES OR PRACTICES DESCRIBED IN THE ESCP IS A VIOLATION OF THE PERMIT. (SECTIONS 4 AND 4.11)
6. THE ESCP MUST BE ACCURATE AND REFLECT SITE CONDITIONS. (SECTION 4.8)
7. SUBMISSION OF ALL ESCP REVISIONS IS NOT REQUIRED. SUBMITTAL OF THE ESCP REVISIONS IS ONLY UNDER SPECIFIC CONDITIONS. SUBMIT ALL NECESSARY REVISION TO DEQ OR AGENT WITHIN 10 DAYS. (SECTION 4.9)
8. SEQUENCE CLEARING AND GRADING TO THE MAXIMUM EXTENT PRACTICAL TO PREVENT EXPOSED INACTIVE AREAS FROM BECOMING A SOURCE OF EROSION. (SECTION 2.2.2)
9. CREATE SMOOTH SURFACES BETWEEN SOIL SURFACE AND EROSION AND SEDIMENT CONTROLS TO PREVENT STORMWATER FROM BYPASSING CONTROLS AND PONDING. (SECTION 2.2.3)
10. IDENTIFY, MARK, AND PROTECT (BY CONSTRUCTION FENCING OR OTHER MEANS) CRITICAL RIPARIAN AREAS AND VEGETATION INCLUDING IMPORTANT TREES AND ASSOCIATED ROOTING ZONES, AND VEGETATION AREAS TO BE PRESERVED. IDENTIFY VEGETATIVE BUFFER ZONES BETWEEN THE SITE AND SENSITIVE AREAS (E.G., WETLANDS), AND OTHER AREAS TO BE PRESERVED, ESPECIALLY IN PERIMETER AREAS. (SECTION 2.2.1)
11. PRESERVE EXISTING VEGETATION WHEN PRACTICAL AND RE-VEGETATE OPEN AREAS. RE-VEGETATE OPEN AREAS WHEN PRACTICABLE BEFORE AND AFTER GRADING OR CONSTRUCTION. IDENTIFY THE TYPE OF VEGETATIVE SEED MIX USED. (SECTION 2.2.5)
12. MAINTAIN AND DELINEATE ANY EXISTING NATURAL BUFFER WITHIN THE 50-FEET OF WATERS OF THE STATE. (SECTION 2.2.4)
13. INSTALL PERIMETER SEDIMENT CONTROL, INCLUDING STORM DRAIN INLET PROTECTION AS WELL AS ALL SEDIMENT BASINS, TRAPS, AND BARRIERS PRIOR TO LAND DISTURBANCE. (SECTIONS 2.1.3)
14. CONTROL BOTH PEAK FLOW RATES AND TOTAL STORMWATER VOLUME, TO MINIMIZE EROSION AT OUTLETS AND DOWNSTREAM CHANNELS AND STREAMBANKS. (SECTIONS 2.1.1. AND 2.2.16)
15. CONTROL SEDIMENT AS NEEDED ALONG THE SITE PERIMETER AND AT ALL OPERATIONAL INTERNAL STORM DRAIN INLETS AT ALL TIMES DURING CONSTRUCTION, BOTH INTERNALLY AND AT THE SITE BOUNDARY. (SECTIONS 2.2.6 AND 2.2.13)
16. ESTABLISH CONCRETE TRUCK AND OTHER CONCRETE EQUIPMENT WASHOUT AREAS BEFORE BEGINNING CONCRETE WORK. (SECTION 2.2.14)
17. APPLY TEMPORARY AND/OR PERMANENT SOIL STABILIZATION MEASURES IMMEDIATELY ON ALL DISTURBED AREAS AS GRADING PROGRESSES. TEMPORARY OR PERMANENT STABILIZATIONS MEASURES ARE NOT REQUIRED FOR AREAS THAT ARE INTENDED TO BE LEFT UNVEGETATED, SUCH AS DIRT ACCESS ROADS OR UTILITY POLE PADS.(SECTIONS 2.2.20 AND 2.2.21)
18. ESTABLISH MATERIAL AND WASTE STORAGE AREAS, AND OTHER NON-STORMWATER CONTROLS. (SECTION 2.3.7)
19. KEEP WASTE CONTAINER LIDS CLOSED WHEN NOT IN USE AND CLOSE LIDS AT THE END OF THE BUSINESS DAY FOR THOSE CONTAINERS THAT ARE ACTIVELY USED THROUGHOUT THE DAY. FOR WASTE CONTAINERS THAT DO NOT HAVE LIDS, PROVIDE EITHER (1) COVER (E.G., A TARP, PLASTIC SHEETING, TEMPORARY ROOF) TO PREVENT EXPOSURE OF WASTES TO PRECIPITATION, OR (2) A SIMILARLY EFFECTIVE MEANS DESIGNED TO PREVENT THE DISCHARGE OF POLLUTANTS (E.G., SECONDARY CONTAINMENT). (SECTION 2.3.7)
20. PREVENT TRACKING OF SEDIMENT ONTO PUBLIC OR PRIVATE ROADS USING BMPS SUCH AS: CONSTRUCTION ENTRANCE, GRAVELED (OR PAVED) EXITS AND PARKING AREAS, GRAVEL ALL UNPAVED ROADS LOCATED ONSITE, OR USE AN EXIT TIRE WASH. THESE BMPS MUST BE IN PLACE PRIOR TO LAND- DISTURBING ACTIVITIES. (SECTION 2.2.7)
21. WHEN TRUCKING SATURATED SOILS FROM THE SITE, EITHER USE WATER-TIGHT TRUCKS OR DRAIN LOADS ON SITE. (SECTION 2.2.7.F)
22. CONTROL PROHIBITED DISCHARGES FROM LEAVING THE CONSTRUCTION SITE, I.E., CONCRETE WASH-OUT, WASTEWATER FROM CLEANOUT OF STUCCO, PAINT AND CURING COMPOUNDS. (SECTIONS 1.5 AND 2.3.9)
23. ENSURE THAT STEEP SLOPE AREAS WHERE CONSTRUCTION ACTIVITIES ARE NOT OCCURRING ARE NOT DISTURBED. (SECTION 2.2.10)
24. PREVENT SOIL COMPACTION IN AREAS WHERE POST-CONSTRUCTION INFILTRATION FACILITIES ARE TO BE INSTALLED. (SECTION 2.2.12)
25. USE BMPS TO PREVENT OR MINIMIZE STORMWATER EXPOSURE TO POLLUTANTS FROM SPILLS; VEHICLE AND EQUIPMENT FUELING, MAINTENANCE, AND STORAGE; OTHER CLEANING AND MAINTENANCE ACTIVITIES; AND WASTE HANDLING ACTIVITIES. THESE POLLUTANTS INCLUDE FUEL, HYDRAULIC FLUID, AND OTHER OILS FROM VEHICLES AND MACHINERY, AS WELL AS DEBRIS, FERTILIZER, PESTICIDES AND HERBICIDES, PAINTS, SOLVENTS, CURING COMPOUNDS AND ADHESIVES FROM CONSTRUCTION OPERATIONS. (SECTIONS 2.2.15 AND 2.3)
26. PROVIDE PLANS FOR SEDIMENTATION BASINS THAT HAVE BEEN DESIGNED PER SECTION 2.2.17 AND STAMPED BY AN ODOT PROFESSIONAL ENGINEER. (SEE SECTION 2.2.17.A)
27. IF ENGINEERED SOILS ARE USED ON SITE, A SEDIMENTATION BASIN/IMPOUNDMENT MUST BE INSTALLED. (SEE SECTIONS 2.2.17 AND 2.2.18)
28. PROVIDE A DEWATERING PLAN FOR ACCUMULATED WATER FROM PRECIPITATION AND UNCONTAMINATED GROUNDWATER SEEPAGE DUE TO SHALLOW EXCAVATION ACTIVITIES. (SEE SECTION 2.4)
29. IMPLEMENT THE FOLLOWING BMPS WHEN APPLICABLE: WRITTEN SPILL PREVENTION AND RESPONSE PROCEDURES, EMPLOYEE TRAINING ON SPILL PREVENTION AND PROPER DISPOSAL PROCEDURES, SPILL KITS IN ALL VEHICLES, REGULAR MAINTENANCE SCHEDULE FOR VEHICLES AND MACHINERY, MATERIAL DELIVERY AND STORAGE CONTROLS, TRAINING AND SIGNAGE, AND COVERED STORAGE AREAS FOR WASTE AND SUPPLIES. (SECTION 2.3)
30. USE WATER, SOIL-BINDING AGENT OR OTHER DUST CONTROL TECHNIQUE AS NEEDED TO AVOID WIND-BLOWN SOIL. (SECTION 2.2.9)
31. THE APPLICATION RATE OF FERTILIZERS USED TO REESTABLISH VEGETATION MUST FOLLOW MANUFACTURER'S RECOMMENDATIONSTO MINIMIZE NUTRIENT RELEASES TO SURFACE WATERS. EXERCISE CAUTION WHEN USING TIME-RELEASE FERTILIZERS WITHIN ANY WATERWAY RIPARIAN ZONE. (SECTION 2.3.5)
32. IF AN ACTIVE TREATMENT SYSTEM (FOR EXAMPLE, ELECTRO-COAGULATION, FLOCCULATION, FILTRATION, ETC.) FOR SEDIMENT OR OTHER POLLUTANT REMOVAL IS EMPLOYED, SUBMIT AN OPERATION AND MAINTENANCE PLAN (INCLUDING SYSTEM SCHEMATIC, LOCATION OF SYSTEM, LOCATION OF INLET, LOCATION OF DISCHARGE, DISCHARGE DISPERSION DEVICE DESIGN, AND A SAMPLING PLAN AND FREQUENCY) BEFORE OPERATING THE TREATMENT SYSTEM. OBTAIN ENVIRONMENTAL MANAGEMENT PLAN APPROVAL FROM DEQ BEFORE OPERATING THE TREATMENT SYSTEM. OPERATE AND MAINTAIN THE TREATMENT SYSTEM ACCORDING TO MANUFACTURER'S SPECIFICATIONS. (SECTION 1.2.9)
33. TEMPORARILY STABILIZE SOILS AT THE END OF THE SHIFT BEFORE HOLIDAYS AND WEEKENDS, IF NEEDED. THE REGISTRANT IS RESPONSIBLE FOR ENSURING THAT SOILS ARE STABLE DURING RAIN EVENTS AT ALL TIMES OF THE YEAR. (SECTION 2.2)
34. AS NEEDED BASED ON WEATHER CONDITIONS, AT THE END OF EACH WORKDAY SOIL STOCKPILES MUST BE STABILIZED OR COVERED, OR OTHER BMPS MUST BE IMPLEMENTED TO PREVENT DISCHARGES TO SURFACE WATERS OR CONVEYANCE SYSTEMS LEADING TO SURFACE WATERS. (SECTION 2.2.8)
35. SEDIMENT FENCE: REMOVE TRAPPED SEDIMENT BEFORE IT REACHES ONE THIRD OF THE ABOVE GROUND FENCE HEIGHT AND BEFORE FENCE REMOVAL. (SECTION 2.1.5.B)
36. OTHER SEDIMENT BARRIERS (SUCH AS BIOBAGS): REMOVE SEDIMENT BEFORE IT REACHES TWO INCHES DEPTH ABOVE GROUND HEIGHT AND BEFORE BMP REMOVAL. (SECTION 2.1.5.C)
37. CATCH BASINS: CLEAN BEFORE RETENTION CAPACITY HAS BEEN REDUCED BY FIFTY PERCENT. SEDIMENT BASINS AND SEDIMENT TRAPS: REMOVE TRAPPED SEDIMENTS BEFORE DESIGN CAPACITY HAS BEEN REDUCED BY FIFTY PERCENT AND AT COMPLETION OF PROJECT. (SECTION 2.1.5.D)
38. WITHIN 24 HOURS, SIGNIFICANT SEDIMENT THAT HAS LEFT THE CONSTRUCTION SITE, MUST BE REMEDIATED. INVESTIGATE THE CAUSE OF THE SEDIMENT RELEASE AND IMPLEMENT STEPS TO PREVENT A RECURRENCE OF THE DISCHARGE WITHIN THE SAME 24 HOURS. ANY IN-STREAM CLEAN-UP OF SEDIMENT SHALL BE PERFORMED ACCORDING TO THE ODOT DEPARTMENT OF STATE LANDS REQUIRED TIMEFRAME. (SECTION 2.2.19.A)
39. THE INTENTIONAL WASHING OF SEDIMENT INTO STORM SEWERS OR DRAINAGE WAYS MUST NOT OCCUR. VACUUMING OR DRY SWEEPING AND MATERIAL PICKUP MUST BE USED TO CLEANUP RELEASED SEDIMENTS. (SECTION 2.2.19)
40. DOCUMENT ANY PORTION(S) OF THE SITE WHERE LAND DISTURBING ACTIVITIES HAVE PERMANENTLY CEASED OR WILL BE TEMPORARILY INACTIVE FOR 14 OR MORE CALENDAR DAYS. (SECTION 6.5.F.)
41. PROVIDE TEMPORARY STABILIZATION FOR THAT PORTION OF THE SITE WHERE CONSTRUCTION ACTIVITIES CEASE FOR 14 DAYS OR MORE WITH A COVERING OF BLOWN STRAW AND A TACKIFIER, LOOSE STRAW, OR AN ADEQUATE COVERING OF COMPOST MULCH UNTIL WORK RESUMES ON THAT PORTION OF THE SITE. (SECTION 2.2.20)
42. DO NOT REMOVE TEMPORARY SEDIMENT CONTROL PRACTICES UNTIL PERMANENT VEGETATION OR OTHER COVER OF EXPOSED AREAS IS ESTABLISHED. ONCE CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED, ALL TEMPORARY EROSION CONTROLS AND RETAINED SOILS MUST BE REMOVED AND DISPOSED OF PROPERLY, UNLESS NEEDED FOR LONG TERM USE FOLLOWING TERMINATION OF PERMIT COVERAGE. (SECTION 2.2.21)

LOCAL AGENCY-SPECIFIC EROSION CONTROL NOTES:

1. THE CONSTRUCTION NOTES AND DETAILS SHOWN ON THIS PLAN REFLECT RECOMMENDED PROCEDURES AS ADDRESSED IN THE "EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL" BY CLACKAMAS COUNTY WATER ENVIRONMENTAL SERVICES.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER INSTALLATION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL MEASURES, IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
3. THE IMPLEMENTATION OF THESE ESC PLANS AND CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED BY THE LOCAL JURISDICTION, AND VEGETATION/LANDSCAPING IS ESTABLISHED.
4. IT IS THE INTENT OF THESE PLANS TO SHOW POSSIBLE APPLICATIONS OF RECOMMENDED PROCEDURES IN THE EVENT THAT EROSION CONTROL IS NEEDED. ALL RECOMMENDED PROCEDURES ARE DEPENDENT ON CONSTRUCTION METHODS, STAGING, SITE CONDITIONS, WEATHER, AND SCHEDULING. THE PROCEDURES SHOWN ON THE PLANS ARE NOT INTENDED TO BE EXCLUSIVE OF ALL THE PROTECTION REQUIRED IN AN AREA AT A PARTICULAR INSTANT. THEY SHOULD BE USED AS A GUIDELINE ONLY.
5. EROSION CONTROL MEASURES ARE SHOWN FOR GENERAL PURPOSES. THE CONTRACTOR SHALL PHASE EROSION CONTROL AS NEEDED. REFER TO SPECIAL PROVISIONS FOR EROSION CONTROL STAGING.
6. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY MARKED IN THE FIELD PRIOR TO CONSTRUCTION. REFER TO THE SPECIFICATIONS FOR FURTHER DETAIL.
7. THE CONTRACTOR IS RESPONSIBLE FOR CONTROL OF SEDIMENT TRANSPORT WITHIN PROJECT LIMITS DURING CONSTRUCTION. IF AN INSTALLED EROSION CONTROL SYSTEM DOES NOT ADEQUATELY CONTAIN SEDIMENT ON SITE, THEN THE EROSION CONTROL MEASURES MUST BE FIELD ADJUSTED BY THE CONTRACTOR AS NECESSARY FOR EXPECTED STORM EVENTS TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT LEAVE THE SITE.
8. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETE AND APPROVED, AND VEGETATION/LANDSCAPING IS ESTABLISHED.
9. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO INSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.
10. TEMPORARY EROSION CONTROL METHODS MUST REMAIN AND BE MAINTAINED UNTIL PERMANENT EROSION CONTROL METHODS ARE IN PLACE AND OPERATIONAL. THESE METHODS SHALL BE REMOVED ONCE SOIL STABILIZATION HAS BEEN ACHIEVED PER THE ENGINEER.
11. ADDITIONAL INTERIM MEASURES SHALL BE INSTALLED AS NECESSARY TO PREVENT SEDIMENT OR SEDIMENT LADEN RUNOFF FROM LEAVING THE SITE IN ACCORDANCE WITH THE "EROSION PREVENTION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL" BY CLACKAMAS COUNTY WATER ENVIRONMENT SERVICES (WES). THESE MEASURES WILL BE INSTALLED ALONG EXPOSED SOIL TO PREVENT SEDIMENT TRANSPORT.
12. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
13. THE CONTRACTOR SHALL HYDROSEED ALL CUT AND FILL SLOPES, AND ALL DISTURBED GROUND AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE HYDROSEED AREAS UNTIL VEGETATION UPON THEM IS ESTABLISHED. ANY ADDITIONAL HYDROSEEDING NECESSARY TO ESTABLISH VEGETATION SHALL BE DONE BY THE CONTRACTOR.
14. AFTER OCTOBER 1, ALL BARE SOIL SHALL BE RE-SEEDED, COVERED WITH AN APPROPRIATE EROSION CONTROL STRAW BLANKET AND FERTILIZED. WHERE RAPID GERMINATION IS REQUIRED, USE THE DWARF GRASS MIX IN THE SPECIFICATIONS.
15. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROTECTION OF ALL ADJACENT PROPERTIES AND DOWNSTREAM FACILITIES FROM EROSION AND SILTATION DURING THE COURSE OF THE WORK. ANY DAMAGE RESULTING FROM SUCH EROSION AND SILTATION SHALL BE CORRECTED AT THE SOLE EXPENSE OF THE CONTRACTOR.
16. ANY IN-STREAM WORK SHALL BE SCHEDULED IN STRICT ACCORDANCE WITH SPECIFIC LOCAL REQUIREMENTS OF THE DIVISION OF STATE LANDS, AND ODOT DEPARTMENT OF FISH AND WILDLIFE.
17. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT. IF CONSTRUCTION OCCURS DURING WET WEATHER; HAUL ROADS AND OTHER HIGH USE TRAFFIC AREAS SHALL BE PROTECTED BY AT LEAST 18" OF 3"-0 CRUSHED ROCK UNDERLAIN BY A WOVEN GEOTEXTILE, SUCH AS AMOCO 2006, MIRAFI 600X, OR EQUIVALENT.
18. IN AREAS SUBJECT TO SURFACE AND AIR MOVEMENT OF DUST, WHERE ON-SITE OR OFF-SITE DAMAGE IS LIKELY TO OCCUR, ONE OR MORE OF THE FOLLOWING PREVENTATIVE MEASURES SHALL BE TAKEN FOR DUST CONTROL:
   - MINIMIZE THE PERIOD OF SOIL EXPOSURE THROUGH THE USE OF TEMPORARY GROUND COVER AND OTHER TEMPORARY STABILIZATION PRACTICES.
   - THE SITE IS SPRINKLED WITH WATER UNTIL SURFACE IS WET. REPEAT AS NEEDED TO PREVENT THE CARRY OUT OF MUD ONTO STREET, REFER TO STABILIZED CONSTRUCTION ENTRANCE DETAILS.
   - SPRAY EXPOSED SOILS WITH A DUST PALLIATIVE. NOTE, USED OIL IS PROHIBITED AS A PALLIATIVE.
19. PRIOR TO ANY SITE EXCAVATION, ALL EXISTING AND NEWLY CONSTRUCTED STORM DRAINAGE INLETS SHALL BE PROTECTED AS SHOWN ON THE DETAIL SHEETS TO PREVENT SEDIMENT FROM ENTERING THE STORM DRAINAGE SYSTEM PRIOR TO PERMANENT STABILIZATION OF THE DISTURBED AREA. CLEAN THE FILTER AS NECESSARY TO MAINTAIN DRAINAGE. PROVIDE APPROVED TRAFFIC CONTROL DEVICES AS NECESSARY. REMOVE FILTER AND CLEAN CATCH BASINS FOLLOWING COMPLETION OF SITEWORK.
20. AT NO TIME SHALL MORE THAN 12" OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A TRAPPED CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
21. STORM DRAIN INLETS, BASINS, AND AREA DRAINS SHALL BE PROTECTED UNTIL PAVEMENT SURFACES ARE COMPLETED AND/OR VEGETATION IS RE-ESTABLISHED.
22. PAVEMENT SURFACES AND VEGETATION ARE TO BE PLACED AS RAPIDLY AS POSSIBLE.
23. THE CONTRACTOR SHALL PRUNE ALL VEGETATION, AS NECESSARY, AWAY AND UP FROM THE STREET AS WELL AS ANY ROOT PRUNING AS DETERMINED BY THE ENGINEER. THE CONTRACTOR SHALL PROTECT ALL EXISTING TREES AND LANDSCAPING THAT IS TO REMAIN.

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24



SUBCONTRACTOR LIST:

NOTE: ALL SUBCONTRACTORS WILL BE WORKING THROUGHOUT THE ENTIRE SITE

SUBCONTRACTOR	WORK PERFORMED
'PENDING'	'PENDING'
'PENDING'	'PENDING'
'PENDING'	'PENDING'
'PENDING'	'PENDING'
'PENDING'	'PENDING'

BMP MATRIX FOR CONSTRUCTION PHASES

REFER TO DEQ GUIDANCE MANUAL FOR A COMPREHENSIVE LIST OF AVAILABLE BMP'S.

	CLEARING	MASS GRADING	UTILITY INSTALLATION	STREET CONSTRUCTION	FINAL STABILIZATION
EROSION PREVENTION					
PRESERVE NATURAL VEGETATION	** X	X	X	X	X
GROUND COVER		X			X
HYDRAULIC APPLICATIONS					X
PLASTIC SHEETING		X			
MATTING					X
DUST CONTROL	X	X	X	X	X
TEMPORARY/ PERMANENT SEEDING		X	X	X	X
BUFFER ZONE	** X	X	X	X	X
OTHER:					
SEDIMENT CONTROL					
SEDIMENT FENCE (PERIMETER)	** X	X	X	X	X
SEDIMENT FENCE (INTERIOR)					
STRAW WATTLES					
FILTER BERM	** X	X	X	X	
INLET PROTECTION	** X	X	X	X	X
DEWATERING		*X	X	X	
SEDIMENT TRAP					
NATURAL BUFFER ENCROACHMENT	*X	*X	*X	*X	*X
OTHER:					
RUN OFF CONTROL					
CONSTRUCTION ENTRANCE	** X	X	X	X	X
PIPE SLOPE DRAIN	X	X	X	X	X
OUTLET PROTECTION	X	X	X	X	X
SURFACE ROUGHENING		X			X
CHECK DAMS	** X	X	X	X	X
OTHER:					
POLLUTION PREVENTION					
PROPER SIGNAGE	X	X	X	X	X
HAZ WASTE MGMT	X	X	X	X	X
SPILL KIT ON-SITE	X	X	X	X	X
CONCRETE WASHOUT AREA	X	X	X	X	X

* SIGNIFIES ADDITIONAL BMP'S REQUIRED FOR WORK WITHIN 50' OF WATER OF THE STATE.
** SIGNIFIES BMP THAT WILL BE INSTALLED PRIOR TO ANY GROUND DISTURBING ACTIVITY.

PERMITTEE'S SITE INSPECTOR: JIM CONRAD
COMPANY/AGENCY: CLACKAMAS COUNTY TRANSPORTATION ENGINEERING
PHONE: 503-742-4686
E-MAIL: JCONRAD@CLACKAMAS.US
DESCRIPTION OF EXPERIENCE: PROJECT CONSTRUCTION AND CESCL CERTIFIED PROJECT CONSTRUCTION AND CESCL CERTIFIED INSPECTOR (NO. 72736155)

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

EROSION & SEDIMENT CONTROL COVER SHT
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD
DATE: OCT 2024
PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

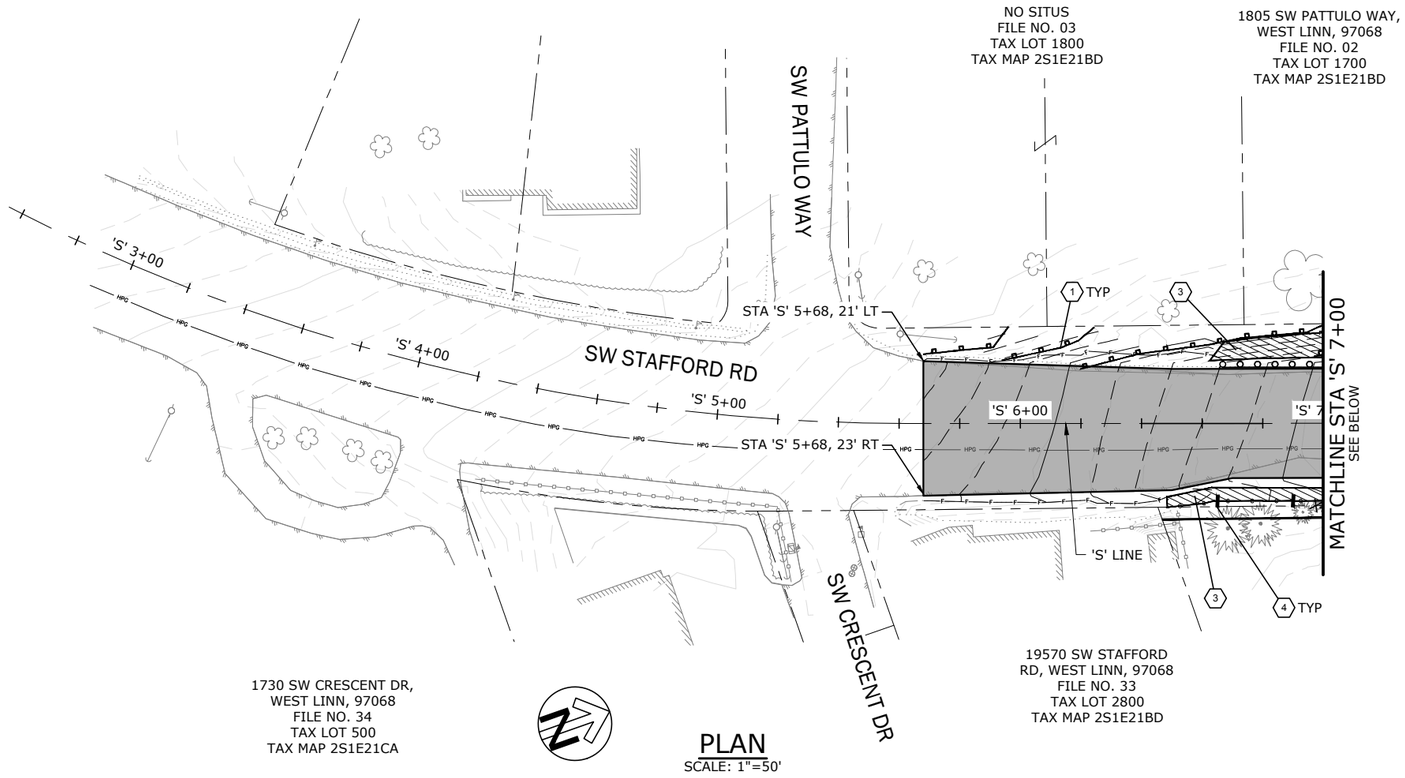
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

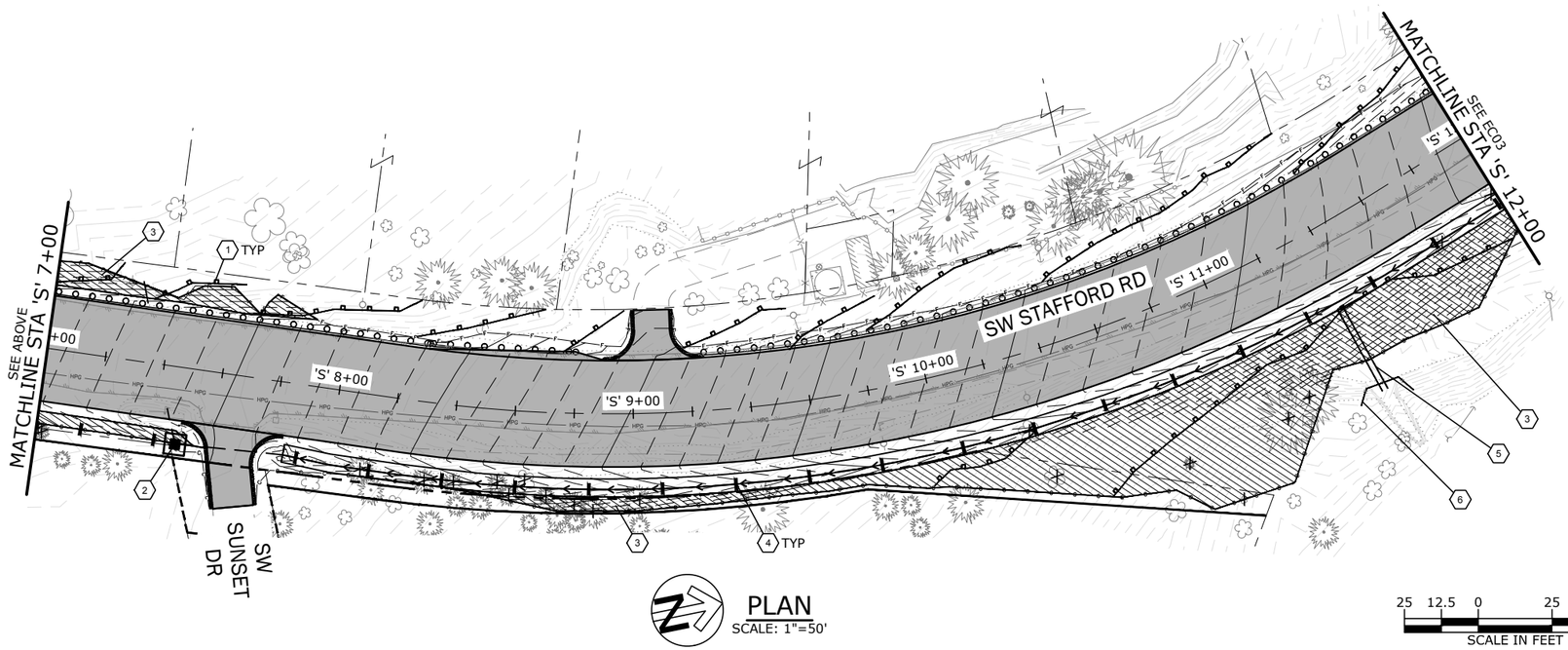
NO.	DATE:

Sheet No. EC01

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC01 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

EROSION CONTROL NOTES:

1. INSTALL COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9 PER ODOT STD DWG NO RD1033
2. INSTALL INLET PROTECTION TYPE 3 PER ODOT STD DWG NO RD1010
3. INSTALL SLOPE MATTING - TYPE D AND CHANNEL MATTING - TYPE E PER ODOT STD DWG NO RD1055
4. INSTALL COMPOST FILTER SOCK CHECK DAM - TYPE 6 PER ODOT STD DWG NO RD1006
5. INSTALL TEMPORARY SLOPE DRAIN WITH ENERGY DISSIPATOR PER ODOT STD DWG NO RD1045
6. INSTALL SEDIMENT FENCE PER ODOT STD DWG NO RD1040

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED
- CHECK DAM
- SEDIMENT FENCE
- ROADSIDE DITCH

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CLEARING, GRADING, UTIL, & STREET PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

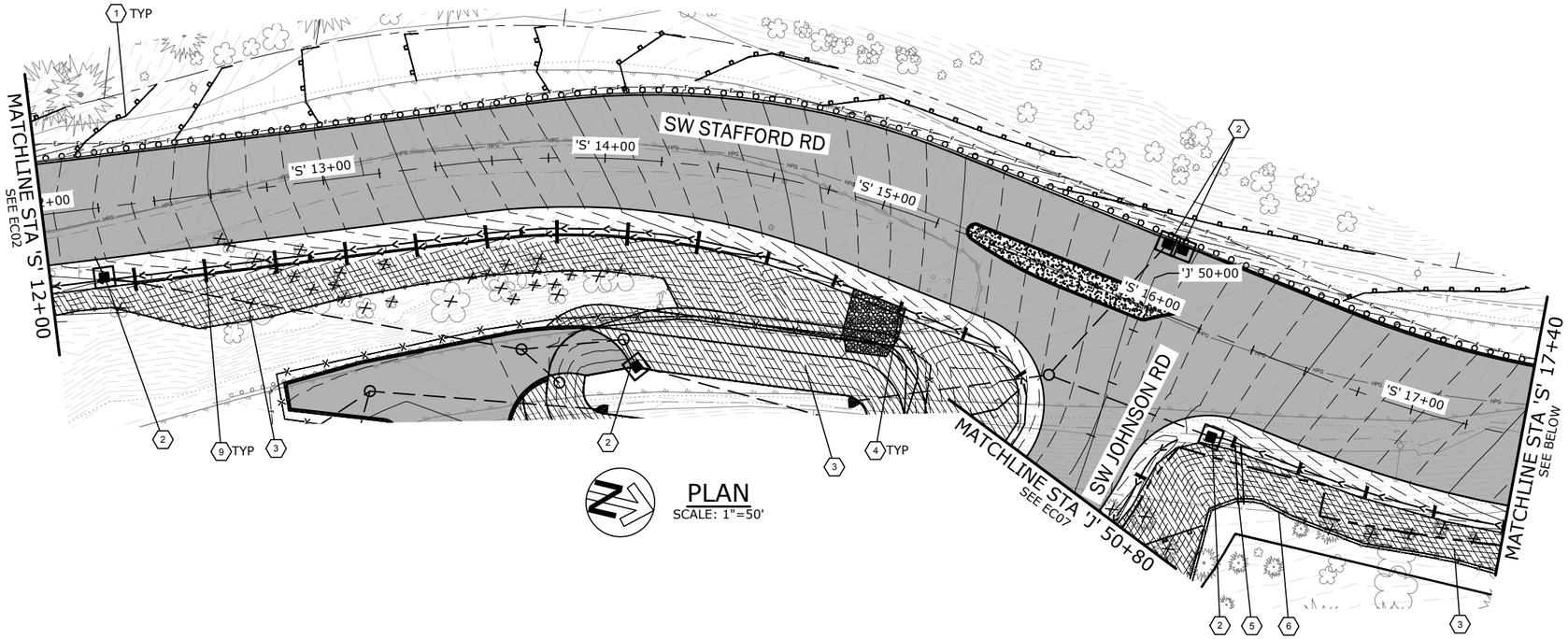
NO.	DATE:

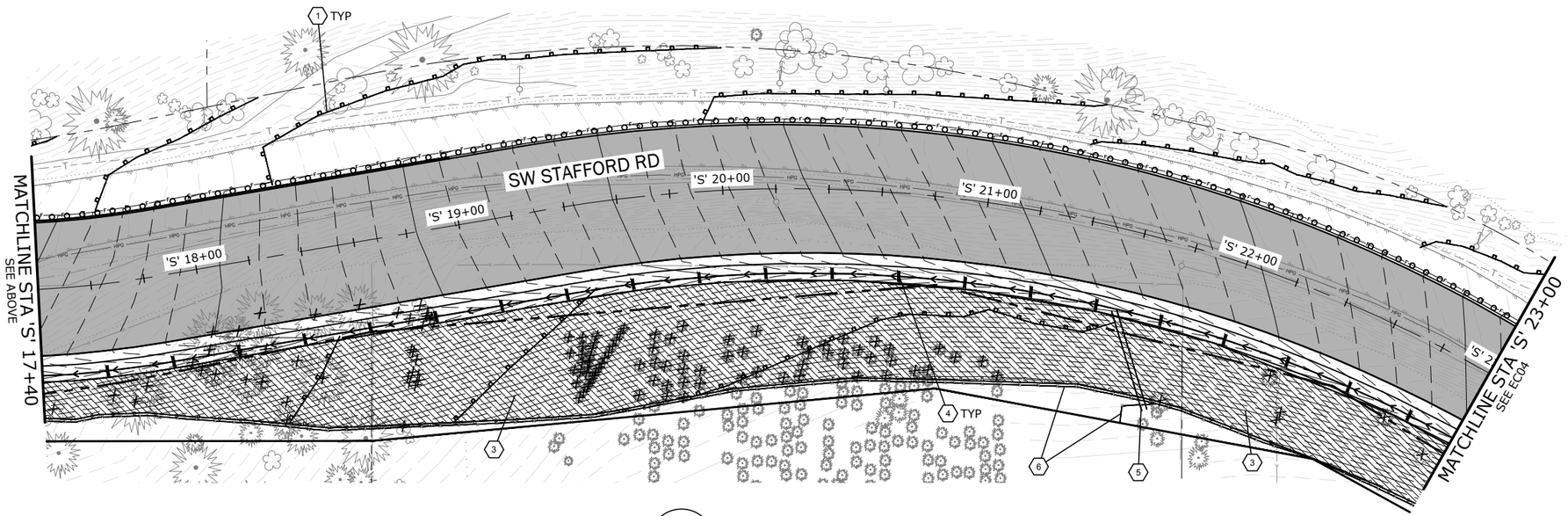
Sheet No.
EC02

100 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC02 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)





REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

EROSION CONTROL NOTES:

1. INSTALL COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9 PER ODOT STD DWG NO RD1033
2. INSTALL INLET PROTECTION TYPE 3 PER ODOT STD DWG NO RD1010
3. INSTALL SLOPE MATTING - TYPE C AND CHANNEL MATTING - TYPE E PER ODOT STD DWG NO RD1055
4. INSTALL COMPOST FILTER SOCK CHECK DAM - TYPE 6 PER ODOT STD DWG NO RD1006
5. INSTALL TEMPORARY SLOPE DRAIN WITH ENERGY DISSIPATOR PER ODOT STD DWG NO RD1045
6. INSTALL SEDIMENT FENCE PER ODOT STD DWG NO RD1040
9. INSTALL CHECK DAM,TYPE 1 PER ODOT STD DWG NO RD1005

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED
- CHECK DAM - TYPE 1
- CHECK DAM - TYPE 6
- SEDIMENT FENCE
- ROADSIDE DITCH

25 12.5 0 25 50
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CLEARING, GRADING, UTIL, & STREET PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

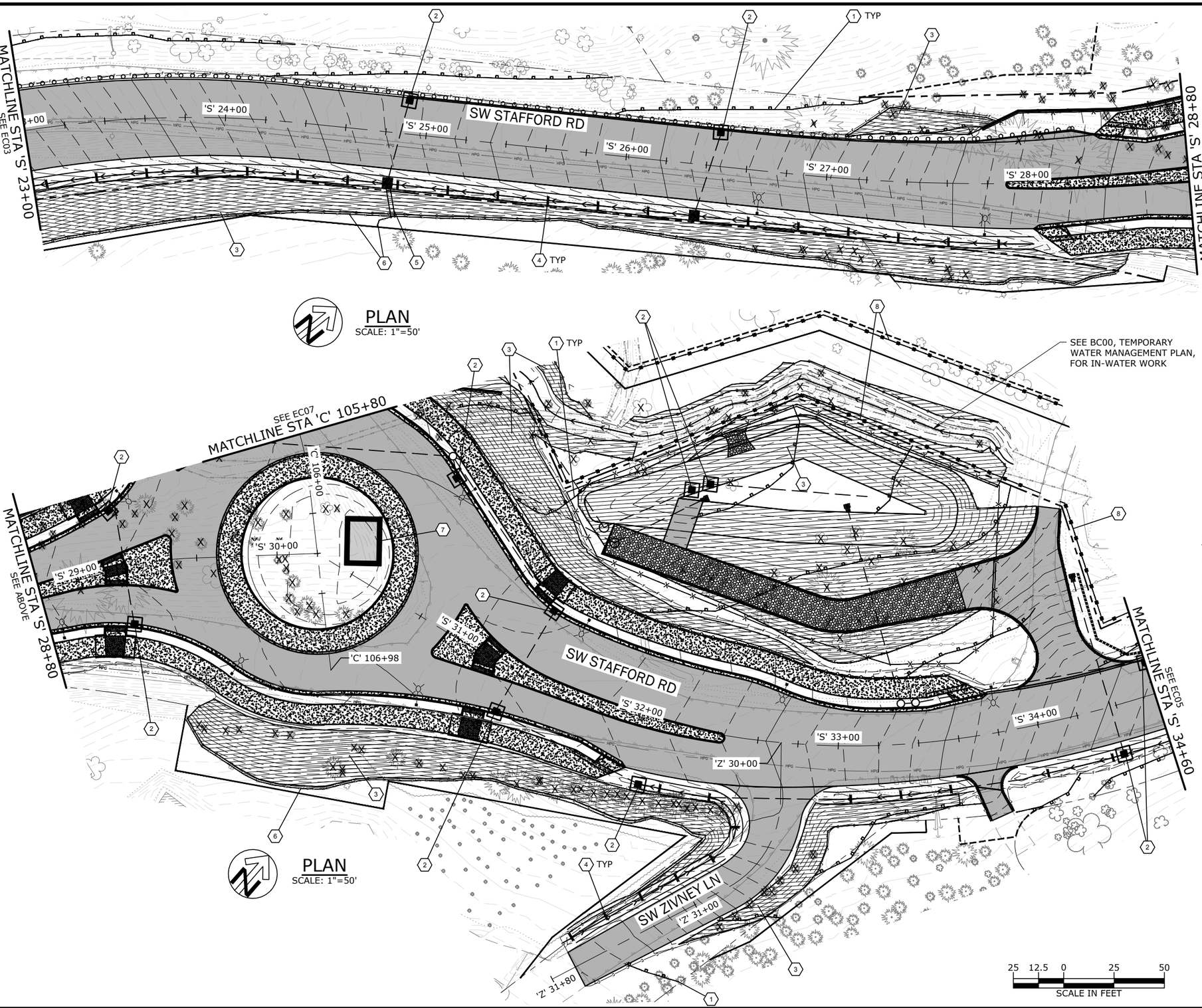
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

NO.	DATE:

Sheet No.
EC03

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC03 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)



REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

EROSION CONTROL NOTES:

1. INSTALL COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9 PER ODOT STD DWG NO RD1033
2. INSTALL INLET PROTECTION TYPE 3 PER ODOT STD DWG NO RD1010
3. INSTALL SLOPE MATTING - TYPE C AND CHANNEL MATTING - TYPE E PER ODOT STD DWG NO RD1055
4. INSTALL COMPOST FILTER SOCK CHECK DAM - TYPE 6 PER ODOT STD DWG NO RD1006
5. INSTALL TEMPORARY SLOPE DRAIN WITH ENERGY DISSIPATOR PER ODOT STD DWG NO RD1045
6. INSTALL SEDIMENT FENCE PER ODOT STD DWG NO RD1040
7. INSTALL CONCRETE TRUCK WASH OUT PER ODOT STD DWG NO RD1070
8. INSTALL ORANGE CONSTRUCTION FENCE

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED
- CHECK DAM - TYPE 6
- SEDIMENT FENCE
- ROADSIDE DITCH
- ORANGE CONSTRUCTION FENCE

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CLEARING, GRADING, UTIL, & STREET PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

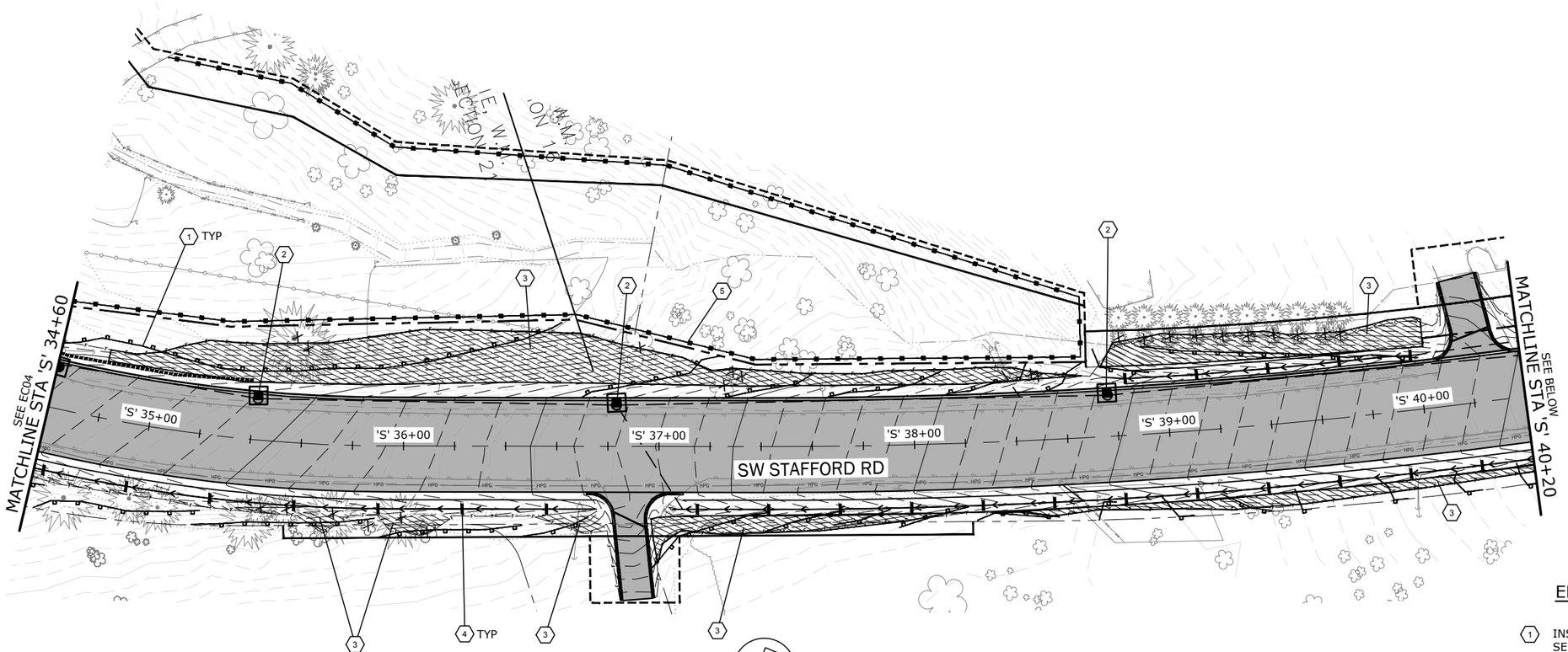
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

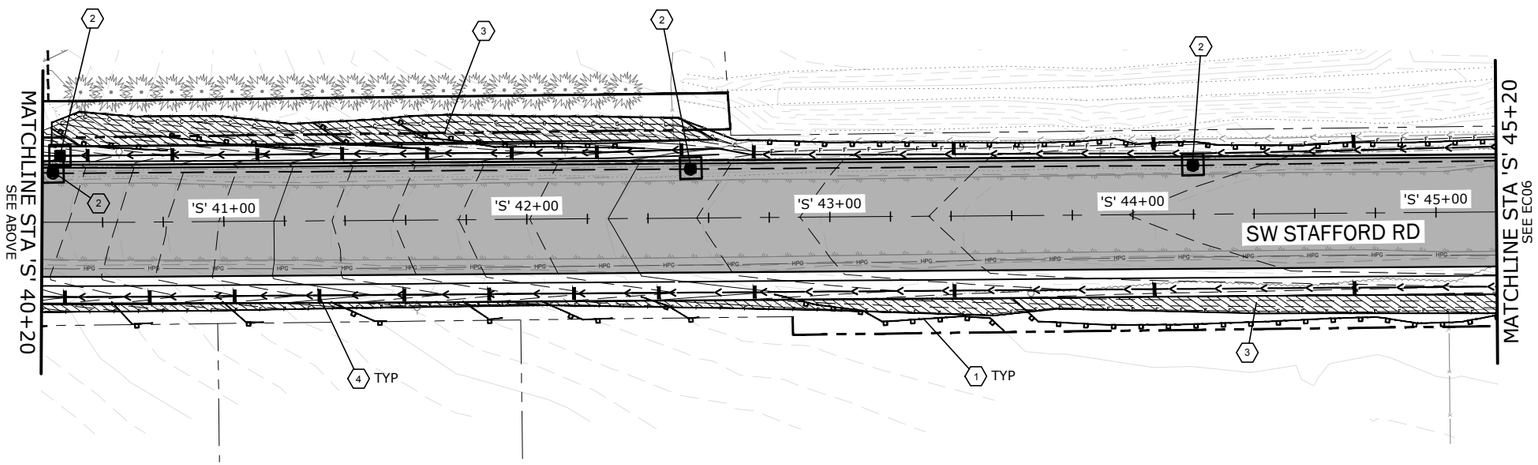
NO.	DATE:

Sheet No. EC04

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC04 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

EROSION CONTROL NOTES:

1. INSTALL COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9 PER ODOT STD DWG NO RD1033
2. INSTALL INLET PROTECTION TYPE 3 PER ODOT STD DWG NO RD1010
3. INSTALL SLOPE MATTING - TYPE C AND CHANNEL MATTING - TYPE E PER ODOT STD DWG NO RD1055
4. INSTALL COMPOST FILTER SOCK CHECK DAM - TYPE 6 PER ODOT STD DWG NO RD1006
5. INSTALL ORANGE CONSTRUCTION FENCE

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED — X
- CHECK DAM - TYPE 6
- SEDIMENT FENCE
- ROADSIDE DITCH

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CLEARING, GRADING, UTIL, & STREET PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

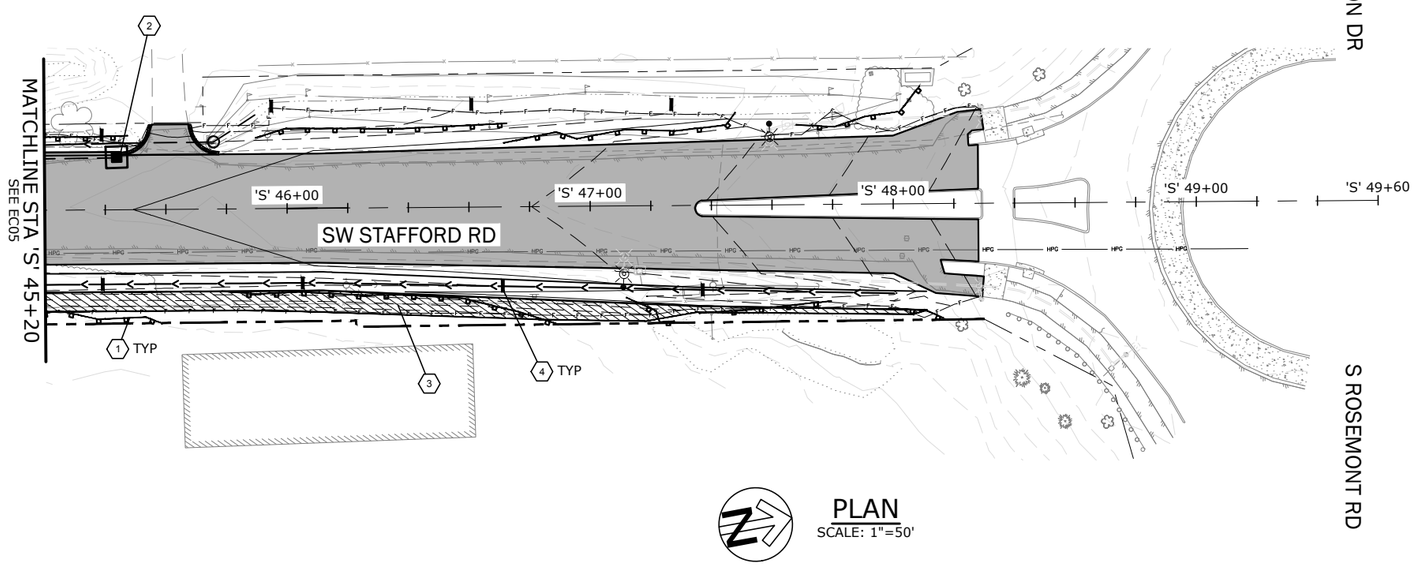
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

NO.	DATE:

Sheet No.
EC05

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC05 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'

EROSION CONTROL NOTES:

1. INSTALL COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9 PER ODOT STD DWG NO RD1033
2. INSTALL INLET PROTECTION TYPE 3 PER ODOT STD DWG NO RD1010
3. INSTALL SLOPE MATTING - TYPE C AND CHANNEL MATTING - TYPE E PER ODOT STD DWG NO RD1055
4. INSTALL COMPOST FILTER SOCK CHECK DAM - TYPE 6 PER ODOT STD DWG NO RD1006

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED — X
- CHECK DAM - TYPE 6
- SEDIMENT FENCE
- ROADSIDE DITCH

25 12.5 0 25 50
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CLEARING, GRADING, UTIL, & STREET PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

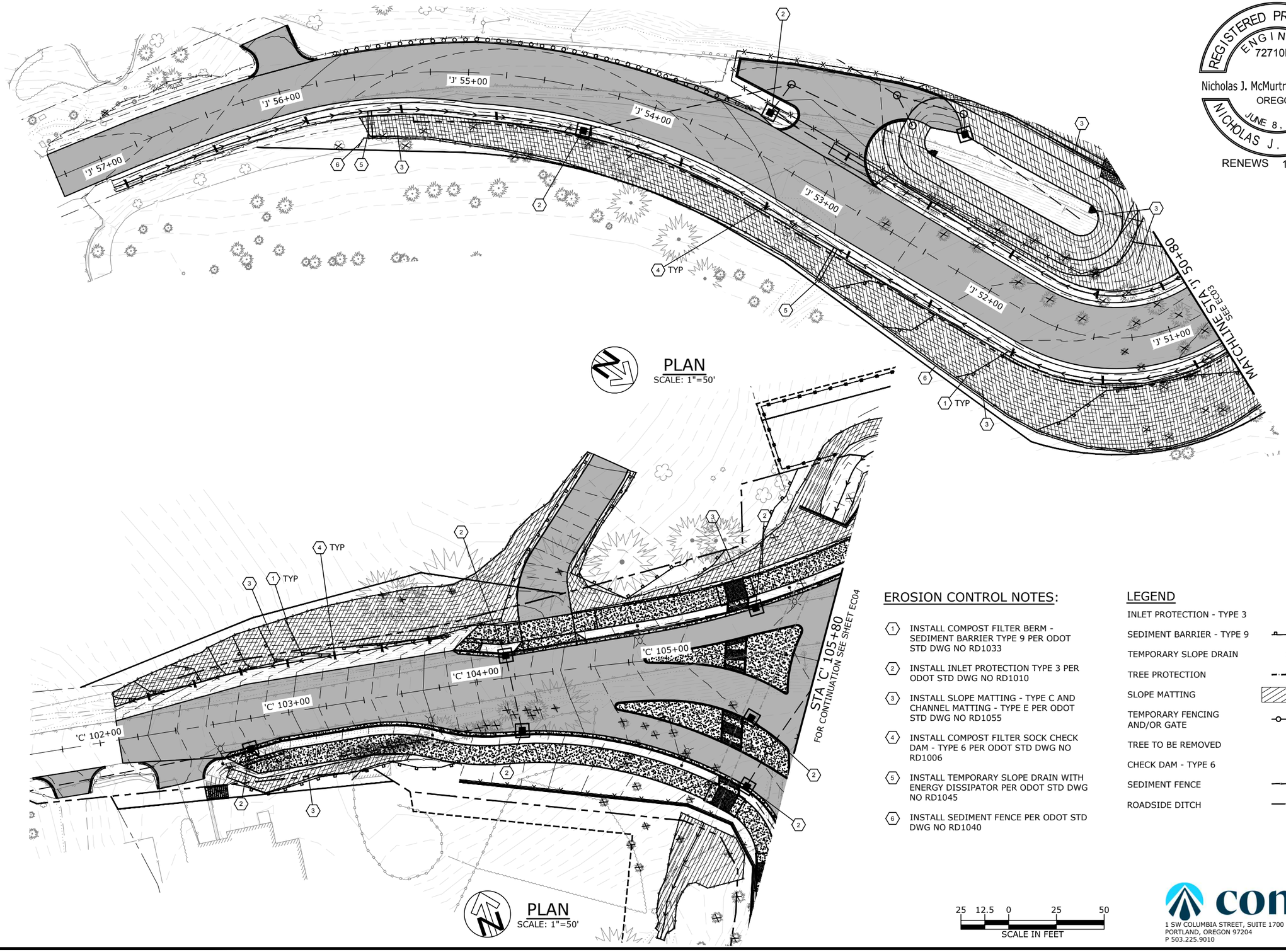
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

NO.	DATE:

Sheet No.
EC06

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC06 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)



EROSION CONTROL NOTES:

1. INSTALL COMPOST FILTER BERM - SEDIMENT BARRIER TYPE 9 PER ODOT STD DWG NO RD1033
2. INSTALL INLET PROTECTION TYPE 3 PER ODOT STD DWG NO RD1010
3. INSTALL SLOPE MATTING - TYPE C AND CHANNEL MATTING - TYPE E PER ODOT STD DWG NO RD1055
4. INSTALL COMPOST FILTER SOCK CHECK DAM - TYPE 6 PER ODOT STD DWG NO RD1006
5. INSTALL TEMPORARY SLOPE DRAIN WITH ENERGY DISSIPATOR PER ODOT STD DWG NO RD1045
6. INSTALL SEDIMENT FENCE PER ODOT STD DWG NO RD1040

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED (X)
- CHECK DAM - TYPE 6
- SEDIMENT FENCE
- ROADSIDE DITCH

25 12.5 0 25 50
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

CLEARING, GRADING, UTIL, & STREET PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: JMO

REVISIONS

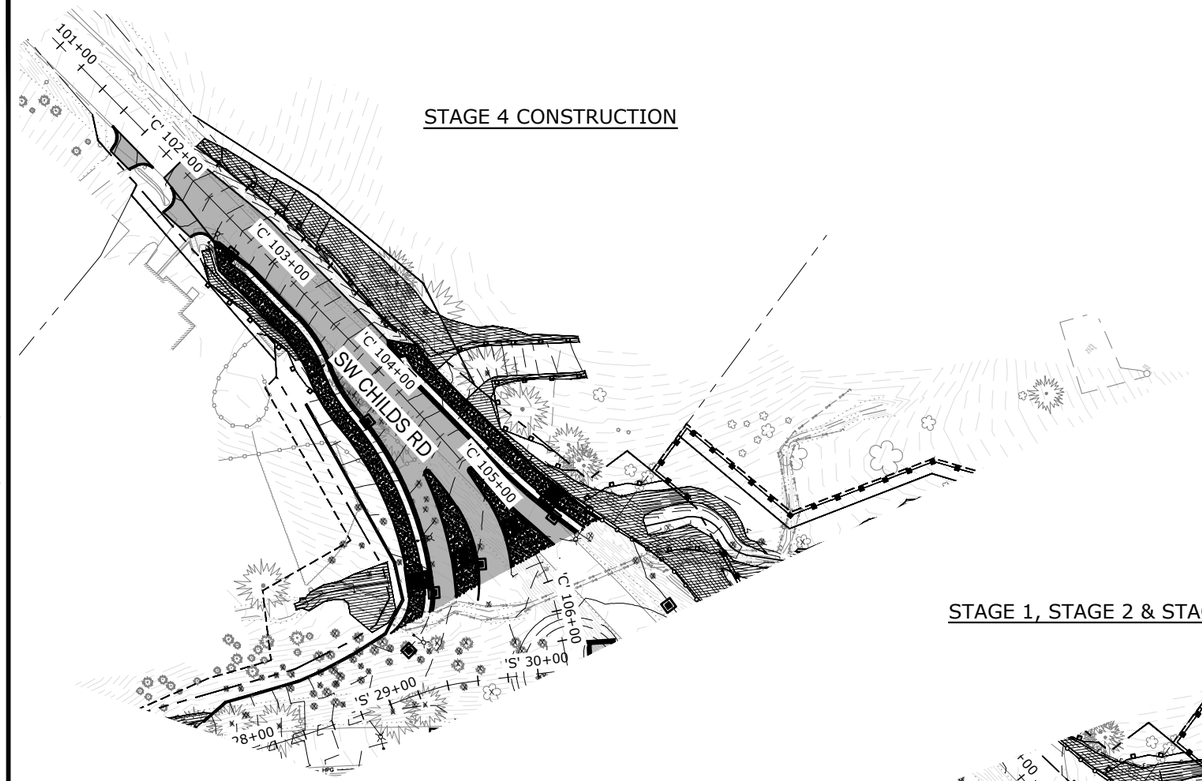
NO.	DATE:

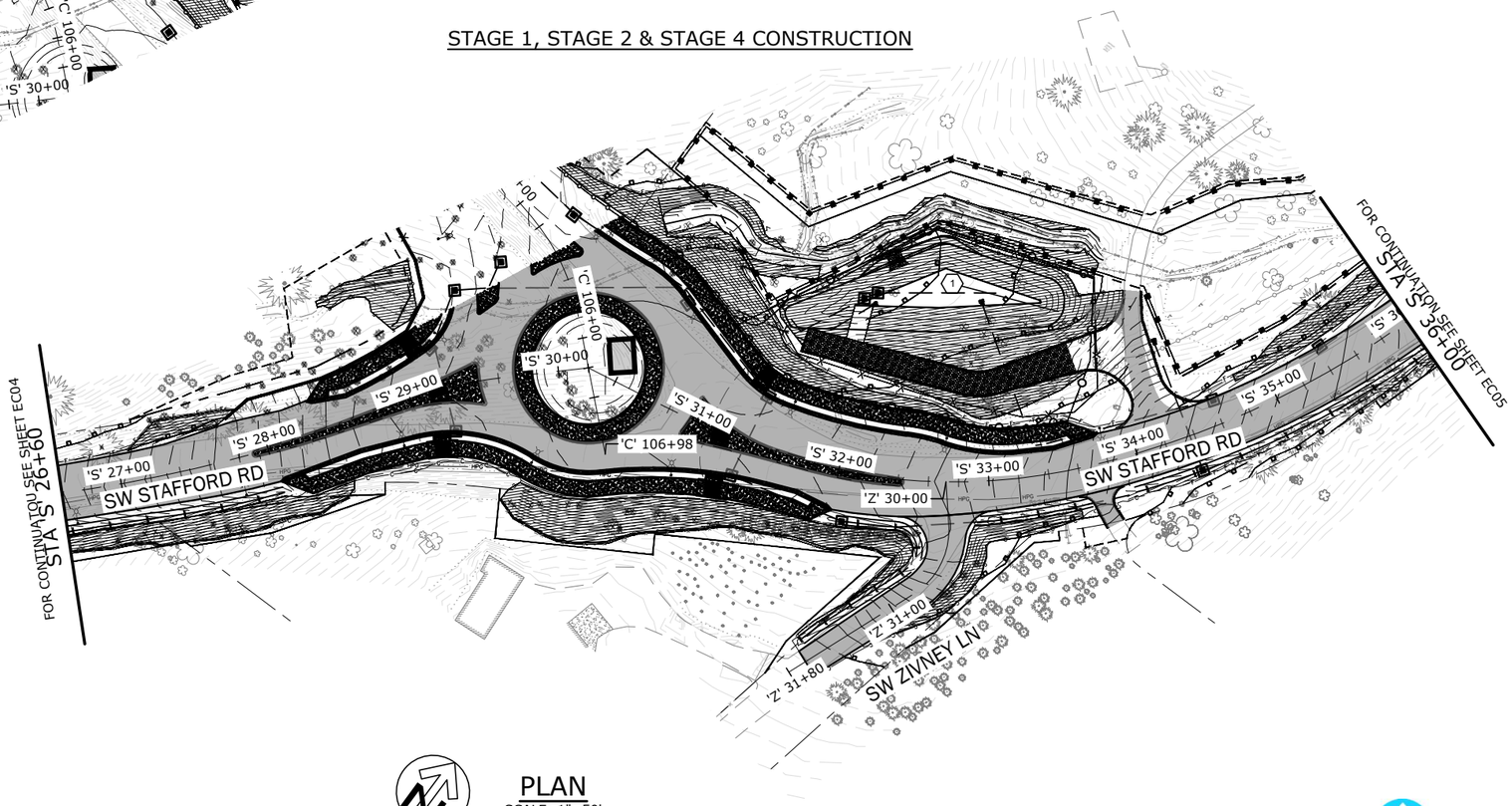
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No. EC07

105 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC07 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)





PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

LEGEND

- INLET PROTECTION - TYPE 3
- SEDIMENT BARRIER - TYPE 9
- TEMPORARY SLOPE DRAIN
- TREE PROTECTION
- SLOPE MATTING
- TEMPORARY FENCING AND/OR GATE
- TREE TO BE REMOVED — X
- CHECK DAM - TYPE 6
- SEDIMENT FENCE
- ORANGE CONSTRUCTION FENCE
- ROADSIDE DITCH

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

EROSION CONTROL NOTES:

1. INSTALL TIRE WASH - TYPE 1 PER ODOT STD DWG NO RD1060

WQ AREA - FINAL STABILIZATION PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

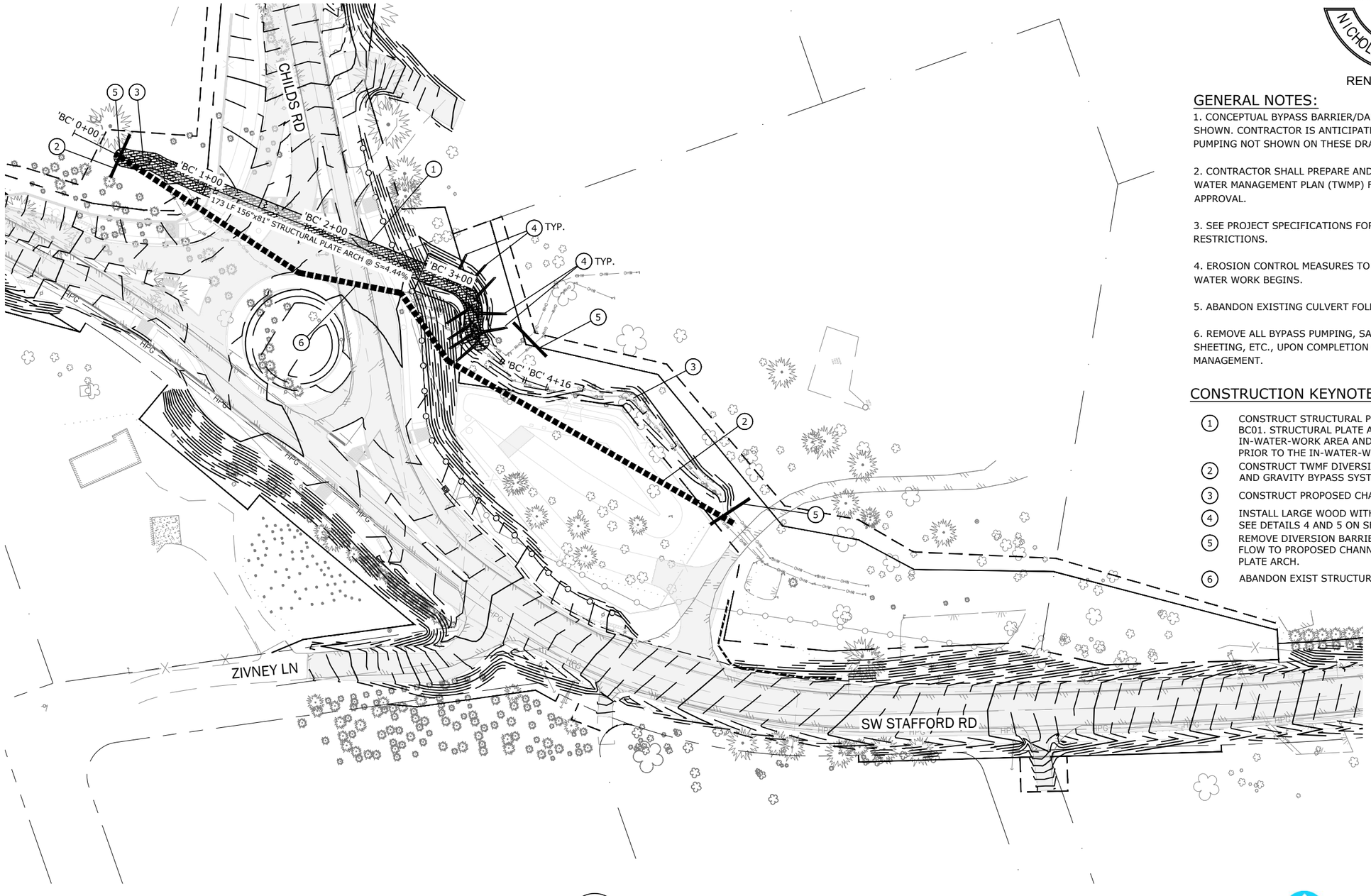
NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
EC08

106 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-EC.dwg EC08 10/31/2024 4:06 PM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=80'

40 20 0 40 80
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

GENERAL NOTES:

1. CONCEPTUAL BYPASS BARRIER/DAM CONFIGURATION SHOWN. CONTRACTOR IS ANTICIPATED TO PROVIDE BYPASS PUMPING NOT SHOWN ON THESE DRAWINGS.

2. CONTRACTOR SHALL PREPARE AND SUBMIT A TEMPORARY WATER MANAGEMENT PLAN (TWMP) FOR REVIEW AND APPROVAL.

3. SEE PROJECT SPECIFICATIONS FOR IN WATER WORK RESTRICTIONS.

4. EROSION CONTROL MEASURES TO BE IN PLACE BEFORE IN WATER WORK BEGINS.

5. ABANDON EXISTING CULVERT FOLLOWING FISH SALVAGE.

6. REMOVE ALL BYPASS PUMPING, SANDBAGS, PLASTIC SHEETING, ETC., UPON COMPLETION OF TEMPORARY WATER MANAGEMENT.

CONSTRUCTION KEYNOTES:

1. CONSTRUCT STRUCTURAL PLATE ARCH PER SHEET BC01. STRUCTURAL PLATE ARCH IS OUTSIDE OF THE IN-WATER-WORK AREA AND MAY BE CONSTRUCTED PRIOR TO THE IN-WATER-WORK WINDOW.
2. CONSTRUCT TWMF DIVERSION BARRIERIS/DAMS AND GRAVITY BYPASS SYSTEM
3. CONSTRUCT PROPOSED CHANNEL.
4. INSTALL LARGE WOOD WITH VEGETATED RIP RAP. SEE DETAILS 4 AND 5 ON SHEET BC05.
5. REMOVE DIVERSION BARRIERS/DAM AND DIRECT FLOW TO PROPOSED CHANNEL AND STRUCTURAL PLATE ARCH.
6. ABANDON EXIST STRUCTURE (SEE SHEET C10A)

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP WATER MANAGEMENT PLAN

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW / AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

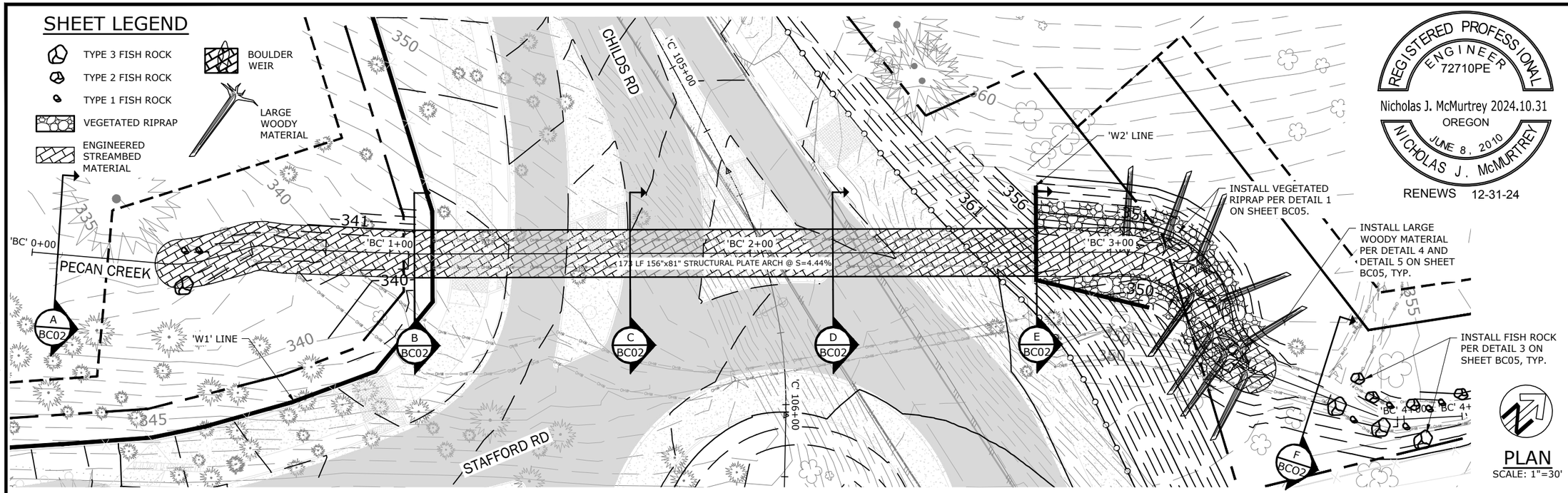
NO.	DATE:

Sheet No.
BC00

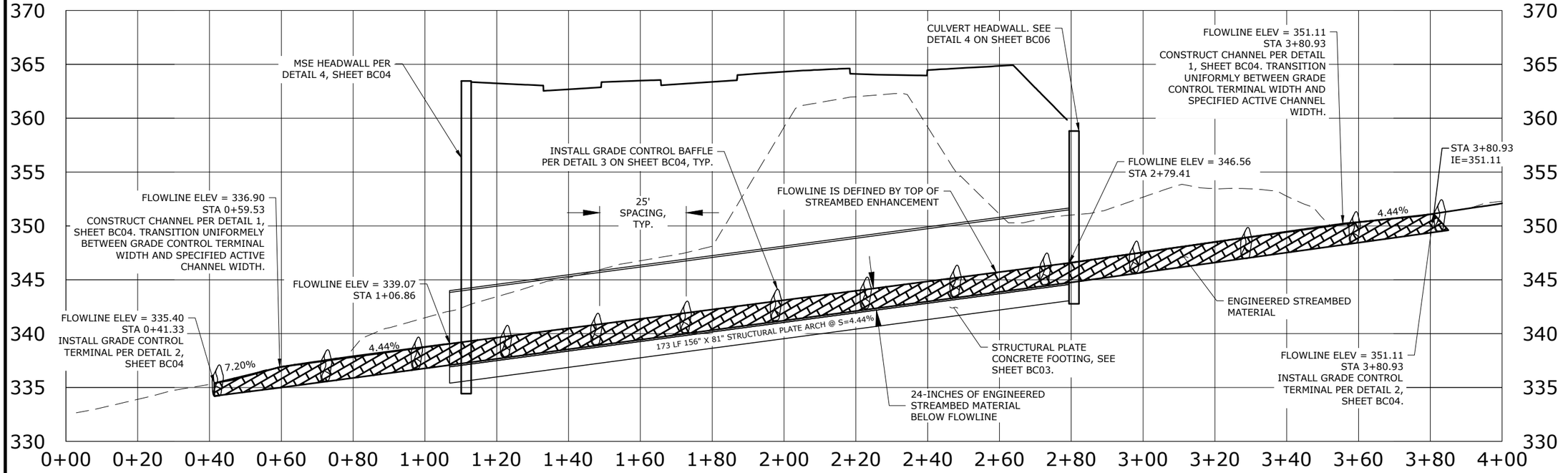
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC00 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)

SHEET LEGEND

- TYPE 3 FISH ROCK
- TYPE 2 FISH ROCK
- TYPE 1 FISH ROCK
- VEGETATED RIPRAP
- ENGINEERED STREAMBED MATERIAL
- BOULDER WEIR
- LARGE WOODY MATERIAL



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STRUCTURAL PLATE ARCH PLAN & PROFILE

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RPW/AJR	JSD	NJM

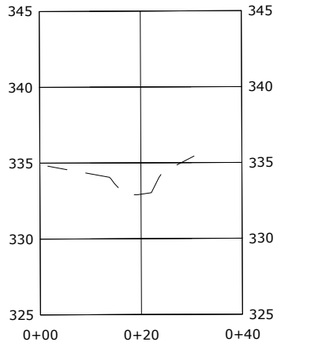
REVISIONS

NO.	DATE:

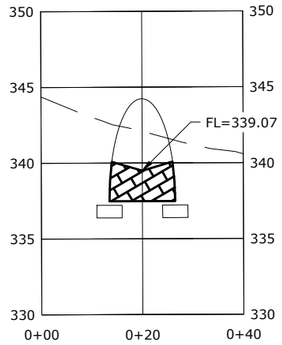
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
BC01

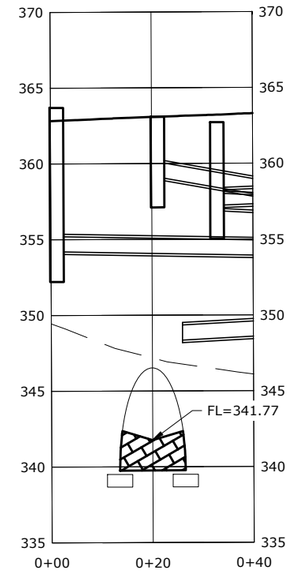
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC01 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



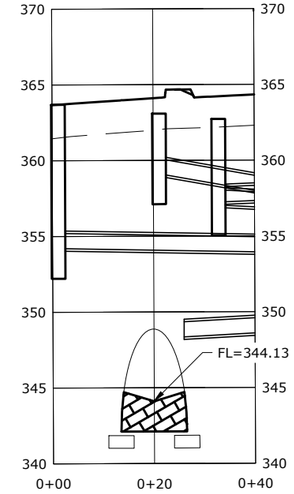
SECTION
SCALE: 1"=30' HORIZ, 1"=10' VERT (A BC01)



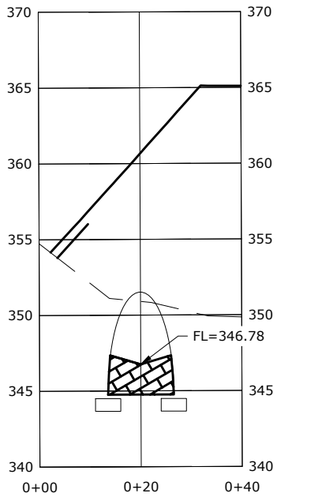
SECTION
SCALE: 1"=30' HORIZ, 1"=10' VERT (B BC01)



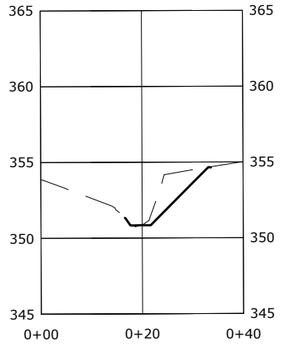
SECTION
SCALE: 1"=30' HORIZ, 1"=10' VERT (C BC01)



SECTION
SCALE: 1"=30' HORIZ, 1"=10' VERT (D BC01)



SECTION
SCALE: 1"=30' HORIZ, 1"=10' VERT (E BC01)



SECTION
SCALE: 1"=30' HORIZ, 1"=10' VERT (F BC01)

HYDRAULIC DATA

ITEM	ORDINARY HIGH WATER	STREAMBED DESIGN	DESIGN FLOOD
DISCHARGE (CFS)	33	86	89
RECURRENCE INTERVAL (YEARS)	2	50	100
WATER SURFACE DEPTH AT UPSTREAM INLET	1.04	1.97	2.02
WATER SURFACE DEPTH AT DOWNSTREAM OUTLET	0.74	1.40	1.44
VELOCITY (FPS)	2.85	3.92	3.97

ENGINEERED STREAMBED MATERIAL

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

STREAMBED GRADING DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

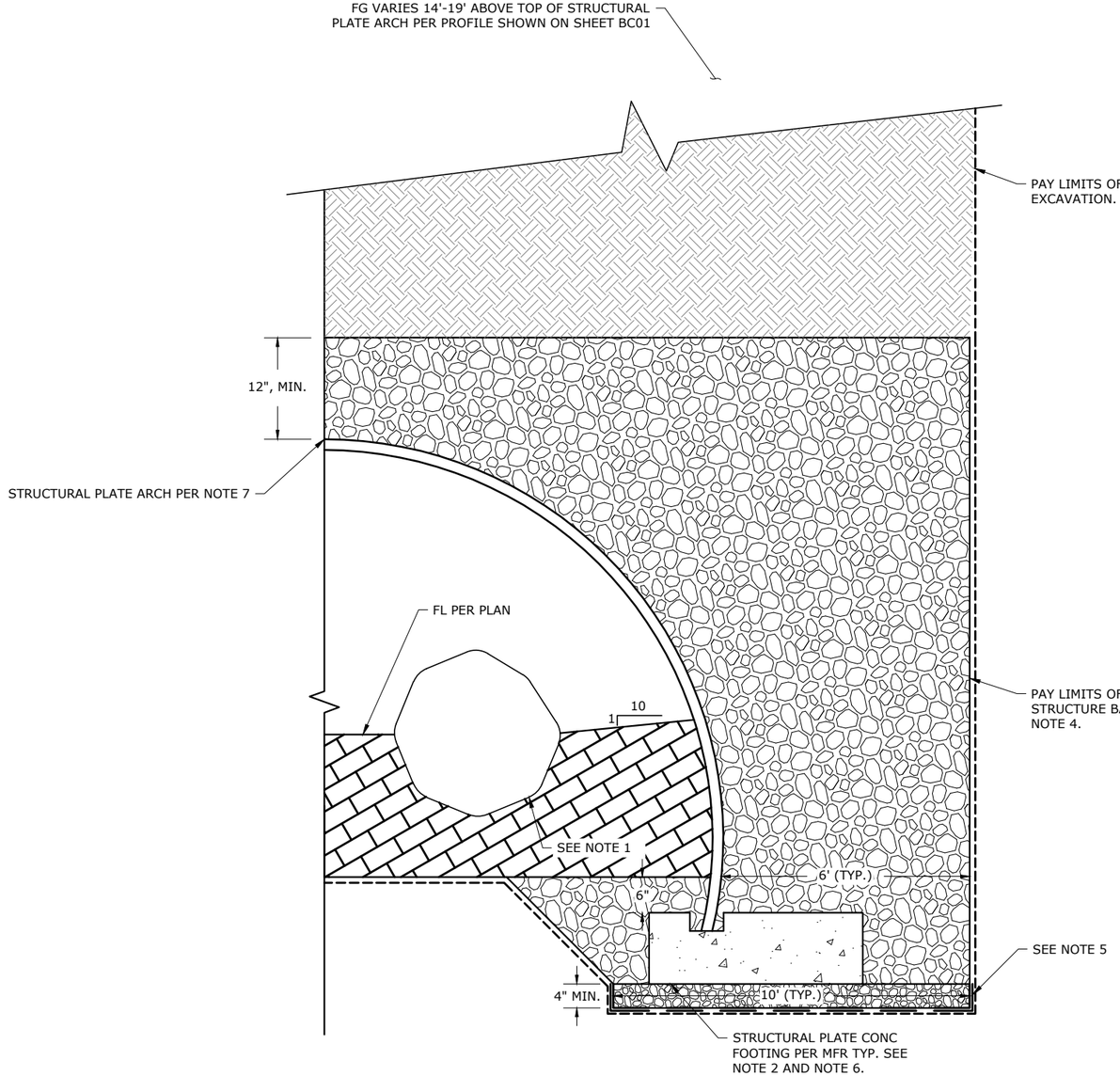
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
BC02

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC02 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



STRUCTURAL PLATE ARCH SECTION

SCALE: NTS

EMBANKMENT

AGGREGATE BASE

ENGINEERED STREAMBED MATERIAL

GRANULAR STRUCTURE BACKFILL

NOTES:

1. PROVIDE FISH ROCKS AS SHOWN ON PLANS. SEE SHEET BC05.

2. COORDINATE WITH THE ENGINEER TO APPROVE PREPARED SUBGRADE PRIOR TO PLACEMENT OF CONC FOOTINGS.

3. COORDINATE WITH ENGINEER TO FIELD INSPECT FOUNDATION SOIL CONDITIONS PRIOR TO COMPLETING STRUCTURE EXCAVATION AND BACKFILL BELOW ELEVATIONS SHOWN.

4. VERTICAL TRENCH IDENTIFIED DEFINES PAY LIMITS OF STRUCTURE EXCAVATION, AND GRANULAR STRUCTURE BACKFILL. USE OF LAYBACK SLOPE OR SHORING SHALL BE INCIDENTAL TO STRUCTURE EXCAVATION. STRUCTURE EXCAVATION EXTENDS TO EXISTING GRADE.

5. PROVIDE A SINGLE LAYER OF NON-WOVEN SUBGRADE GEOTEXTILE BETWEEN UNDISTURBED NATIVE SOIL AND BEDDING OR GRANULAR STRUCTURE BACKFILL. EXTEND GEOTEXTILE VERTICALLY FROM NATIVE SOIL TO BOTTOM OF FOOTING ELEVATION.

6. FOOTING SHOWN IS CONCEPTUAL AND ACTUAL DIMENSIONS ARE SUBJECT TO MANUFACTURER DESIGN.

7. PROVIDE 10 GAGE THICK STRUCTURAL PLATE ARCH WITH 156-INCH SPAN AND 81-INCH RISE, MEASURED TO THE INSIDE INTERIOR CREST OF CORRUGATION. PROVIDE MATERIAL MEETING THE REQUIREMENTS OF AASHTO M167 - STANDARD SPECIFICATION FOR CORRUGATED STEEL STRUCTURAL PLATE. MANUFACTURE THE PLATES, FASTENERS AND APPURTENANT ITEMS IN ACCORDANCE WITH ASTM A-761. APPLY 3 OZ. GALVANIZING ZINC COATING PER SQUARE FOOT OF STEEL PLATE.

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

STRUCTURAL PLATE ARCH DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

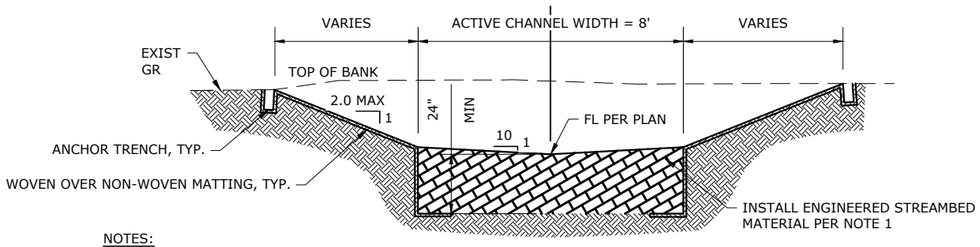
NO.	DATE:

Sheet No.
BC03

110 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC03 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



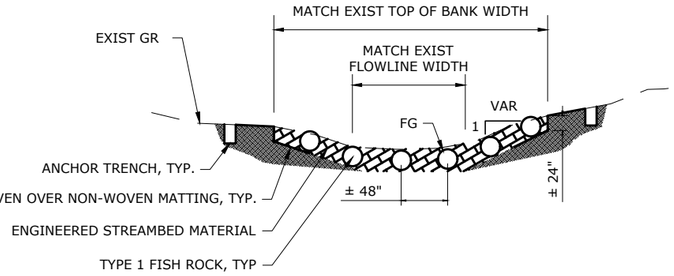
NOTES:

1. INSTALL ENGINEERED STREAMBED MATERIAL PER DETAIL 5, THIS SHEET.
2. INSTALL SLOPE AND CHANNEL MATTING PER ODOT STD DWG RD1055

CHANNEL DETAIL

SCALE: NTS

1 BC01



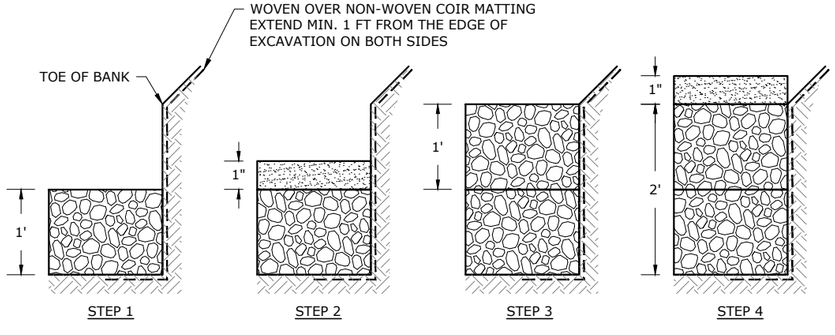
NOTE:

1. FINAL PLACEMENT AND ELEVATIONS OF FISH ROCKS TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

GRADE CONTROL TERMINAL

SCALE: NTS

2 BC01



STREAMBED MATERIAL PLACEMENT:

STEP 1. EXCAVATE CHANNEL TO ACCOMMODATE TWO LIFTS OF ENGINEERED STREAMBED MATERIAL. LINE BOTH SIDES OF EXCAVATED CHANNEL WITH WOVEN OVER NON-WOVEN COIR MATTING EXTENDING A MINIMUM OF 1 FOOT FROM THE EDGE OF EXCAVATION.

STEP 2. PLACE 1 INCH OF STREAMBED SAND (FINES) UNIFORMLY OVER ENGINEERED STREAMBED MATERIAL AND APPLY WATER TO WASH INTO THE ENGINEERED STREAMBED MATERIAL. WASH IN ADDITIONAL FINES UNTIL WATER IS MAINTAINED ON THE SURFACE OF THE STREAMBED.

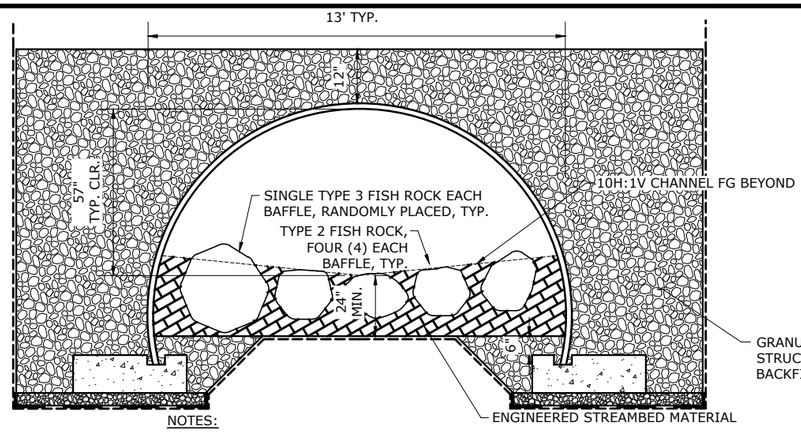
STEP 3. PLACE 1 FOOT OF ENGINEERED STREAMBED MATERIAL TO FINAL ELEVATION.

STEP 4. PLACE 1 INCH OF STREAMBED SAND (FINES) UNIFORMLY OVER ENGINEERED STREAMBED MATERIAL AND APPLY WATER TO WASH INTO THE ENGINEERED STREAMBED MATERIAL. WASH IN ADDITIONAL FINES UNTIL WATER IS MAINTAINED ON THE SURFACE OF THE STREAMBED.

ENGINEERED STREAMBED MATERIAL PREPARATION

SCALE: NTS

5



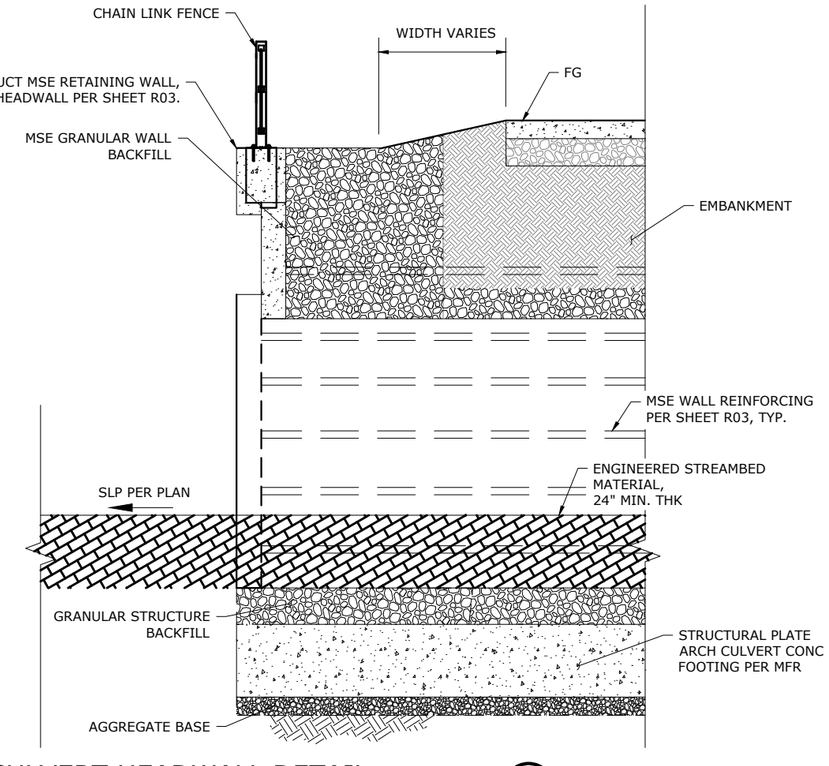
NOTES:

1. FULLY EMBED TYPE 2 FISH ROCKS.
2. EMBED TYPE 3 FISH ROCKS SO THAT 6" TO 12" REMAINS EXPOSED ABOVE STREAMBED ENHANCEMENT MATERIAL.

GRADE CONTROL BAFFLE

SCALE: NTS

3 BC01



CULVERT HEADWALL DETAIL

SCALE: NTS

4 BC01

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

WATERWAY ENHANCEMENT DETAILS - 1

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

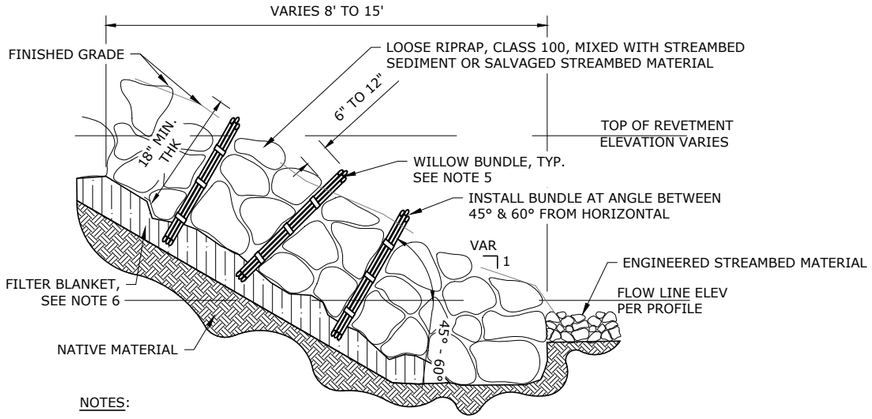
REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
BC04

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC04 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



NOTES:

1. WILLOW BUNDLES SHALL BE INSTALLED AT TIME OF RIPRAP CONSTRUCTION.

2. SPACING SHALL BE APPROXIMATELY 36" ON CENTER AS RIPRAP ALLOWS.

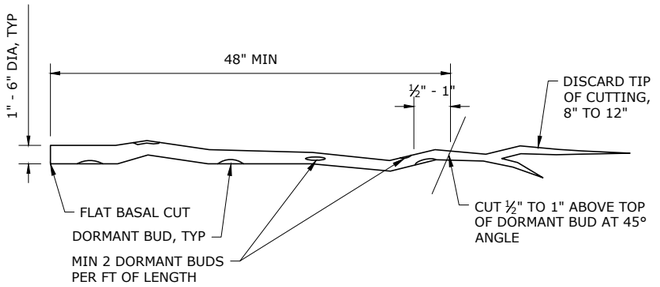
3. APPROXIMATELY 80% OF BUNDLE LENGTH TO BE BELOW SURFACE OF RIPRAP.

4. BURIED ENDS OF BUNDLES MUST BE IN CONTACT WITH NATIVE SOIL, STANDING WATER OR MOIST ZONE NEAR BOTTOM OF RIPRAP REVETMENT EXCAVATION.

5. PROVIDE 3 TO 5 PLANT CUTTINGS PER BUNDLE, SECURED W/ BIODEGRADABLE COIR TWINE AT 3 POINTS, AS SHOWN, INSERT W/ BUDS POINTING UP. PROVIDE PLANT CUTTINGS PER DET 2, THIS SHT.

6. FILTER BLANKET IS REQUIRED PER SECTION 00390.13 OF THE OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION.

VEGETATED RIPRAP
SCALE: NTS — 1 / BC01



NOTES:

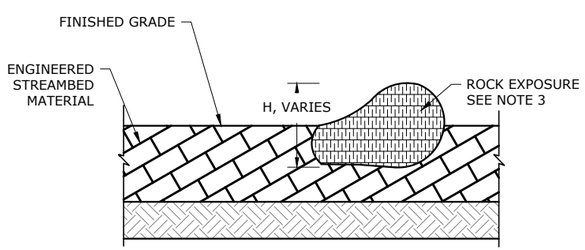
1. HARVEST AREA TO BE WITHIN SAME ECO-REGION AS PROJECT AREA.

2. CUT FROM VIGOROUS 1 - 3 YEAR OLD WOOD ON PLANTS GROWING IN FULL SUNLIGHT.

3. IMMEDIATELY REMOVE ALL LATERAL BRANCHES AND CUT LEADER (APICAL STEM) APPROXIMATELY 8" - 12" DOWN STEM FROM TIP LEADER.

4. STORE PROTECTED AT 32° - 42° FAHRENHEIT FOR UP TO 4 MONTHS, OR BEFORE DORMANT BUD DEVELOPMENT.

PLANT CUTTING
SCALE: NTS — 2 / BC05



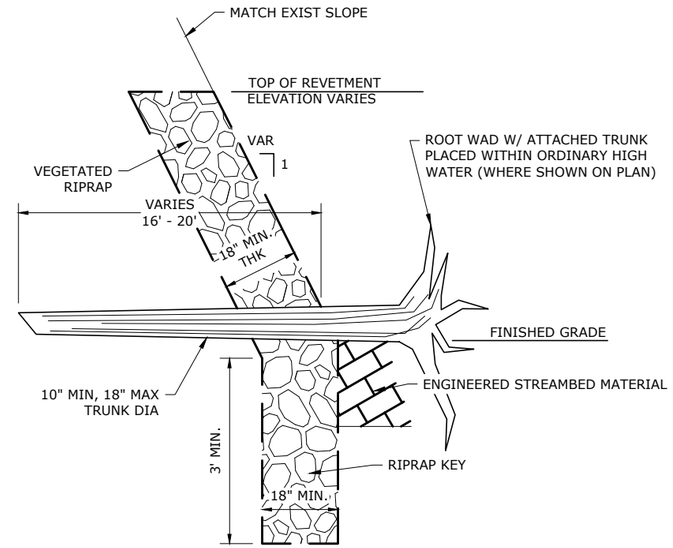
NOTES:

1. FISH ROCKS SHALL BE RANDOMLY PLACED.

2. FINAL PLACEMENT TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

3. DIMENSION 'H' IS TYPICAL FISH ROCK HEIGHT. FISH ROCK TO BE EMBEDDED INTO FINISHED GRADE 70% TO 90% OF 'H'.

FISH ROCK DETAIL
SCALE: NTS — 3 / BC01

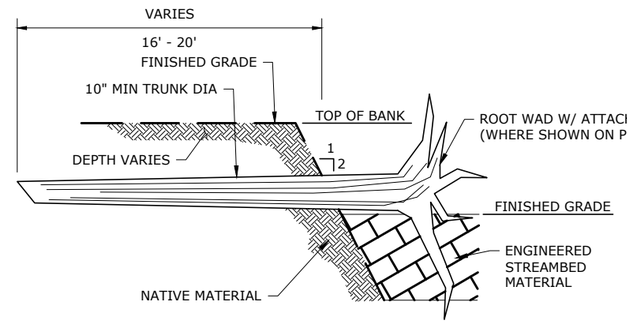


SECTION

NOTE:

1. FINAL PLACEMENT TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

VEGETATED RIPRAP WITH LARGE WOODY MATERIAL
SCALE: NTS — 4 / BC01



SECTION

NOTE:

1. FINAL PLACEMENT TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

LARGE WOODY MATERIAL IN NATIVE BANK
SCALE: NTS — 5 / BC01

REGISTERED PROFESSIONAL ENGINEER
72710PE
Nicholas J. McMurtrey 2024.10.31
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

WATERWAY ENHANCEMENT DETAILS - 2

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

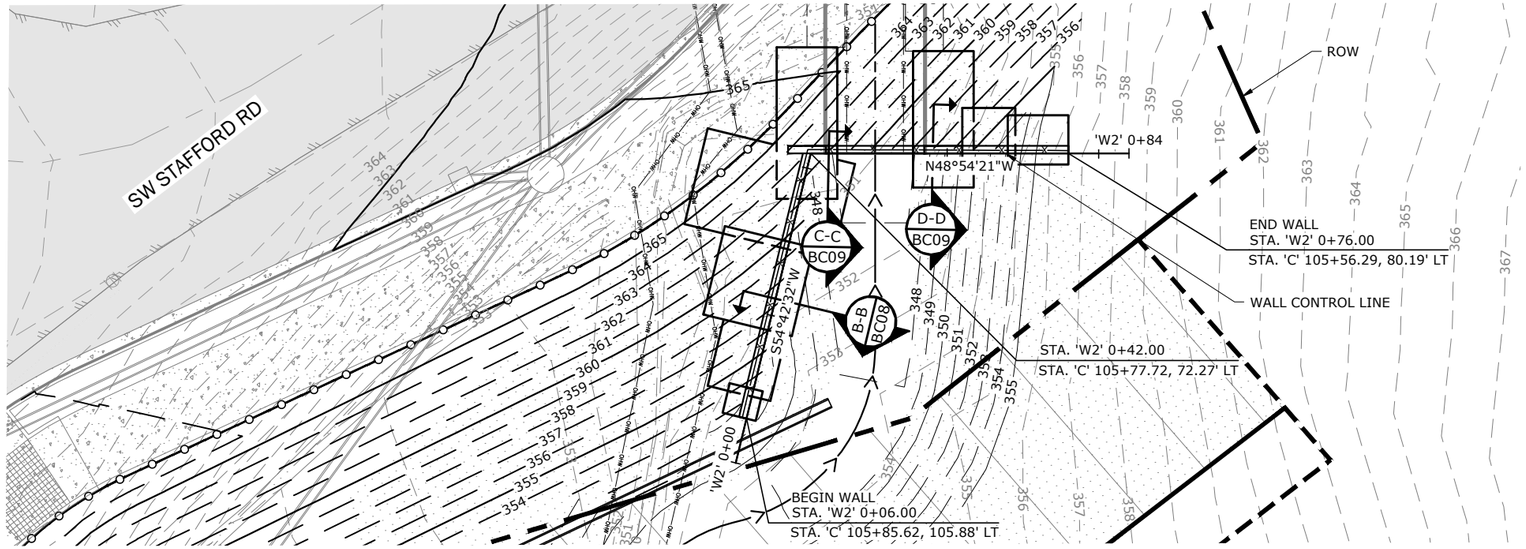
NO.	DATE:

Sheet No. BC05

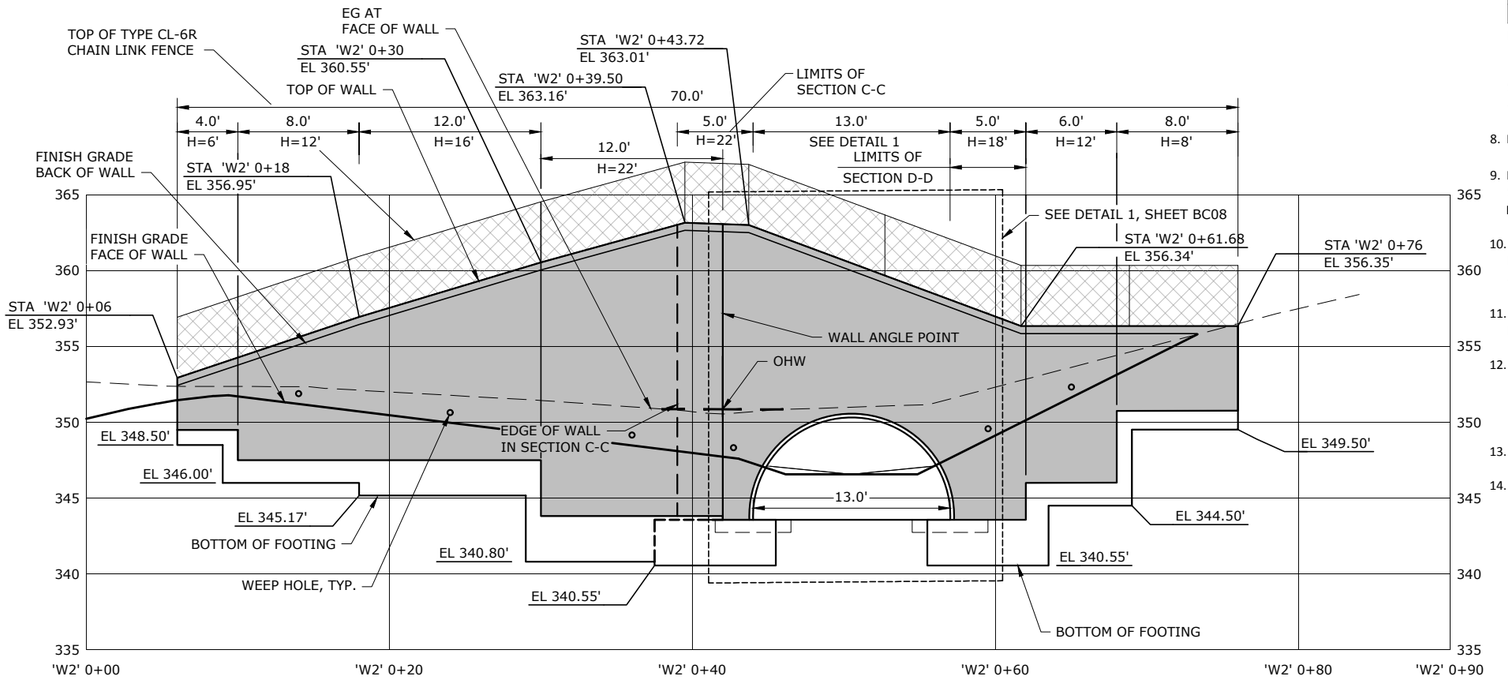
112 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC05 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=20'



PROFILE
SCALE: 1"=10' HORIZ, 1"=10' VERT

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

GENERAL NOTES:

1. CAST-IN-PLACE SEMI-GRAVITY STANDARD RETAINING WALL IS DESIGNED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS - SEVENTH EDITION (INCLUDING 2016 INTERIM REVISIONS) AND THE ODOT GEOTECHNICAL DESIGN MANUAL (GDM), 2016.

2. CAST-IN-PLACE SEMI-GRAVITY STANDARD RETAINING WALL DESIGN IS BASED ON THE FOLLOWING SOIL PROPERTIES:
   - BACKFILL & RETAINED SOIL: SOIL ANGLE OF INTERNAL FRICTION = 34°; SOIL COHESION = 0 PSF; SOIL WEIGHT = 125 PCF
   - FOUNDATION SOIL: SOIL ANGLE OF INTERNAL FRICTION = 30°; SOIL COHESION = 0 PSF

3. THE INTERNAL STABILITY AND EXTERNAL STABILITY DESIGN FOR OVERTURNING AND SLIDING STABILITY IS ADDRESSED IN THE STANDARD DESIGN. OVERALL STABILITY, BEARING RESISTANCE AND SETTLEMENT ARE ADDRESSED IN SITE SPECIFIC DESIGN.

4. CAST-IN-PLACE SEMI-GRAVITY STANDARD RETAINING WALL IS NOT DESIGNED FOR TRAFFIC BARRIER VEHICULAR COLLISION LOAD OR HYDROSTATIC OR SEEPAGE FORCES.

5. SEISMIC LATERAL WALL COEFFICIENT, kh=0.20.

6. PROVIDE CLASS 4000 STRUCTURAL CONCRETE.

7. PROVIDE REINFORCING STEEL ACCORDING TO ASTM SPECIFICATION A706, OR AASHTO M31 (ASTM A615) GRADE 60. USE THE FOLLOWING SPLICE LENGTHS UNLESS SHOWN OTHERWISE:

REINFORCING SPLICE LENGTHS (CLASS B) GRADE 60 f'c = 4.0 ksi									
BAR SIZE	#3	#4	#5	#6	#7	#8	#9	#10	#11
UNCOATED	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-3"	4'-1"	5'-2"	6'-4"

INCREASE ALL SPLICE LENGTHS 40% FOR HORIZONTAL OR NEARLY HORIZONTAL BARS SO PLACED THAT MORE THAN 12" OF FRESH CONCRETE IS CAST BELOW THE BAR.

SPLICE REINFORCING STEEL AT ALTERNATE BARS, STAGGERED AT LEAST ONE SPLICE LENGTH OR AS FAR AS POSSIBLE, UNLESS SHOWN OTHERWISE.

8. PLACE BARS 2" CLEAR OF THE NEAREST FACE OF CONCRETE UNLESS SHOWN OTHERWISE.

9. PLACE EXPANSION JOINTS THROUGH WALL AND FOOTING AND CONTRACTION JOINTS IN WALL ONLY. SEE PLAN AND ELEVATION FOR LOCATION OF JOINTS. IF NOT SHOWN, PLACE EXPANSION JOINTS AT INTERVALS NOT TO EXCEED 90'-0" AND CONTRACTION JOINTS AT INTERVALS NOT TO EXCEED 30'-0".

10. PERFORM SHEAR KEY EXCAVATION WITH CARE TO PROVIDE KEY DIMENSIONS INDICATED. REMOVE LOOSE MATERIAL AND POUR CONCRETE AGAINST UNDISTURBED FOUNDATION SOIL IN THE FOOTING AND KEY EXCAVATION.

11. DO NOT BACKFILL WALL UNTIL ALL TRENCHING THAT MAY BE NECESSARY IN FRONT OF WALL IS BACKFILLED AND COMPACTED, AND COMPACTED TOE FILL IS IN PLACE TO TOP OF SUBGRADE.

12. FOR INTERMEDIATE WALL HEIGHTS THAT ARE BETWEEN THE WALL HEIGHT VALUES GIVEN IN THE WALL DATA TABLES, USE THE TABULAR DATA FOR THE NEXT HIGHER WALL HEIGHT. FOR INTERMEDIATE VALUES OF SEISMIC LATERAL WALL COEFFICIENT, KH, USE TABULAR DATA FOR THE NEXT HIGHER KH.

13. SEE PROJECT PLANS FOR REQUIRED FOOTING EMBEDMENT.

14. TOP OF WALL VARIES LINEARLY BETWEEN ELEVATIONS SHOWN.

20 10 0 20 40
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

RET WALL 'W2' PLAN & PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR | DRAFTED BY: SHC | CHECKED BY: NJM

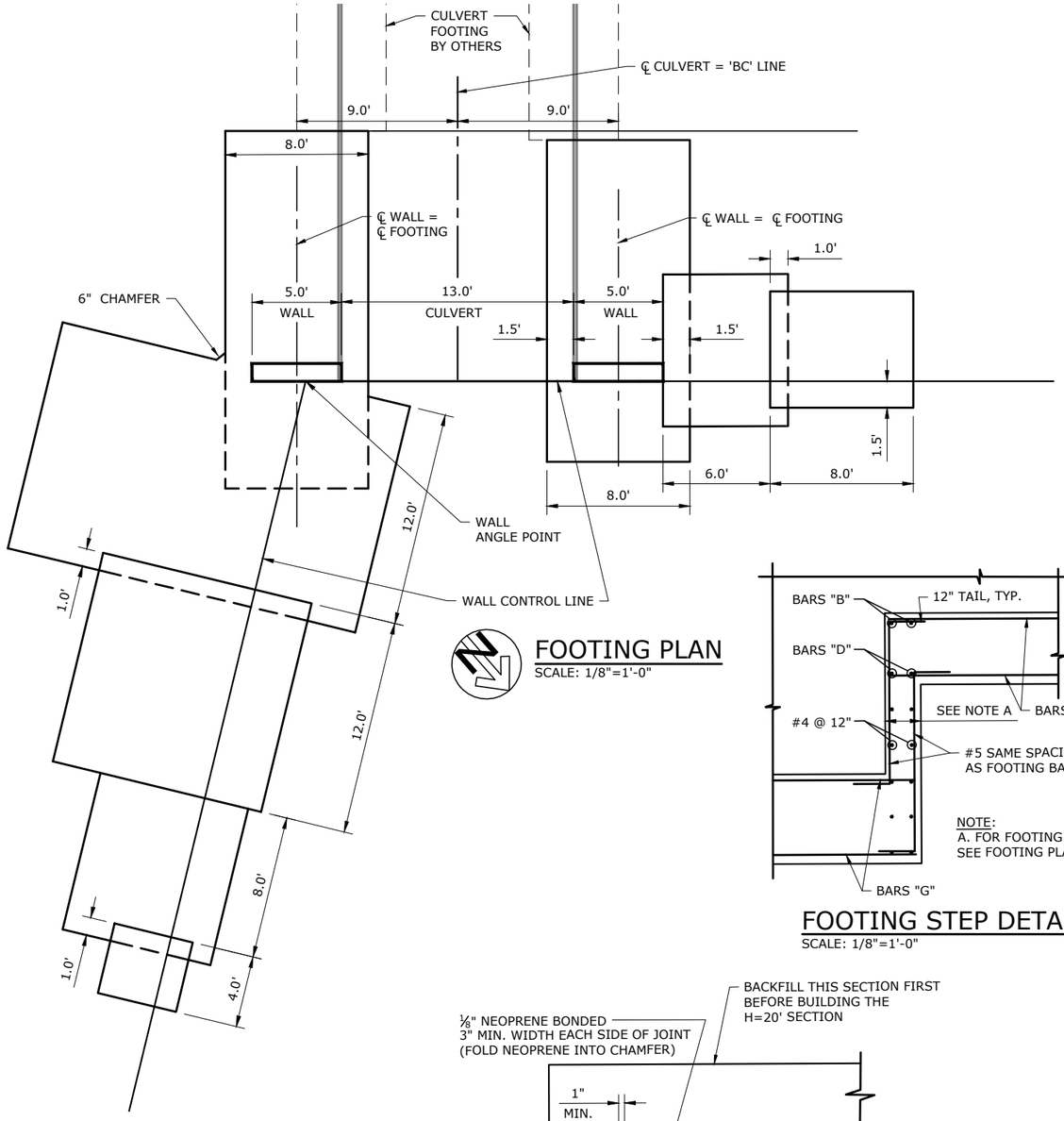
REVISIONS

NO.	DATE:

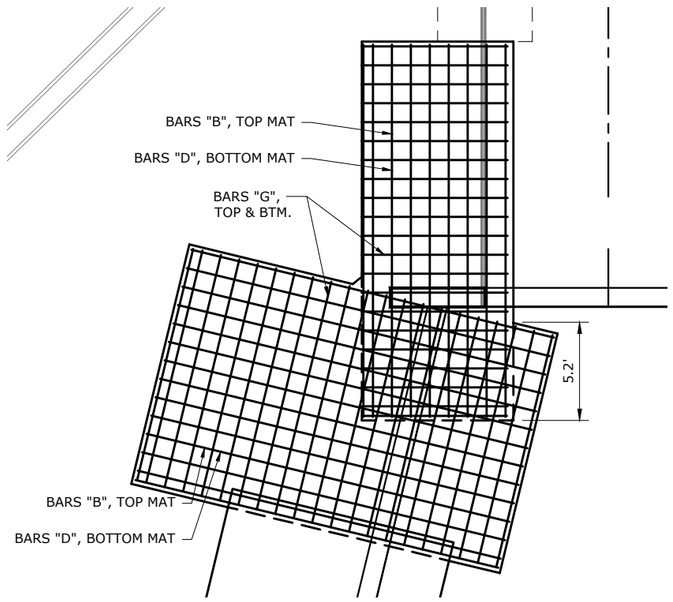
Sheet No.
BC06

113 of 162

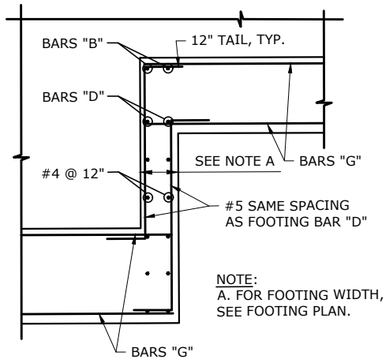
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC06 10/31/2024 9:37 AM SERGE.CHERNISHOFF 24.1s (LMS Tech)



FOOTING PLAN
SCALE: 1/8"=1'-0"

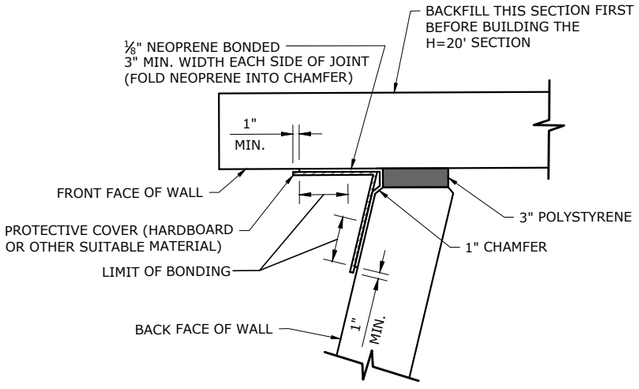


FOOTING REINFORCEMENT PLAN
SCALE: 1/8"=1'-0"

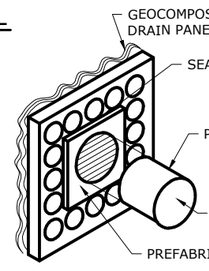


NOTE:
A. FOR FOOTING WIDTH, SEE FOOTING PLAN.

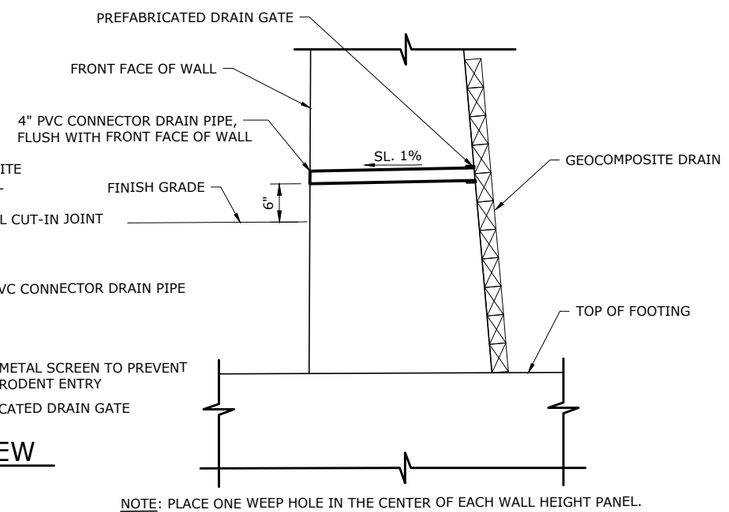
FOOTING STEP DETAIL
SCALE: 1/8"=1'-0"



STRIP WATERSTOP CORNER DETAIL
NOT TO SCALE



ISOMETRIC VIEW
NOT TO SCALE



NOTE: PLACE ONE WEEP HOLE IN THE CENTER OF EACH WALL HEIGHT PANEL.

WEEP HOLE DETAIL
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

RET WALL 'W2' DETAILS - 1

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

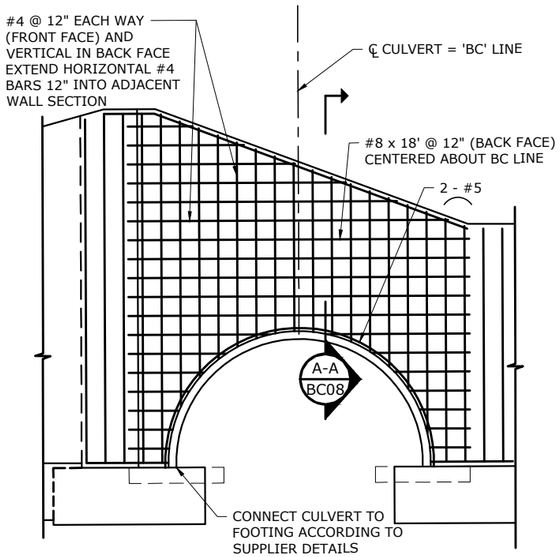
REVISIONS

NO.	DATE:

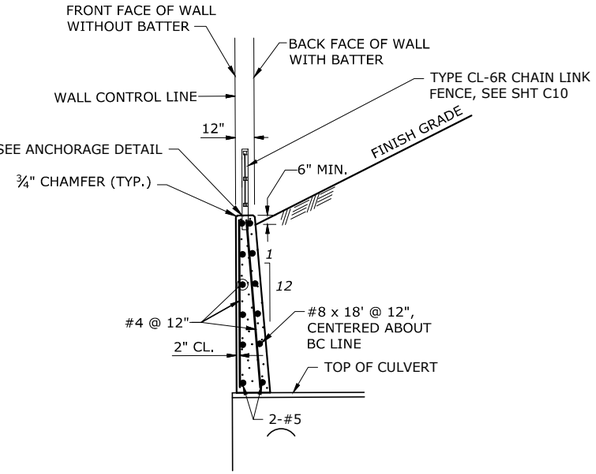
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
BC07

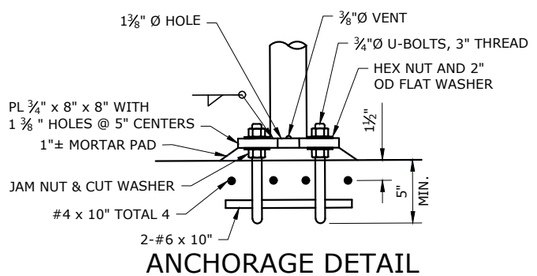
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC07 10/31/2024 9:37 AM SERGE.CHERNISHOFF 24.1s (LMS Tech)



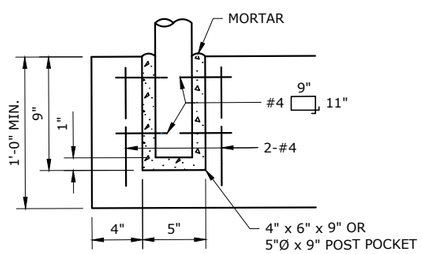
DETAIL 1
SCALE: 1/8"=1'-0"



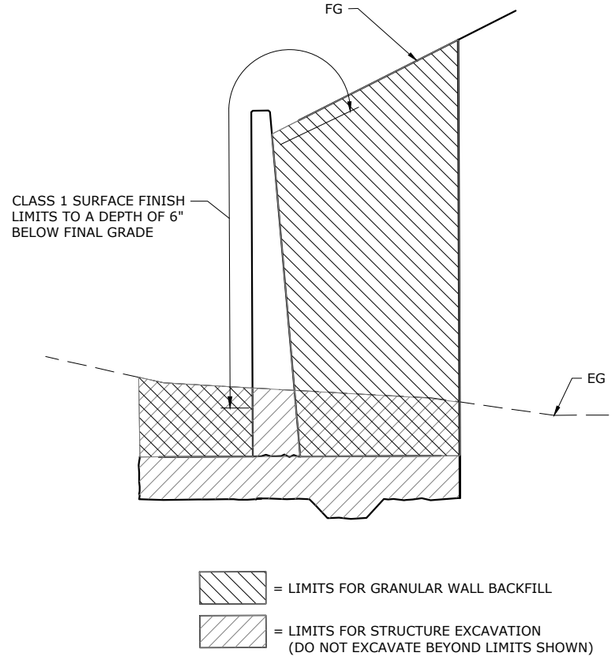
SECTION A-A
SCALE: 1/8"=1'-0"
A
BC08



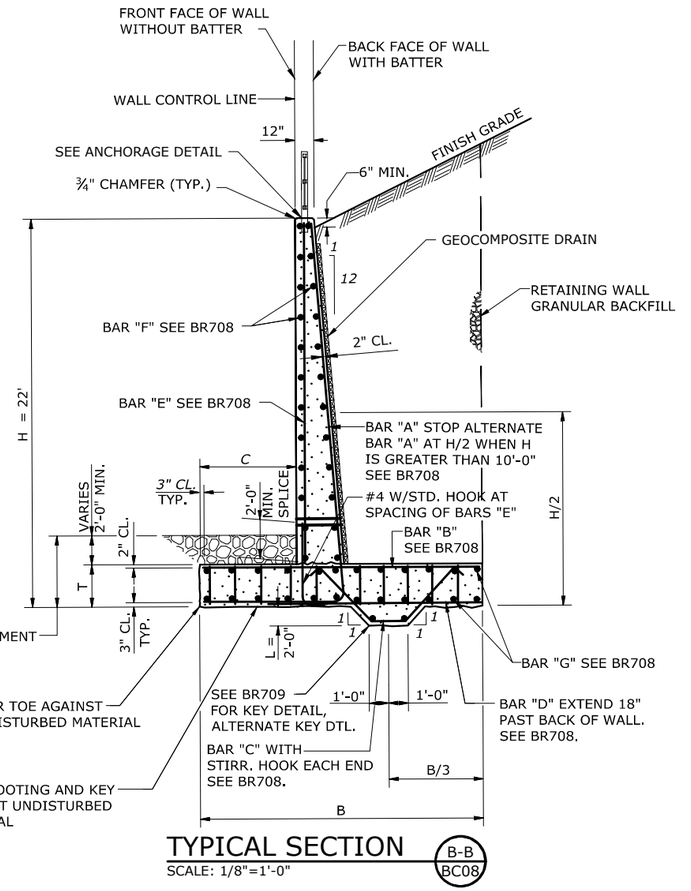
ANCHORAGE DETAIL



ALTERNATIVE ANCHORAGE DETAIL



EXCAVATION AND BACKFILL DIAGRAM
No Scale



TYPICAL SECTION
SCALE: 1/8"=1'-0"
B-B
BC08

8 4 0 8 16
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

RET WALL 'W2' DETAILS - 2

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

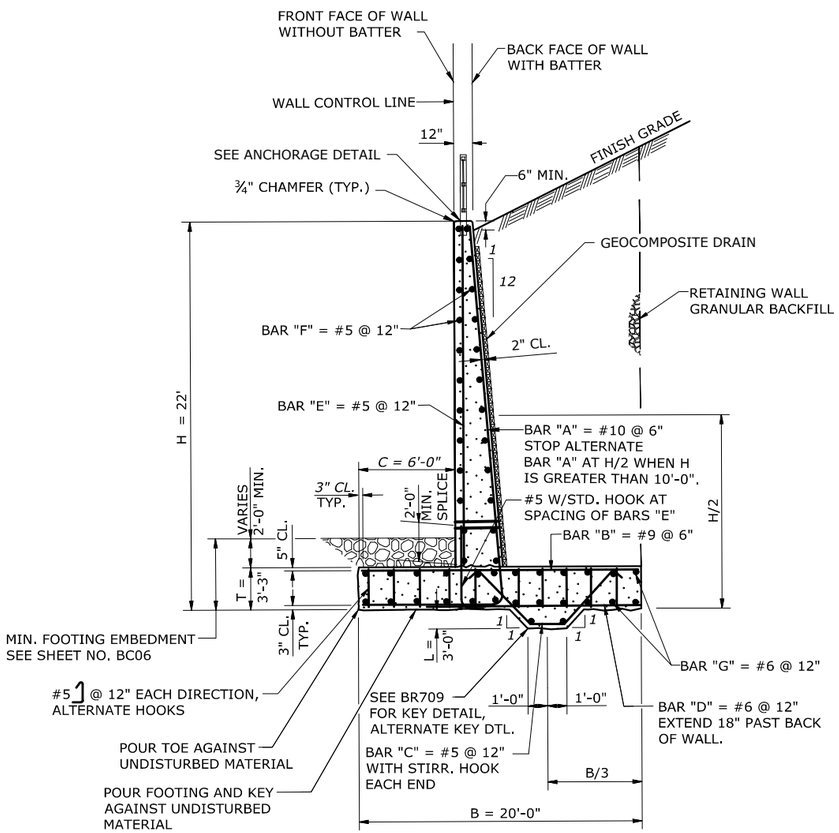
REVISIONS
NO. | DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
BC08

115 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC08 10/31/2024 9:37 AM SERGE.CHERNISHOFF 24.1s (LMS Tech)

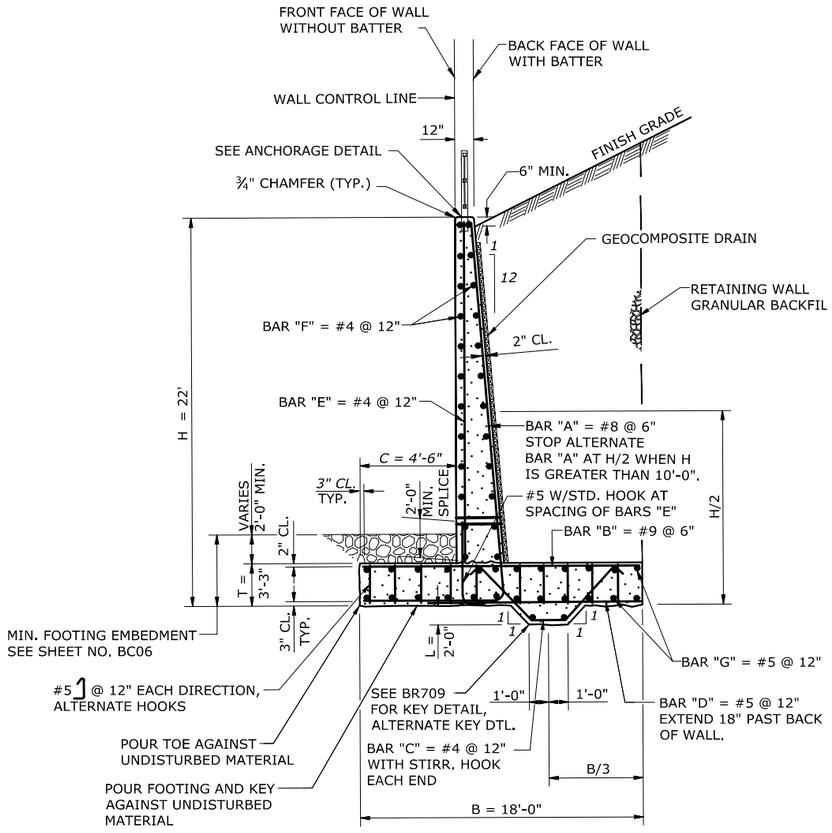


NOTES:
SEE STANDARD DRAWINGS BR705, BR708, AND BR709 FOR DETAILS NOT SHOWN.

SECTION C-C

SCALE: 1/8"=1'-0"

C-C BC09



NOTES:
SEE STANDARD DRAWINGS BR705, BR708, AND BR709 FOR DETAILS NOT SHOWN.

SECTION D-D

SCALE: 1/8"=1'-0"

D-D BC09

8 4 0 8 16
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

RET WALL 'W2' DETAILS - 3

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

REVISIONS

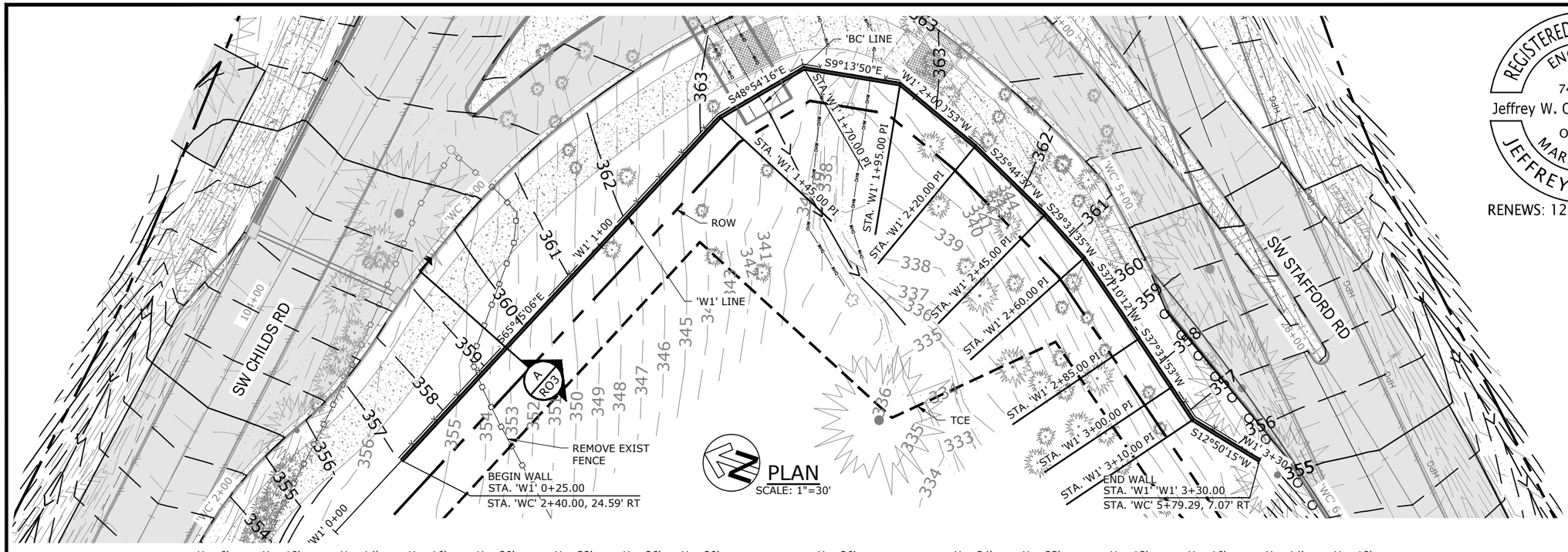
NO.	DATE:

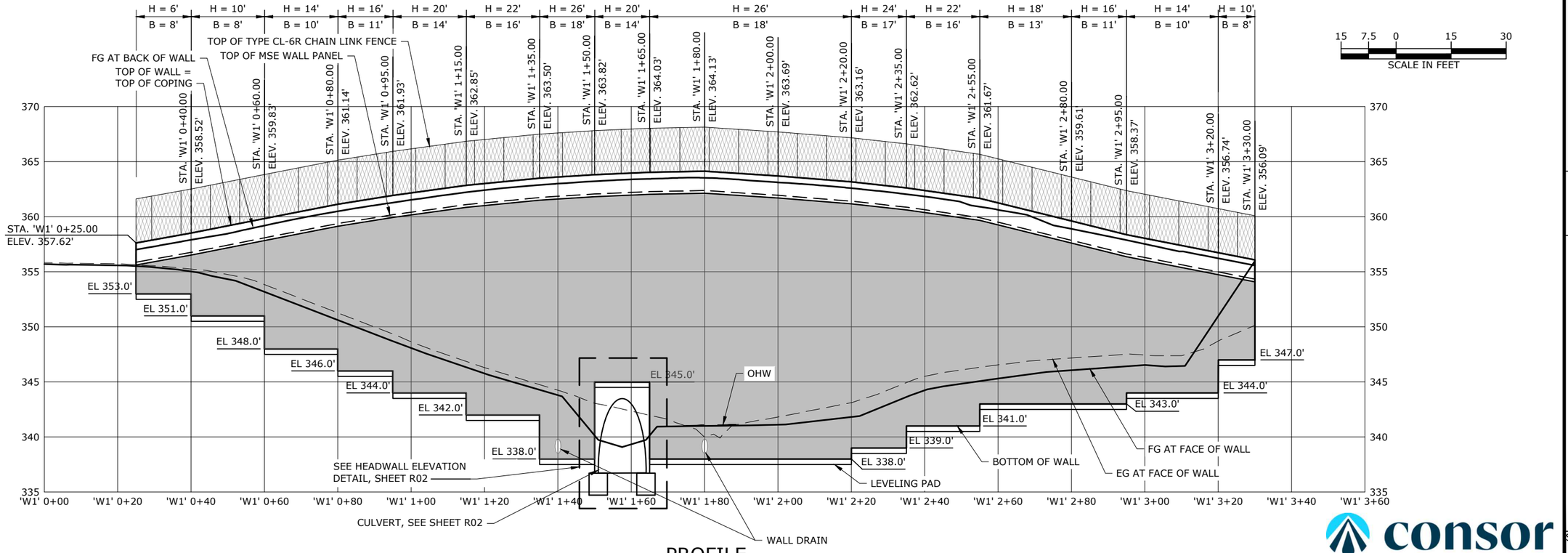
Sheet No.
BC09

116 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC09 10/31/2024 9:37 AM SERGE.CHERNISHOFF 24.1s (LMS Tech)





PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

RET WALL 'W1' PLAN AND PROF

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: SC
DRAFTED BY: JSD
CHECKED BY: JWO

REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No. R01

117 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R.dwg R01 10/9/2024 7:58 PM RILEY.WIGGINS 24.1s (LMS Tech)

GENERAL NOTES:

DESIGN IN CONFORMANCE WITH THE REQUIREMENTS OF THE 2017 AASHTO LRFD BRIDGE DESIGN SPECIFICATION - EIGHTH EDITION (INCLUDING 2016 INTERIM REVISIONS) AND THE ODOT GEOTECHNICAL DESIGN MANUAL (GDM).

SEISMIC DESIGN IS FOR 1000-YEAR RETURN PERIOD (LIFE SAFETY) CRITERIA.

PROVIDE A MINIMUM SERVICE LIFE OF 75 YEARS FOR ALL COMPONENTS.

EXTERNAL STABILITY HAS BEEN ANALYZED. REFER TO LENGTH OF REINFORCEMENT, B, ON DWG. R01 THAT PROVIDES MSE RETAINING WALL REINFORCEMENT LENGTHS WITH ACCEPTABLE SAFETY FACTORS FOR SLIDING AND BEARING CAPACITY. REINFORCEMENT LENGTH MAY BE INCREASED IF REQUIRED FOR INTERNAL STABILITY OF THE WALL SYSTEM.

PROVIDE CLASS 4000 -¾" CONCRETE FOR THE PRECAST MSE WALL PANELS, HEADWALL, AND THE COPING.

PROVIDE MINIMUM CONCRETE COVER OF 2" FOR REINFORCING BARS, UNLESS NOTED OTHERWISE.

PROVIDE REINFORCING STEEL COMPLYING WITH ASTM A615 OR A706, GRADE 60. COLD-BEND ALL BARS. SPLICE REINFORCING AT ALTERNATE BARS, STAGGERED AT LEAST ONE SPLICE LENGTH.

CONSTRUCT MSE WALL FACING VERTICAL (ZERO BATTER).

PROVIDE CLASS 2 (NO COATING) SURFACE FINISH TO OUTER FACE OF PRECAST WALL PANELS.

ASSUME THE FOLLOWING SOIL PARAMETERS:

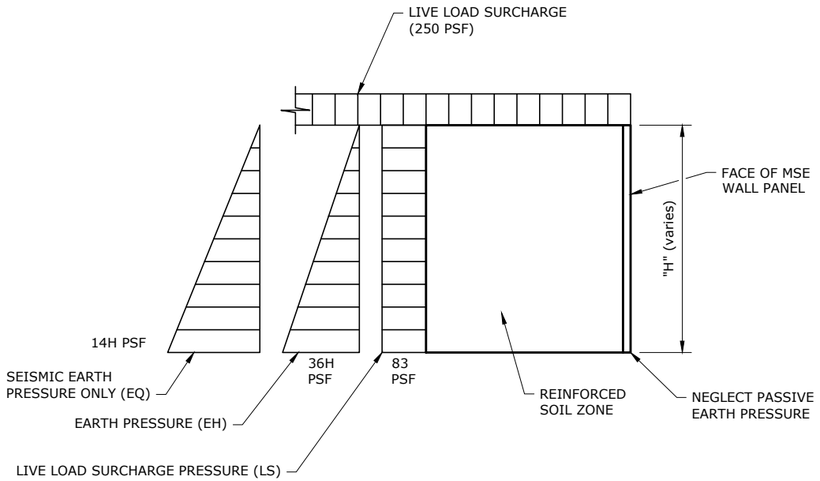
	DENSITY (PCF)	FRICTION ANGLE (DEGREES)	COHESION (PSF)
MSE GRANULAR BACKFILL	130	34	0
FOUNDATION SOIL - MSE RETAINING WALL	120	28	100
RETAINED SOIL	110	30	0

ASSUME THE FOLLOWING LOAD FACTORS:

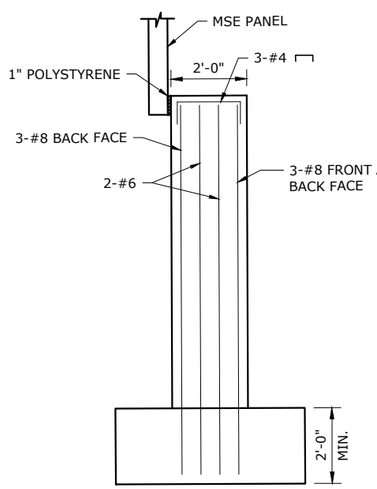
	STRENGTH I-A	STRENGTH I-B	EXTREME EVENT I
HORIZONTAL ACTIVE EARTH PRESSURE, EH	1.5	0.90	1.0
VERTICAL EARTH PRESSURE, EV	1.0	1.35	1.0
LIVE LOAD (TRAFFIC) SURCHARGE, LS	1.75	1.75	1.0

ASSUME THE FOLLOWING RESISTANCE FACTORS:

	STRENGTH I-A	STRENGTH I-B	EXTREME EVENT I
SLIDING RESISTANCE	1.0	1.0	1.0
BEARING RESISTANCE	0.65	0.65	0.9

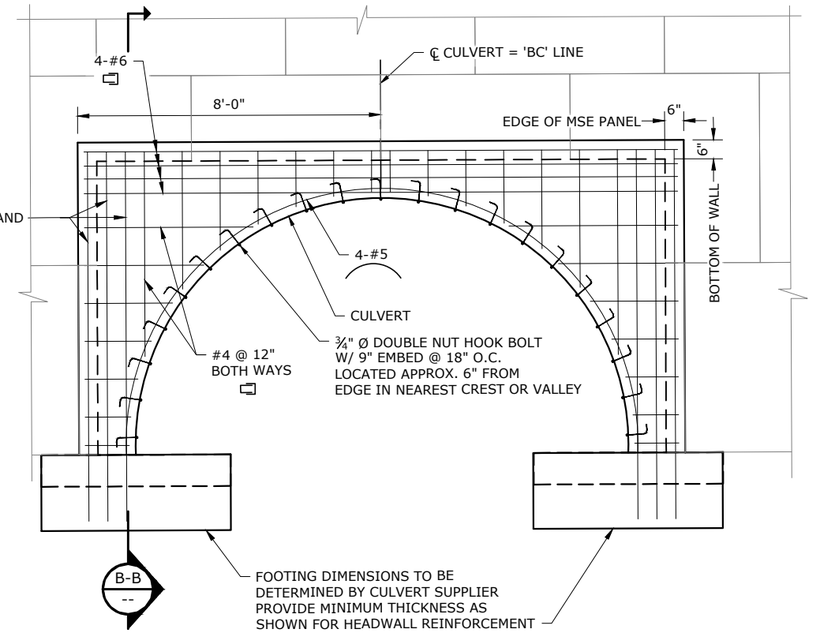


WALL LOADING CONDITIONS
NOT TO SCALE



SECTION B-B
SCALE: 1/4"=1'-0"

A R02



HEADWALL ELEVATION DETAIL
SCALE: 1/4"=1'-0"

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

RET WALL 'W1' SECTIONS - 1

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: SC | DRAFTED BY: JSD | CHECKED BY: JWO

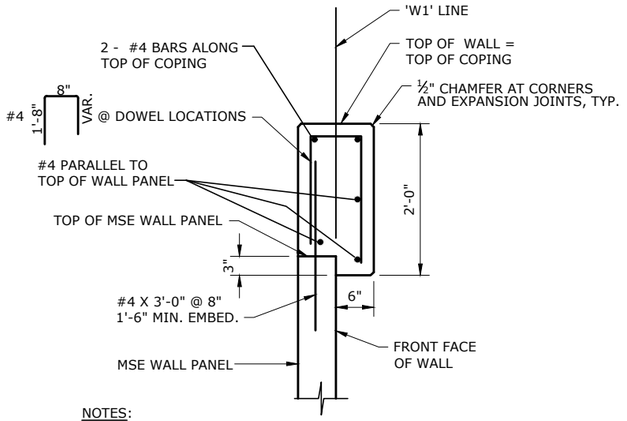
REVISIONS

NO.	DATE:

Sheet No. R02

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R.dwg R02 10/9/2024 7:58 PM RILEY.WIGGINS 24.1s (LMS Tech)

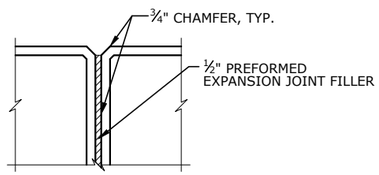


NOTES:

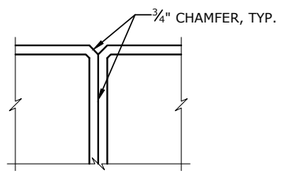
1. PROVIDE COPING CONTRACTION JOINTS AT 15'-0" MAXIMUM SPACING AND COPING EXPANSION JOINTS AT 45'-0" MAXIMUM SPACING. STOP HORIZONTAL BARS 2" CLEAR OF EXPANSION JOINTS. PROVIDE EXTRA BENT BARS ON EACH SIDE OF JOINTS. ALIGN COPING JOINTS WITH VERTICAL WALL PANEL JOINTS.

2. PROVIDE CLASS 2 (NO COATING) SURFACE FINISH TO COPING TO A DEPTH OF 6" BELOW FINAL GRADE.

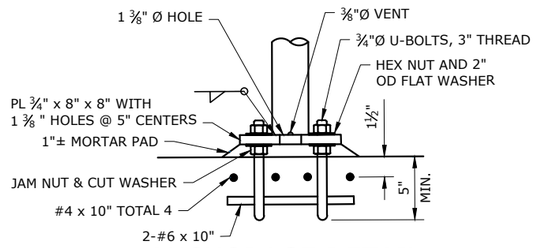
COPING DETAIL
SCALE: 1/2" = 1'-0"



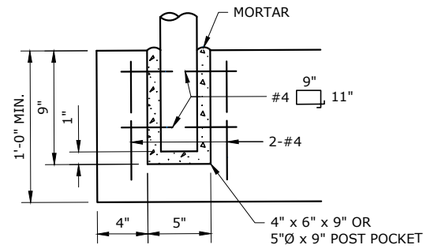
COPING EXPANSION JOINT DETAIL
NOT TO SCALE



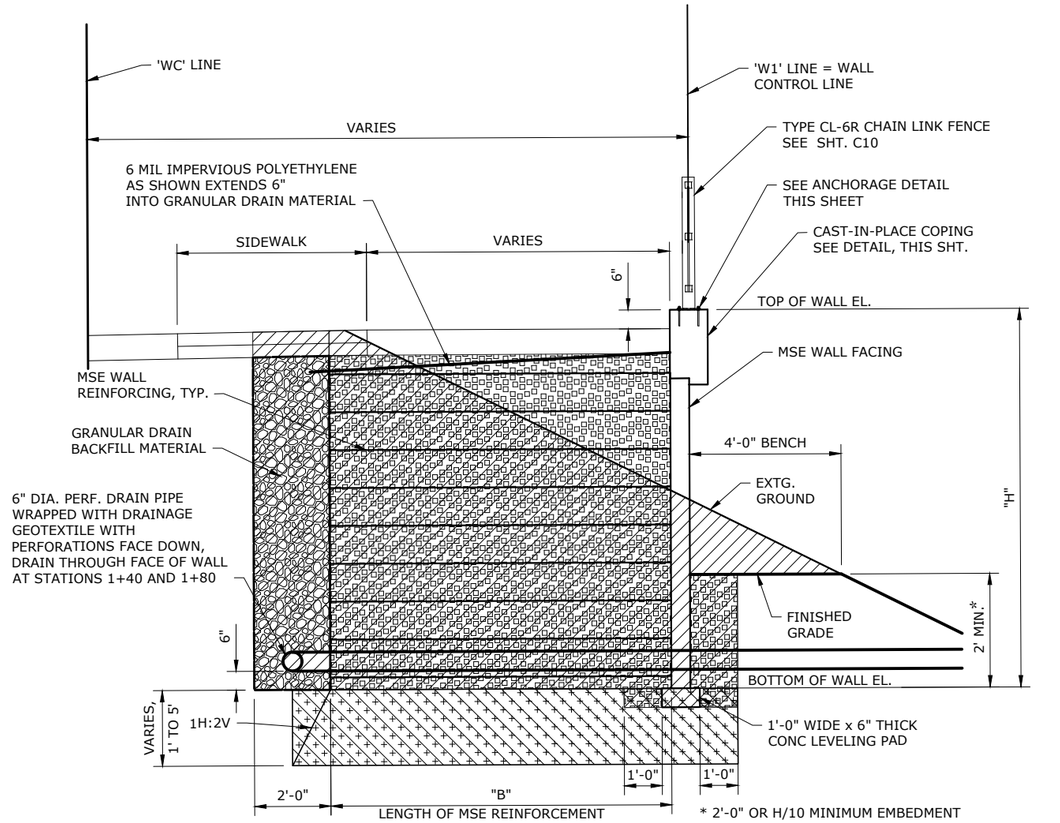
COPING CONTRACTION JOINT DETAIL
NOT TO SCALE



ANCHORAGE DETAIL



ALTERNATIVE ANCHORAGE DETAIL



TYPICAL SECTION
SCALE: 1/4"=1'-0"

A
R01

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
Jeffrey W. Olson 2024.10.31
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

RET WALL 'W1' SECTIONS - 2

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: SC
DRAFTED BY: JSD
CHECKED BY: JWO

REVISIONS

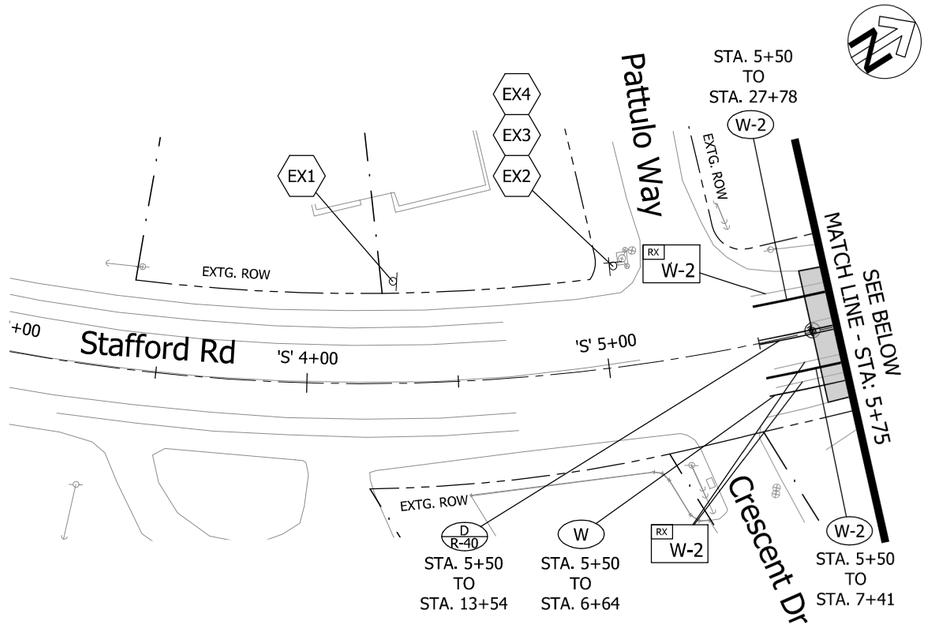
NO.	DATE:

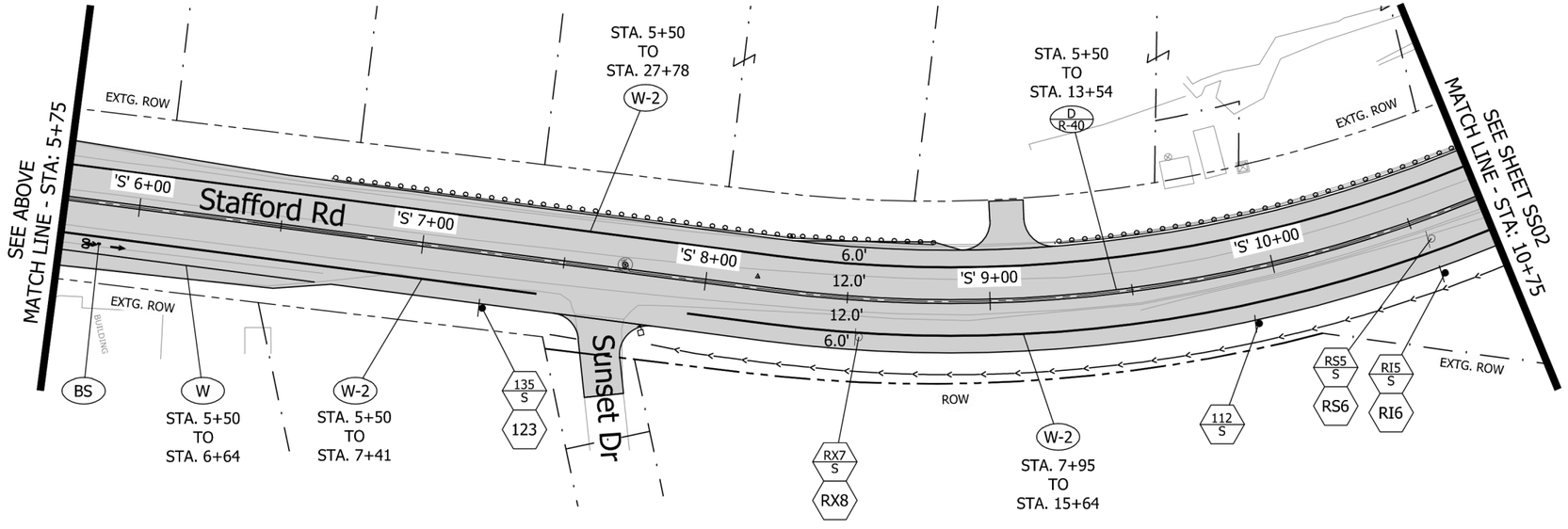
Sheet No. R03

119 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R.dwg R03 10/9/2024 7:58 PM RILEY.WIGGINS 24.1s (LMS Tech)





SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- (X) — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.
- RX / X — REMOVE EXISTING STRIPING AS DEFINED IN ODOT STANDARD DRAWINGS

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29 14:06:58-07'00'
OREGON
JULY 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

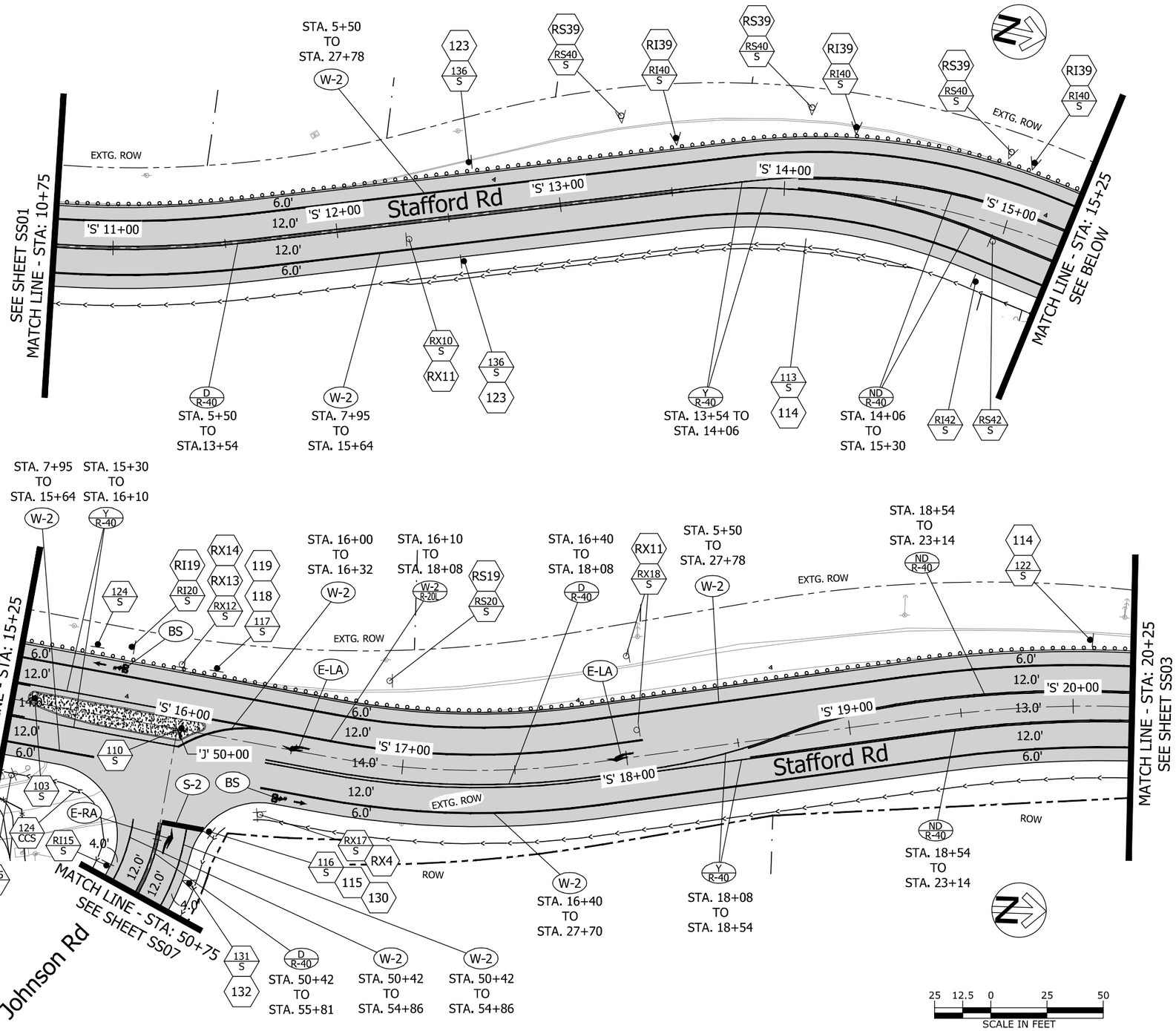
REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS01

Plot Stamp: 10/8/2024 12:47:30 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg



REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- X — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX | DRAFTED BY: D. SHADRIN | CHECKED BY: F. WISMER

REVISIONS

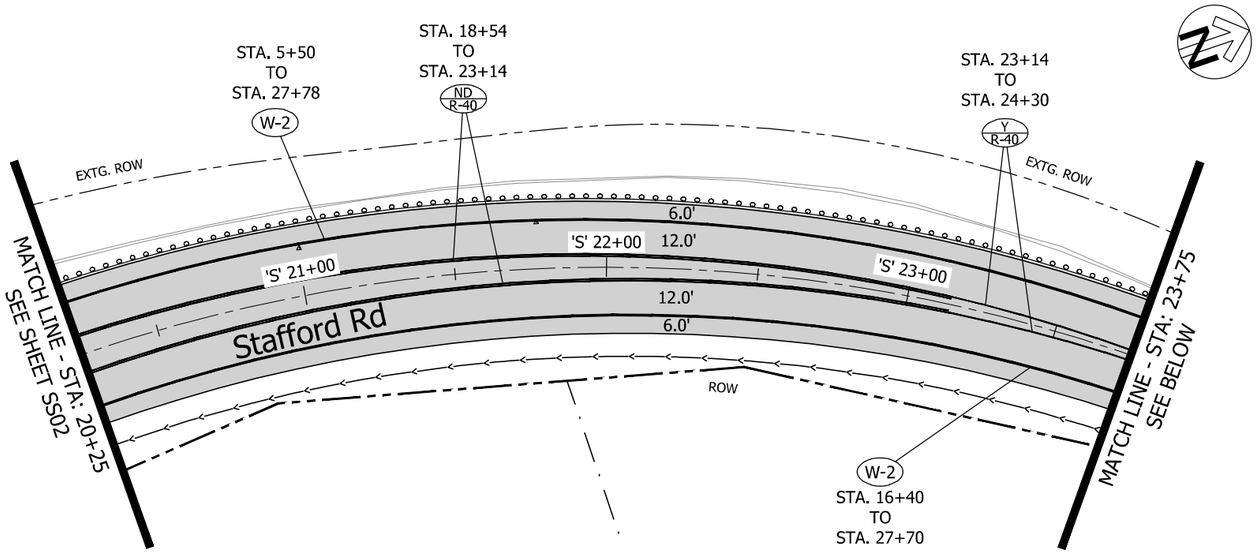
NO.	DATE:

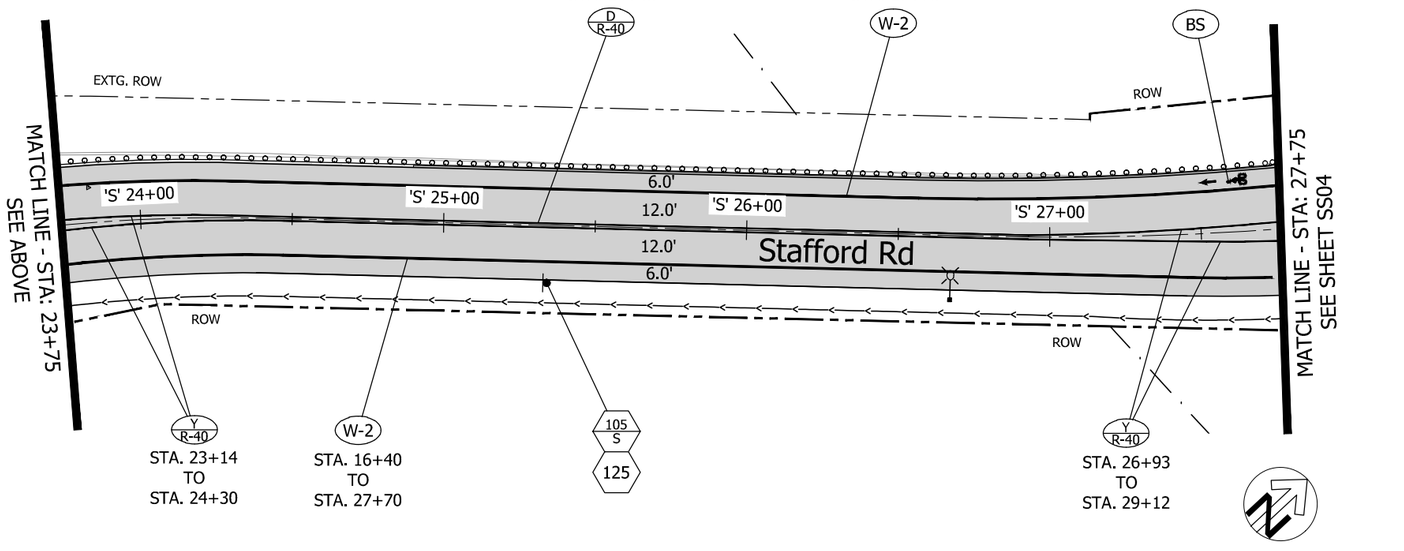
Sheet No. SS02

121 of 162

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Plot Stamp: 10/8/2024 12:47:36 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg





25 12.5 0 25 50
SCALE IN FEET

SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- X — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

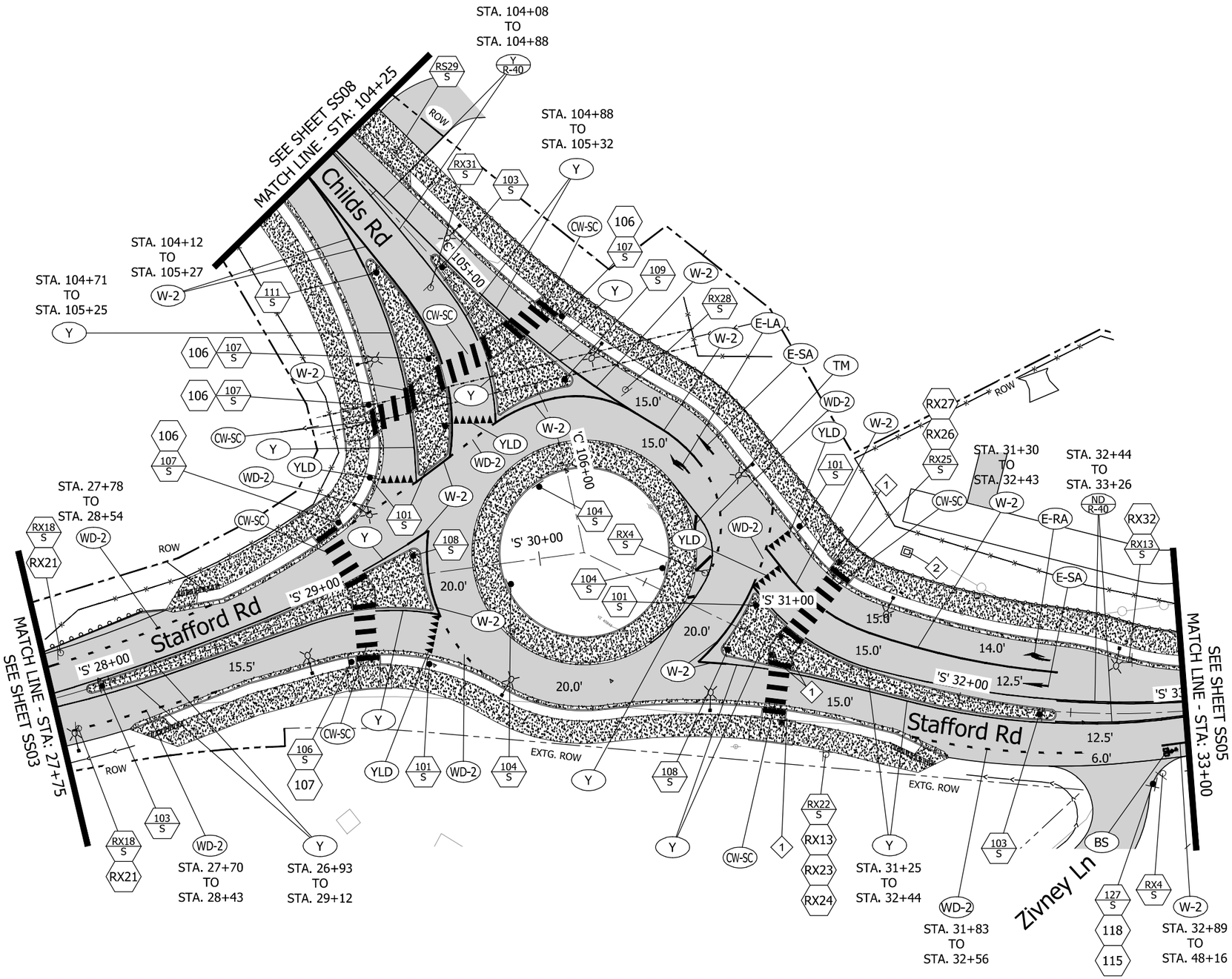
REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS03

Plot Stamp: 10/8/2024 12:47:42 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg



REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- X — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

CONSTRUCTION NOTE

1. SEE ILLUMINATION PLANS FOR RRFB DETAILS.
2. INSTALL TYPE 2 INTERCONNECT JUNCTION BOX DELINEATOR PER ODOT STD. DWG. TM472 and TM570

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
C. COX	D. SHADRIN	F. WISMER

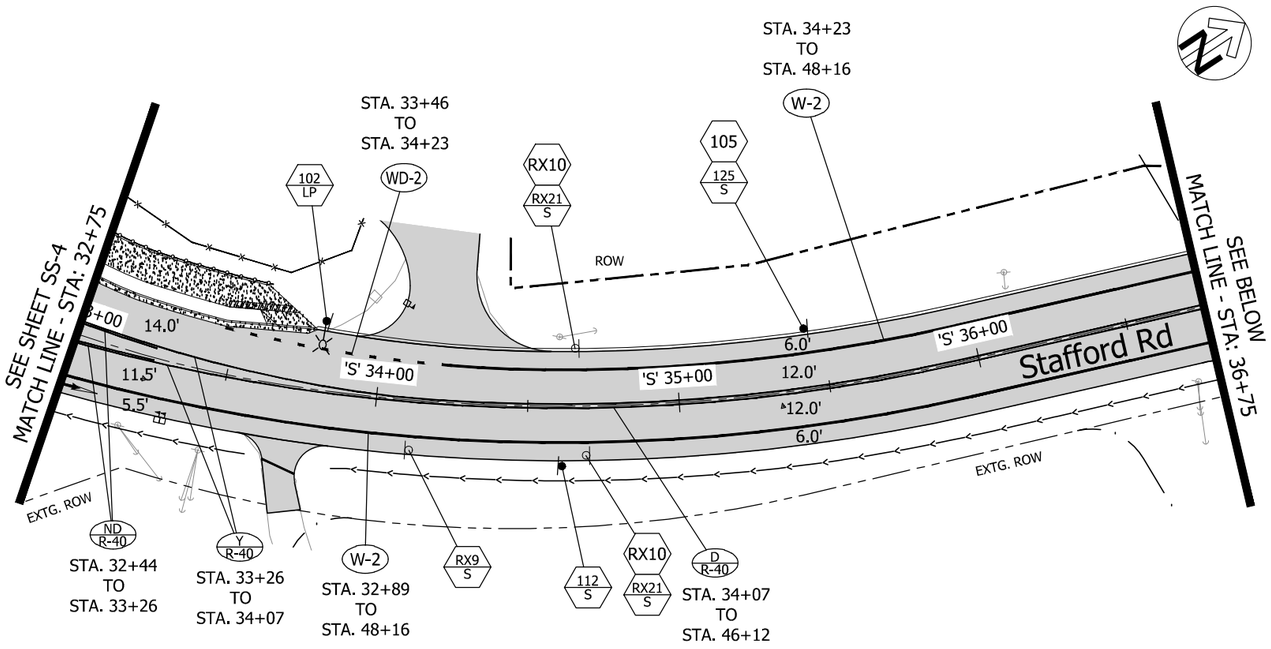
REVISIONS

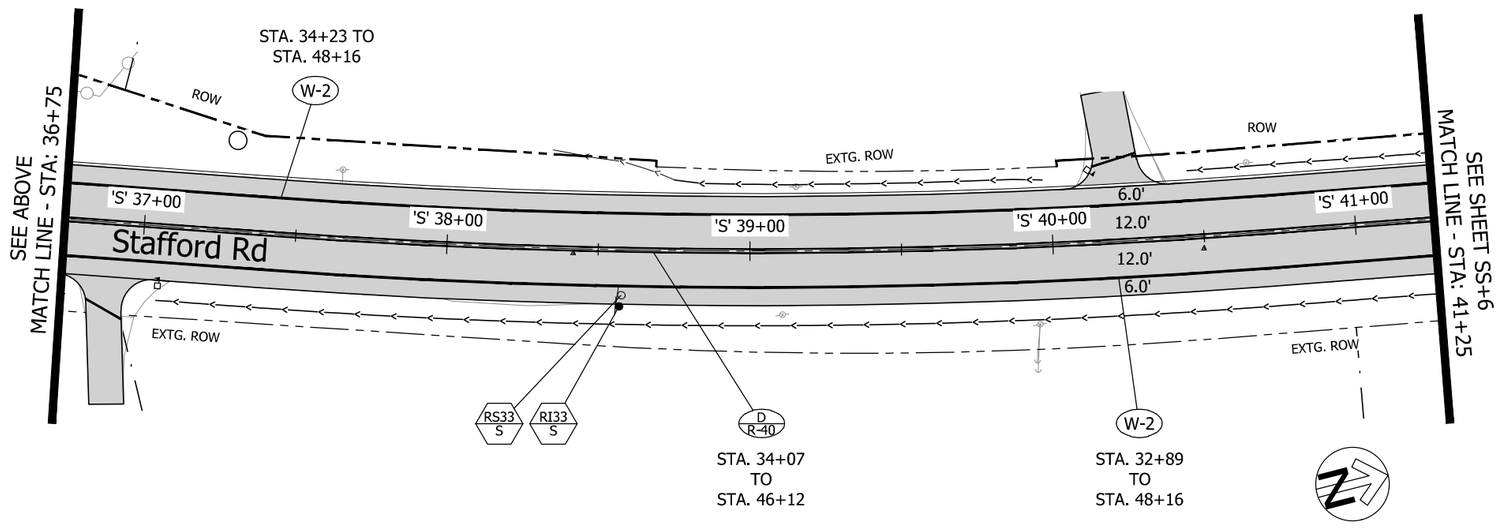
NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS04

Plot Stamp: 10/8/2024 12:47:47 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg





25 12.5 0 25 50
SCALE IN FEET

SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- X — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

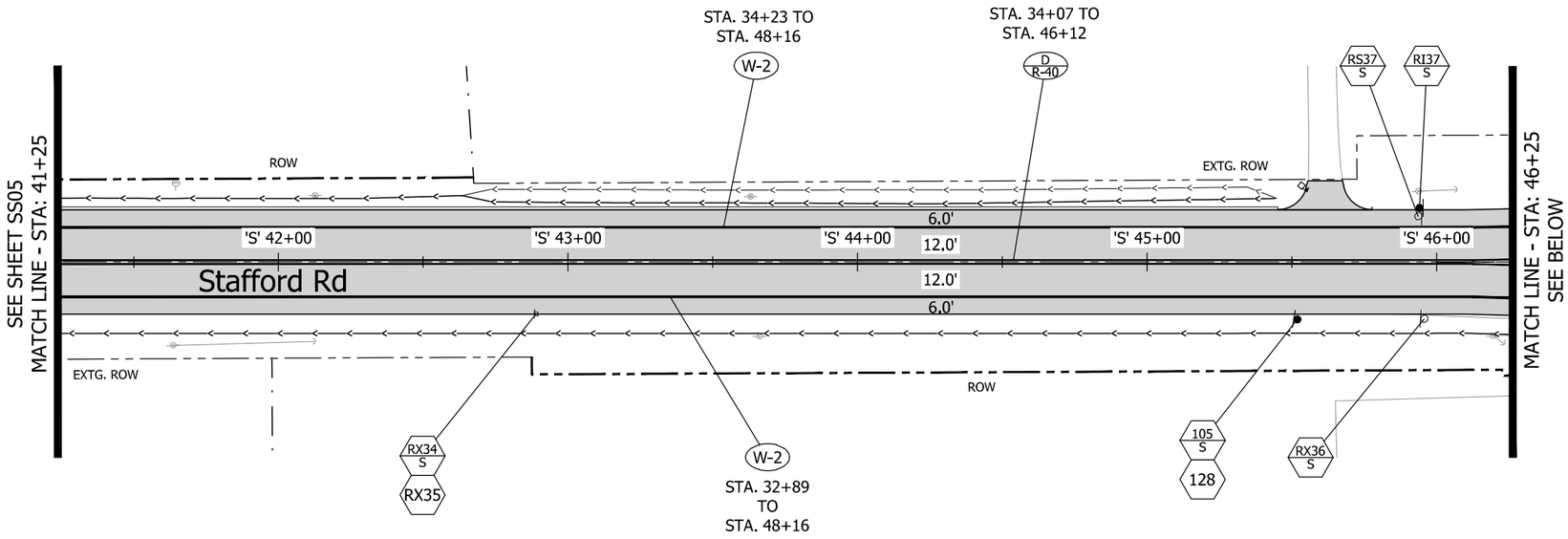
KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

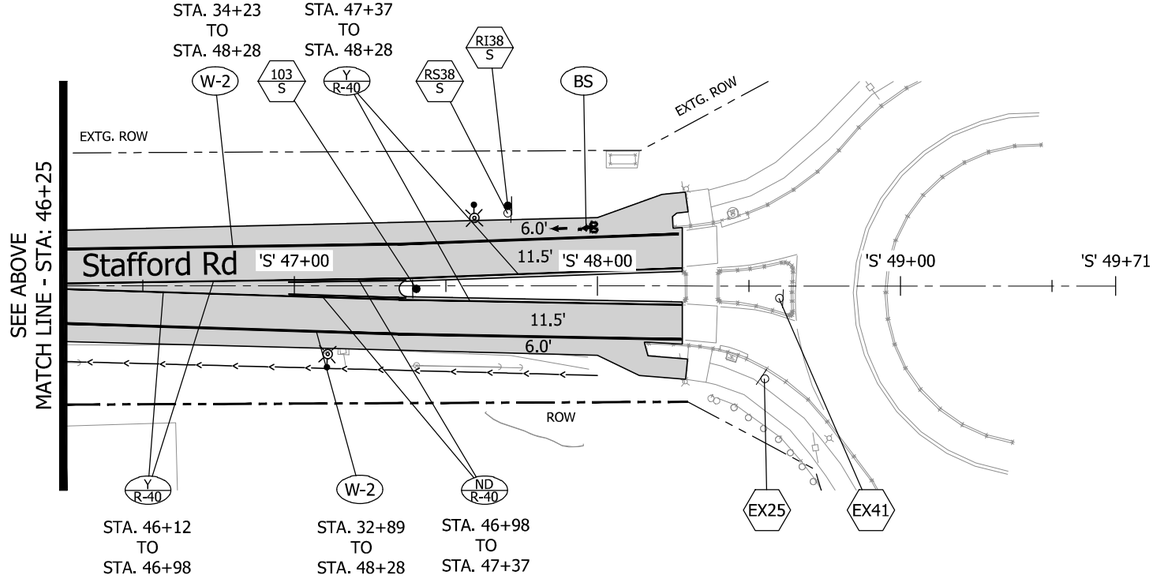
REVISIONS

NO.	DATE:

Sheet No.
SS05

Plot Stamp: 10/8/2024 12:47:53 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg





25 12.5 0 25 50
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- (X) — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX | DRAFTED BY: D. SHADRIN | CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No. SS06

Plot Stamp: 10/8/2024 12:48:01 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

SIGN LEGEND

- N / M — INSTALL NEW SIGN (N) ON NEW (M) SUPPORT.
- RIN / M — REINSTALL EXISTING SIGN (N) AND (M) SUPPORT.
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SUPPORT.

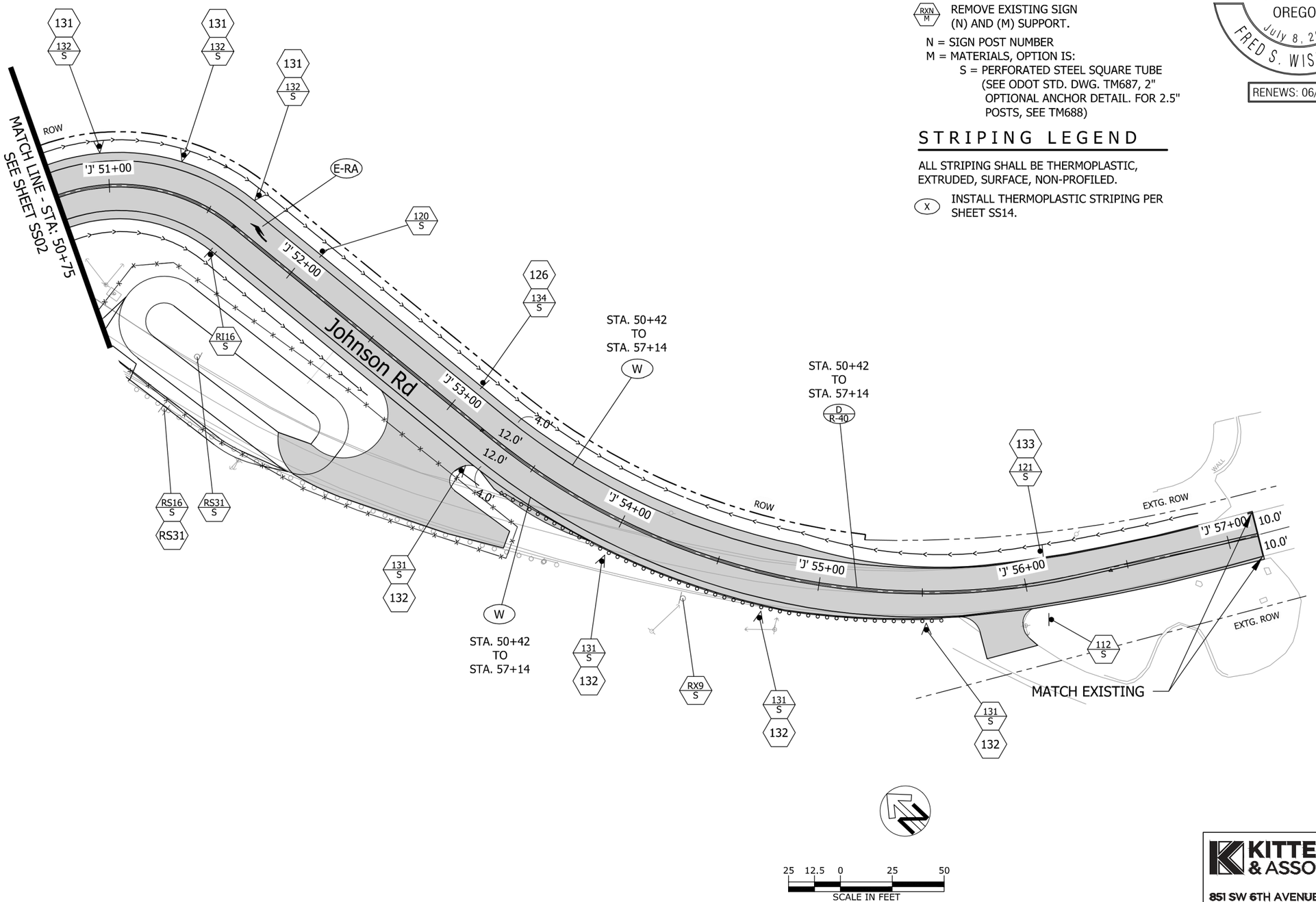
N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

(X) INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26



25 12.5 0 25 50
SCALE IN FEET

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
C. COX	D. SHADRIN	F. WISMER

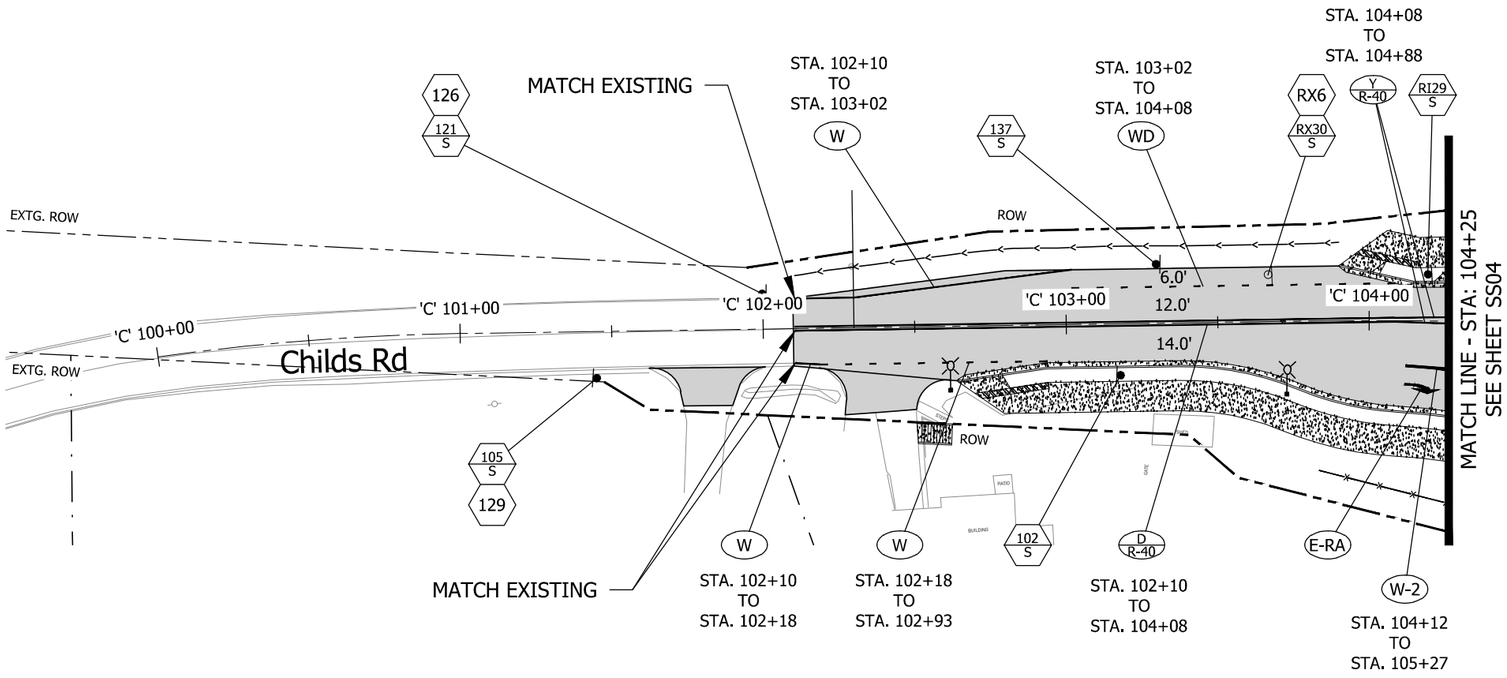
REVISIONS

NO.	DATE:

Sheet No.
SS07
126 of 162

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Plot Stamp: 10/8/2024 12:48:06 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg



REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

SIGN LEGEND

- EXN — MAINTAIN AND PROTECT EXISTING SIGN (N).
- N / M — INSTALL NEW SIGN (N) ON NEW (M) SIGN SUPPORT.
- N — INSTALL NEW SIGN (N).
- RXN / M — REMOVE EXISTING SIGN (N) AND (M) SIGN SUPPORT.
- RXN — REMOVE EXISTING SIGN (N).
- RSN / M — REMOVE AND SAVE EXISTING SIGN (N) AND REMOVE (M) SIGN SUPPORT.
- RSN — REMOVE AND SAVE EXISTING SIGN (N).
- RIN / M — REINSTALL EXISTING SIGN (N) ON NEW (M) SIGN SUPPORT.
- RIN — REINSTALL EXISTING SIGN (N).

N = SIGN POST NUMBER
M = MATERIALS, OPTION IS:
S = PERFORATED STEEL SQUARE TUBE (SEE ODOT STD. DWG. TM687, 2" OPTIONAL ANCHOR DETAIL. FOR 2.5" POSTS, SEE TM688)

STRIPING LEGEND

ALL STRIPING SHALL BE THERMOPLASTIC, EXTRUDED, SURFACE, NON-PROFILED.

- X — INSTALL THERMOPLASTIC STRIPING PER SHEET SS14.

SIGNING AND STRIPING PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS08

Plot Stamp: 10/8/2024 12:48:10 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

EXISTING SIGNS

1

7

13

19

25

31

37

2

8

14

20

26

32

38

3

9

15

21

27

33

39

4

10

16

22

28

34

40

5

11

17

23

29

35

41

6

12

18

24

30

36

42

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

SIGNING DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS09

Plot Stamp: 10/8/2024 12:48:13 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

PROPOSED SIGNS

101 R1-2
36"x36"x36"
5 REQUIRED

107 W16-7L
24"x12"
5 REQUIRED

113 W2-2
36"x36"
1 REQUIRED

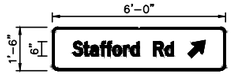
119 W1-7
60"x30"
1 REQUIRED

125 W16-8P
18"x8"
2 REQUIRED

131 W1-8R
24"x30"
8 REQUIRED

137 OBW1-9
36"x36"
1 REQUIRED

102 R3-8
30"x30"
2 REQUIRED



108 D1-1d
72"x18"
2 REQUIRED

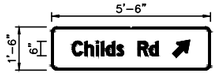
114 W16-8P
29"x8"
2 REQUIRED

120 W3-1
36"x36"
1 REQUIRED

126 W1-1L
36"x36"
2 REQUIRED

132 W1-8L
24"x30"
8 REQUIRED

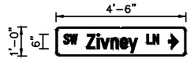
103 R4-7
24"x30"
5 REQUIRED



109 D1-1d
66"x18"
1 REQUIRED

115 R1-1
36"x36"
2 REQUIRED

121 W13-1P
18"x18"
3 REQUIRED

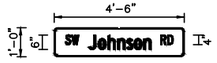


127 D1-1
54"x12"
1 REQUIRED

133 W1-1R
36"x36"
2 REQUIRED

104 R6-4b
60"x24"
3 REQUIRED

110 R3-2
24"x24"
1 REQUIRED



116 D1-1
54"x12"
1 REQUIRED

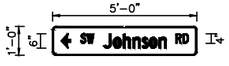
122 W2-2
36"x36"
1 REQUIRED

128 W16-8P
48"x15"
1 REQUIRED

134 W13-1P
24"x24"
1 REQUIRED

105 W2-6
36"x36"
4 REQUIRED

111 OM3-C
12"x36"
1 REQUIRED



117 D1-1
60"x12"
1 REQUIRED

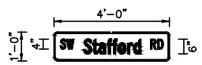
123 W13-1P
24"x24"
3 REQUIRED

129 W16-8P
29"x8"
1 REQUIRED

135 W1-2L
36"x36"
1 REQUIRED

106 W11-2
36"x36"
5 REQUIRED

112 R2-1
30"x36"
3 REQUIRED



118 D3-1
48"x12"
2 REQUIRED

124 OR22-7
24"x18"
2 REQUIRED

130 R3-5
24"x30"
1 REQUIRED

136 W1-2R
36"x36"
2 REQUIRED

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

SIGNING DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS10

129 of 162

Plot Stamp: 10/8/2024 12:48:16 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

SIGN & POST DATA TABLE

SIGN NO.	SIGN LOCATION 4/ (See Clack. Co. Std. Dwg. T250)	SIGN DIMENSIONS		SUB-STRATE			COLOR 1/					LEGEND		SIGN NO.	TYPE OF SUPPORT								POST		FOOTING		REMARKS
							BACKGROUND		LEGEND																		
		WIDTH	HEIGHT	PLYWOOD	SHEET ALUMINUM	EXTRUDED ALUM.	ASTM TYPE III or TYPE IV	ASTM TYPE IX OR TYPE XI	ASTM TYPE III or TYPE IV	ASTM TYPE IX OR TYPE XI	NON-REFLECTIVE	PERMANENT	DEMOUNTABLE	2/	WOOD POST	SQ. TUBE SIGN SUPPORT (See Clack. Co. Std. Dwg. T150 and ODOT Std. Dwg. TM 687 and TM688)	STAINLESS STEEL CLAMP (SSC)	SIGNAL POLE MOUNT	MAST ARM SIGN MOUNT	CROSSWALK CLOSURE SUPPORT (See ODOT Std. Dwg. TM240)	CUSTOM VARIABLE SUPPORT	SIZE (BASED ON ESTIMATED LENGTH)	LENGTH (MUST BE FIELD VERIFIED)	LOCATION 3/	MIN. DEPTH 5/ (See ODOT Std. Dwg. TM687)	
101	STA "S" 29+41.37' Rt.	36"	32"		✓		W		R			✓		101		✓							2" x 12GA	12' 6"	3'	34"	
101	STA "S" 30+99.20' Lt.	36"	32"		✓		W		R			✓		101		✓							2" x 12GA	12' 6"	3'	34"	
101	STA "S" 31+02.09' Lt.	36"	32"		✓		W		R			✓		101		✓							2" x 12GA	12' 6"	3'	34"	
101	STA "C" 105+57.22' Rt.	36"	32"		✓		W		R			✓		101		✓							2" x 12GA	12' 6"	3'	34"	
101	STA "C" 105+63.70' Rt.	36"	32"		✓		W		R			✓		101		✓							2" x 12GA	12' 6"	3'	34"	
102	STA "S" 33+80.34' Lt.	30"	30"		✓		W		BK			✓		102			✓										
102	STA "C" 103+17.71' Rt.	30"	30"		✓		W		BK			✓		102		✓							2" x 12GA	12' 4"	3'	34"	
103	STA "S" 15+33.57' Lt.	24"	30"		✓		W		BK			✓		103		✓							2" x 12GA	12' 4"	3'	34"	
103	STA "S" 27+96.33' Rt.	24"	30"		✓		W		BK			✓		103		✓							2" x 12GA	12' 4"	3'	34"	
103	STA "S" 32+36.18' Rt.	24"	30"		✓		W		BK			✓		103		✓							2" x 12GA	12' 4"	3'	34"	
103	STA "S" 47+40.28' Rt.	24"	30"		✓		W		BK			✓		103		✓							2" x 12GA	12' 4"	3'	34"	
103	STA "C" 104+95.09' Lt.	24"	30"		✓		W		BK			✓		103		✓							2" x 12GA	12' 4"	3'	34"	
104	STA "S" 29+85.82' Rt.	60"	24"		✓		W		BK			✓		104		✓							2" x 12GA	11' 10"	3'	34"	
104	STA "S" 30+04.05' Lt.	60"	24"		✓		W		BK			✓		104		✓							2" x 12GA	11' 10"	3'	34"	
104	STA "S" 30+54.33' Lt.	60"	24"		✓		W		BK			✓		104		✓							2" x 12GA	11' 10"	3'	34"	
105	STA "S" 25+34.45' Rt.	36"	36"		✓		Y		BK			✓		105		✓							2" x 12GA	13' 10"	3'	34"	
125		18"	8"		✓		Y		BK			✓		125		✓											Mount below sign 105
105	STA "S" 35+43.99' Lt.	36"	36"		✓		Y		BK			✓		105		✓							2" x 12GA	13' 10"	3'	34"	
125		18"	8"		✓		Y		BK			✓		125		✓											Mount below sign 105
105	STA "S" 45+51.88' Rt.	36"	36"		✓		Y		BK			✓		105		✓							2" x 12GA	13' 10"	3'	34"	
128		30"	12"		✓		Y		BK			✓		128		✓											Mount below sign 105
105	STA "C" 101+44.88' Rt.	36"	36"		✓		Y		BK			✓		105		✓							2" x 12GA	13' 10"	3'	34"	
129		30"	8"		✓		Y		BK			✓		129		✓											Mount below sign 105
106	STA "S" 29+03.87' Rt.	36"	36"		✓		Y		BK			✓		106		✓							2" x 12GA	13' 10"	3'	34"	
107		24"	12"		✓		Y		BK			✓		107		✓											Mount below sign 106
106	STA "S" 29+20.50' Lt.	36"	36"		✓		Y		BK			✓		106		✓							2" x 12GA	13' 10"	3'	34"	
107		24"	12"		✓		Y		BK			✓		107		✓											Mount below sign 106
106	STA "C" 105+19.64' Rt.	36"	36"		✓		Y		BK			✓		106		✓							2" x 12GA	13' 10"	3'	34"	
107		24"	12"		✓		Y		BK			✓		107		✓											Mount below sign 106
106	STA "C" 105+21.84' Rt.	36"	36"		✓		Y		BK			✓		106		✓							2" x 12GA	13' 10"	3'	34"	
107		24"	12"		✓		Y		BK			✓		107		✓											Mount below sign 106
106	STA "C" 105+44.16' Rt.	36"	36"		✓		Y		BK			✓		106		✓							2" x 12GA	13' 10"	3'	34"	
107		24"	12"		✓		Y		BK			✓		107		✓											Mount below sign 106
108	STA "S" 29+44.95' Rt.	72"	18"		✓		G		W			✓		108		✓							2" x 12GA	11' 4"	3'	34"	
108	STA "S" 30+96.41' Rt.	72"	18"		✓		G		W			✓		108		✓							2" x 12GA	11' 4"	3'	34"	
109	STA "C" 105+65.71' Lt.	66"	18"		✓		G		W			✓		109		✓							2" x 12GA	11' 4"	3'	34"	

1/
BK=BLACK
BL=BLUE
BR=BROWN
FY=FLUORESCENT YELLOW
G=GREEN
O=ORANGE
P=PURPLE
R=RED
RB=RED-BLUE
W=WHITE
Y=YELLOW
YG=FLOURESCENT YELLOW-GREEN

2/
NOTE: L,C,R ARE LOCATIONS OF POSTS FACING THE SIGN.
L = LEFT POST
C = CENTER POST
R = RIGHT POST

3/
DISTANCE FROM EDGE OF TRAVEL LANE, FACE OF CURB, GUARDRAIL, OR BARRIER TO THE CENTERLINE OF FOOTING. FOR ADDITIONAL INFORMATION SEE STANDARD DRAWINGS TM600, TM602, AND TM635

4/
NOTE: THE LOCATIONS SHOWN ARE APPROXIMATE EXCEPT FOR SPEED ZONES, SCHOOL ZONES, OBJECT MARKERS AND MILEPOST MARKERS. EXACT LOCATIONS ARE TO BE DETERMINED BY THE ENGINEER

5/
MINIMUM DEPTH OF FOOTING FOR TRIANGULAR BASE BREAKAWAY AND MULTI-POST BREAKAWAY INSTALLATIONS IS FOR A 2' DIAMETER FOOTING. FOR ADDITIONAL INFORMATION SEE STANDARD DRAWINGS TM601 AND TM602.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

SIGN AND POST DATA TABLE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

Sheet No.
SS11
130 of 162

Plot Stamp: 10/8/2024 12:48:18 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

SIGN & POST DATA TABLE

SIGN NO.	SIGN LOCATION 4/ (See Clack. Co. Std. Dwg. T250)	SIGN DIMENSIONS		SUB-STRATE			COLOR 1/						LEGEND		SIGN NO. 2/	TYPE OF SUPPORT								POST		FOOTING		REMARKS
							BACKGROUND		LEGEND																			
		WIDTH	HEIGHT	PLYWOOD	SHEET ALUMINUM	EXTRUDED ALUM.	ASTM TYPE III or TYPE IV	ASTM TYPE IX OR TYPE XI	ASTM TYPE III or TYPE IV	ASTM TYPE IX OR TYPE XI	NON-REFLECTIVE	PERMANENT	DEMOUNTABLE		WOOD POST	SQ. TUBE SIGN SUPPORT (See Clack. Co. Std. Dwg. T150 and ODOT Std. Dwg. TM	STAINLESS STEEL CLAMP (SSC)	SIGNAL POLE MOUNT	MAST ARM SIGN MOUNT	CROSSWALK CLOSURE SUPPORT (See ODOT Std. Dwg. TM240)	CUSTOM VARIABLE SUPPORT	SIZE (BASED ON ESTIMATED LENGTH)	LENGTH (MUST BE FIELD VERIFIED)	LOCATION 3/	MIN. DEPTH 5/ (See Clack. Co. Std. Dwg. T150)	
110	STA "S" 16+00.17' Lt.	24"	24"		✓		W		BK/R			✓		110		✓							2" x 12GA	12' 10"	3'	34"	
111	STA "C" 104+77.11' Rt.	12"	36"		✓		W		BK			✓		111		✓							2" x 12GA	9' 10"	3'	34"	
112	STA "S" 9+91.01' Rt.	30"	36"		✓		W		BK			✓		112		✓							2" x 12GA	12' 10"	3'	34"	
112	STA "S" 34+61.23' Rt.	30"	36"		✓		W		BK			✓		112		✓							2" x 12GA	12' 10"	3'	34"	
112	STA "J" 56+19.95' Rt.	30"	36"		✓		W		BK			✓		112		✓							2" x 12GA	12' 10"	3'	34"	
113	STA "S" 14+17.92' Rt.	36"	36"		✓		Y		BK			✓		113		✓							2" x 12GA	13' 10"	3'	34"	
114		29"	8"		✓		Y		BK			✓		114		✓											Mount below sign 113
115	STA "S" 32+85.39' Rt.	36"	36"		✓		R		W			✓		115		✓							2.5" x 10GA	12' 10"	3'	34"	
118		48"	12"		✓		G		W			✓		118		✓											Mount on flat blade sign bracket (See Clack. Co. Std. Dwg. T130)
127		54"	12"		✓		G		W			✓		127		✓											Mount on flat blade cross sign bracket (See Clack. Co. Std. Dwg. T130)
115	STA "J" 50+52.96' Lt.	36"	36"		✓		R		W			✓		115		✓							2.5" x 10GA	12' 10"	3'	34"	
116		60"	12"		✓		G		W			✓		116		✓											Mount on flat blade sign bracket (See Clack. Co. Std. Dwg. T130)
130		24"	30"		✓		W		BK			✓		130		✓											Mount on flat blade cross sign bracket (See Clack. Co. Std. Dwg. T130)
119	STA "S" 16+10.88' Lt.	60"	30"		✓		G		W			✓		119		✓							2.5" x 10GA	12' 10"	3'	34"	
117		60"	12"		✓		G		W			✓		117		✓											Mount on flat blade sign bracket (See Clack. Co. Std. Dwg. T130)
118		48"	12"		✓		Y		BK			✓		118		✓											Mount on flat blade cross sign bracket (See Clack. Co. Std. Dwg. T130)
120	STA "J" 52+15.72' Lt.	36"	36"		✓		Y		BK			✓		120		✓							2" x 12GA	12' 10"	3'	34"	
122	STA "S" 20+07.49' Lt.	36"	36"		✓		Y		BK			✓		122		✓							2" x 12GA	13' 10"	3'	34"	
114		29"	8"		✓		Y		BK			✓		114		✓											Mount below sign 122
124	STA "S" 15+56.84' Lt.	24"	18"		✓		W		BK			✓		124		✓							2" x 12GA	11' 4"	3'	34"	
124	STA "S" 15+58.33' Rt.	24"	18"		✓		W		BK			✓		124						✓						34"	
126	STA "J" 53+15.72' Lt.	36"	36"		✓		Y		BK			✓		126		✓							2" x 12GA	14' 4"	3'	34"	
134		24"	24"		✓		Y		BK			✓		134		✓											Mount below sign 126
126	STA "C" 101+99.88' Lt.	36"	36"		✓		Y		BK			✓		126		✓							2" x 12GA	14' 4"	3'	34"	
121		18"	18"		✓		Y		BK			✓		121		✓											Mount below sign 126
131	STA "J" 50+73.69' Lt.	24"	30"		✓		Y		BK			✓		131		✓							2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓		Y		BK			✓		132		✓											Mount Back to Back With Sign 131
131	STA "J" 51+07.48' Lt.	24"	30"		✓		Y		BK			✓		131		✓							2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓		Y		BK			✓		132		✓											Mount Back to Back With Sign 131
131	STA "J" 51+41.26' Lt.	24"	30"		✓		Y		BK			✓		131		✓							2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓		Y		BK			✓		132		✓											Mount Back to Back With Sign 131

1/
BK=BLACK
BL=BLUE
BR=BROWN
FY=FLUORESCENT YELLOW
G=GREEN
O=ORANGE
P=PURPLE
R=RED
RB=RED-BLUE
W=WHITE
Y=YELLOW
YG=FLOURESCENT YELLOW-GREEN

2/
NOTE: L,C,R ARE LOCATIONS OF POSTS FACING THE SIGN.
L = LEFT POST
C = CENTER POST
R = RIGHT POST

3/
DISTANCE FROM EDGE OF TRAVEL LANE, FACE OF CURB, GUARDRAIL, OR BARRIER TO THE CENTERLINE OF FOOTING. FOR ADDITIONAL INFORMATION SEE STANDARD DRAWINGS TM600, TM602, AND TM635

4/
NOTE: THE LOCATIONS SHOWN ARE APPROXIMATE EXCEPT FOR SPEED ZONES, SCHOOL ZONES, OBJECT MARKERS AND MILEPOST MARKERS. EXACT LOCATIONS ARE TO BE DETERMINED BY THE ENGINEER

5/
MINIMUM DEPTH OF FOOTING FOR TRIANGULAR BASE BREAKAWAY AND MULTI-POST BREAKAWAY INSTALLATIONS IS FOR A 2' DIAMETER FOOTING. FOR ADDITIONAL INFORMATION SEE STANDARD DRAWINGS TM601 AND TM602.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

SIGN AND POST DATA TABLE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS
NO. | DATE:

Sheet No.
SS12

131 of 162

Plot Stamp: 10/8/2024 12:48:21 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

SIGN & POST DATA TABLE

SIGN NO.	SIGN LOCATION 4/ (See Clack. Co. Std. Dwg. T250)	SIGN DIMENSIONS		SUB-STRATE		COLOR 1/					LEGEND		SIGN NO. 2/	TYPE OF SUPPORT								POST		FOOTING		REMARKS
						BACKGROUND		LEGEND																LOCATION 3/	MIN. DEPTH 5/	
		WIDTH	HEIGHT	PLYWOOD	SHEET ALUMINUM EXTRUDED ALUM.	ASTM TYPE III or TYPE IV	ASTM TYPE IX OR TYPE XI	ASTM TYPE III or TYPE IV	ASTM TYPE IX OR TYPE XI	NON-REFLECTIVE	PERMANENT	DEMOUNTABLE		WOOD POST	SQ. TUBE SIGN SUPPORT (See Clack. Co. Std. Dwg. T150 and ODOT Std. Dwg. TM 687 and TM688)	STAINLESS STEEL CLAMP (SSC)	SIGNAL POLE MOUNT	MAST ARM SIGN MOUNT	CROSSWALK CLOSURE SUPPORT (See ODOT Std. Dwg. TM240)	CUSTOM VARIABLE SUPPORT	SIZE (BASED ON ESTIMATED LENGTH)	LENGTH (MUST BE FIELD VERIFIED)		(See Clack. Co. Std. Dwg. T150)	
131	STA "J" 51+75.05' Lt.	24"	30"		✓	Y		BK			✓		131		✓						2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓	Y		BK			✓		132		✓										Mount Back to Back With Sign 131
131	STA "J" 53+34.25' Rt.	24"	30"		✓	Y		BK			✓		131		✓						2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓	Y		BK			✓		132		✓										Mount Back to Back With Sign 131
131	STA "J" 54+10.22' Rt.	24"	30"		✓	Y		BK			✓		131		✓						2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓	Y		BK			✓		132		✓										Mount Back to Back With Sign 131
131	STA "J" 54+86.10' Rt.	24"	30"		✓	Y		BK			✓		131		✓						2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓	Y		BK			✓		132		✓										Mount Back to Back With Sign 131
131	STA "J" 55+62.38' Rt.	24"	30"		✓	Y		BK			✓		131		✓						2" x 12GA	12' 4"	3'	34"	
132		24"	30"		✓	Y		BK			✓		132		✓										Mount Back to Back With Sign 131
133	STA "J" 56+19.61' Lt.	36"	36"		✓	Y		BK			✓		133		✓						2" x 12GA	14' 4"	3'	34"	
121		18"	18"		✓	Y		BK			✓		121		✓										Mount below sign 133
135	STA "S" 7+23.61' Rt.	36"	36"		✓	Y		BK			✓		135		✓						2" x 12GA	14' 4"	3'	34"	
123		24"	24"		✓	Y		BK			✓		123		✓										Mount below sign 135
136	STA "S" 12+61.72' Lt.	36"	36"		✓	Y		BK			✓		136		✓						2" x 12GA	14' 4"	3'	34"	
123		24"	24"		✓	Y		BK			✓		123		✓										Mount below sign 136
137	STA "C" 103+29.96' Lt.	36"	36"		✓	Y		BK			✓		137		✓						2" x 12GA	12'-10"	3'	34"	
EX5	STA "S" 12+54.61' Rt.	EX	EX		✓	Y		BK			✓		EX5		✓						2" x 12GA	13'10"	3'	34"	
123		24"	24"		✓	Y		BK			✓		123		✓										Mount below sign 5
EX15	STA "J" 50+82.90' Rt.	EX	EX		✓	W		BK			✓		EX15		✓						EX	EX	3'	34"	
EX16	STA "J" 51+74.97' Rt.	EX	EX		✓	G		W			✓		EX16		✓						EX	EX	3'	34"	
EX19	STA "S" 15+71.86' Lt.	EX	EX		✓	Y		BK			✓		EX19		✓						EX	EX	3'	34"	
EX20		EX	EX		✓	Y		BK			✓		EX20		✓										Mount below sign 19
EX29	STA "C" 104+19.25' Lt.	EX	EX		✓	G		W			✓		EX29		✓						EX	EX	3'	34"	
EX33	STA "S" 38+57.18' Rt.	EX	EX		✓	G		W			✓		EX33		✓						EX	EX	3'	34"	
EX37	STA "S" 45+94.05' Lt.	EX	EX		✓	G		W			✓		EX37		✓						EX	EX	3'	34"	
EX38	STA "S" 47+70.44' Lt.	EX	EX		✓	G		W			✓		EX38		✓						EX	EX	3'	34"	
EX39	STA "S" 13+53.79' LT.	EX	EX		✓	Y		BK			✓		EX39		✓						EX	EX	3'	34"	
EX40		EX	EX		✓	Y		BK			✓		EX40		✓										Mount back to back with sign 39
EX39	STA "S" 14+28.79' Lt.	EX	EX		✓	Y		BK			✓		EX39		✓						EX	EX	3'	34"	
EX40		EX	EX		✓	Y		BK			✓		EX40		✓										Mount back to back with sign 39
EX39	STA "S" 15+03.50' Lt.	EX	EX		✓	Y		BK			✓		EX39		✓						EX	EX	3'	34"	
EX40		EX	EX		✓	Y		BK			✓		EX40		✓										Mount back to back with sign 39

1/
BK=BLACK
BL=BLUE
BR=BROWN
FY=FLUORESCENT YELLOW
G=GREEN
O=ORANGE
P=PURPLE
R=RED
RB=RED-BLUE
W=WHITE
Y=YELLOW
YG=FLOURESCENT YELLOW-GREEN

2/
NOTE: L,C,R ARE LOCATIONS OF POSTS FACING THE SIGN.
L = LEFT POST
C = CENTER POST
R = RIGHT POST

3/
DISTANCE FROM EDGE OF TRAVEL LANE, FACE OF CURB, GUARDRAIL, OR BARRIER TO THE CENTERLINE OF FOOTING. FOR ADDITIONAL INFORMATION SEE STANDARD DRAWINGS TM600, TM602, AND TM635

4/
NOTE: THE LOCATIONS SHOWN ARE APPROXIMATE EXCEPT FOR SPEED ZONES, SCHOOL ZONES, OBJECT MARKERS AND MILEPOST MARKERS. EXACT LOCATIONS ARE TO BE DETERMINED BY THE ENGINEER

5/
MINIMUM DEPTH OF FOOTING FOR TRIANGULAR BASE BREAKAWAY AND MULTI-POST BREAKAWAY INSTALLATIONS IS FOR A 2' DIAMETER FOOTING. FOR ADDITIONAL INFORMATION SEE STANDARD DRAWINGS TM601 AND TM602.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

SIGN AND POST DATA TABLE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

Sheet No.
SS13

Plot Stamp: 10/8/2024 12:48:23 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

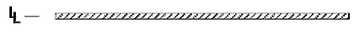
W

4" WHITE LINE

W-2

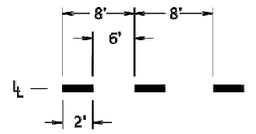
8" WHITE LINE

Y



4" YELLOW LINE

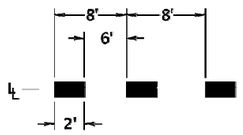
WD



4" WHITE DOTTED LINE

For lane extensions

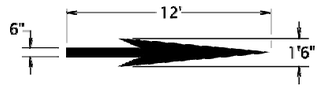
WD-2



8" WHITE DOTTED LINE

For lane extensions and bike lane extensions

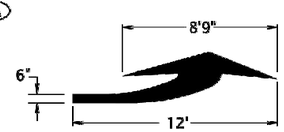
E-SA



ELONGATED STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

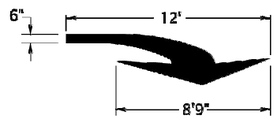
E-LA



ELONGATED LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

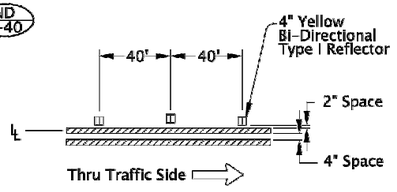
E-RA



ELONGATED RIGHT TURN ARROW (white)

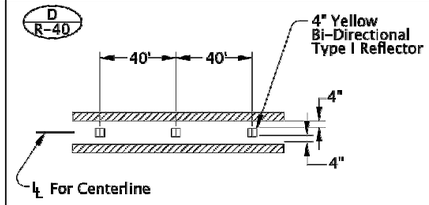
For arrow proportion details, see current version of Standard Highway Signs

ND R-40



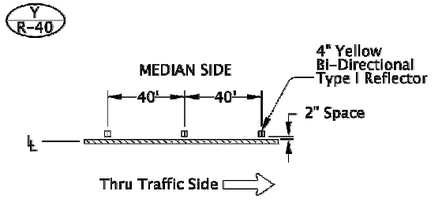
NARROW DOUBLE YELLOW POSITIONING GUIDE
REFLECTORS WITH TWO 4" YELLOW LINES

D R-40



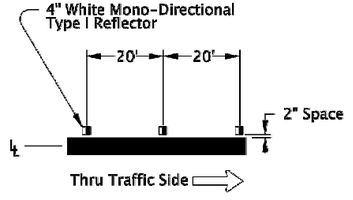
DOUBLE NO-PASS POSITIONING GUIDE
REFLECTORS WITH TWO 4" YELLOW LINES

Y R-40



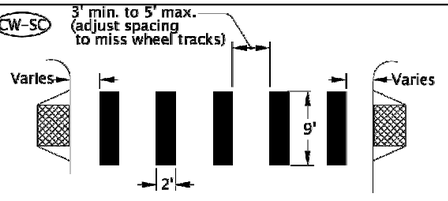
YELLOW LINE POSITIONING GUIDE
REFLECTORS WITH 4" YELLOW LINE

W-2 R-20L



CHANNELIZING LINE POSITIONING GUIDE
REFLECTORS WITH 8" WHITE LINE

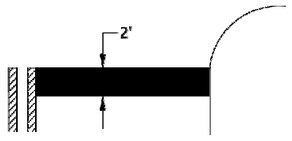
CW-SC



STAGGERED CONTINENTAL CROSSWALK
2' WHITE BARS

Install per Standard Drawing TM530

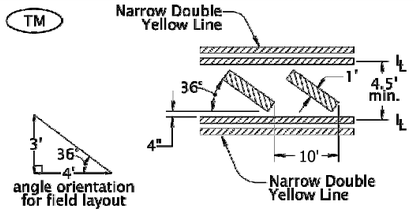
S-2



STOP BAR - LARGE
2' WHITE BAR

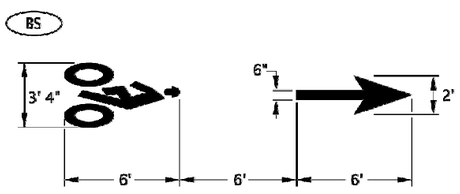
Install per Standard Drawing TM530

TM



TRANSVERSE MEDIAN BARS
1' YELLOW BARS AT 10' SPACING

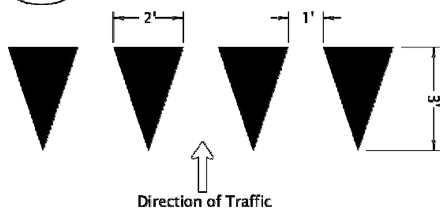
BS



BIKE LANE STANDARD STENCIL (white)

Center marking within lane width
For proportion details, see current version of Standard Highway Signs

YLD



YIELD LINE (white)

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.

RENEWS: 06/30/26

STRIPING DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
SS14

Plot Stamp: 10/8/2024 12:48:25 PM - Caleb Cox
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Signing and Striping Plans-25094.dwg

LEGEND

- STAGE 1 CONSTRUCTION ZONE
- STAGE 2 CONSTRUCTION ZONE
- STAGE 4 CONSTRUCTION ZONE
- STAGE 5 CONSTRUCTION ZONE

NOTES:

1. ALL TCP DETOUR ROUTES MUST BE APPROVED BY THE ENGINEER PRIOR TO ANY ROAD CLOSURE.
2. COORDINATE PORTABLE CHANGEABLE MESSAGE SIGN PLACEMENT AND MESSAGE WITH ENGINEER PRIOR TO PLACEMENT.
3. OBTAIN ALL STATE AND COUNTY PERMITS PRIOR TO TCP SIGN/PORTABLE CHANGEABLE MESSAGE SIGN PLACEMENT.

STAGE 2
CHILDS ROAD & STAFFORD ROAD CLOSED TO TRAFFIC NORTH OF JOHNSON ROAD TO SOUTH OF ROSEMONT ROAD, LOCAL ACCESS ONLY NORTH OF CHILDS ROAD

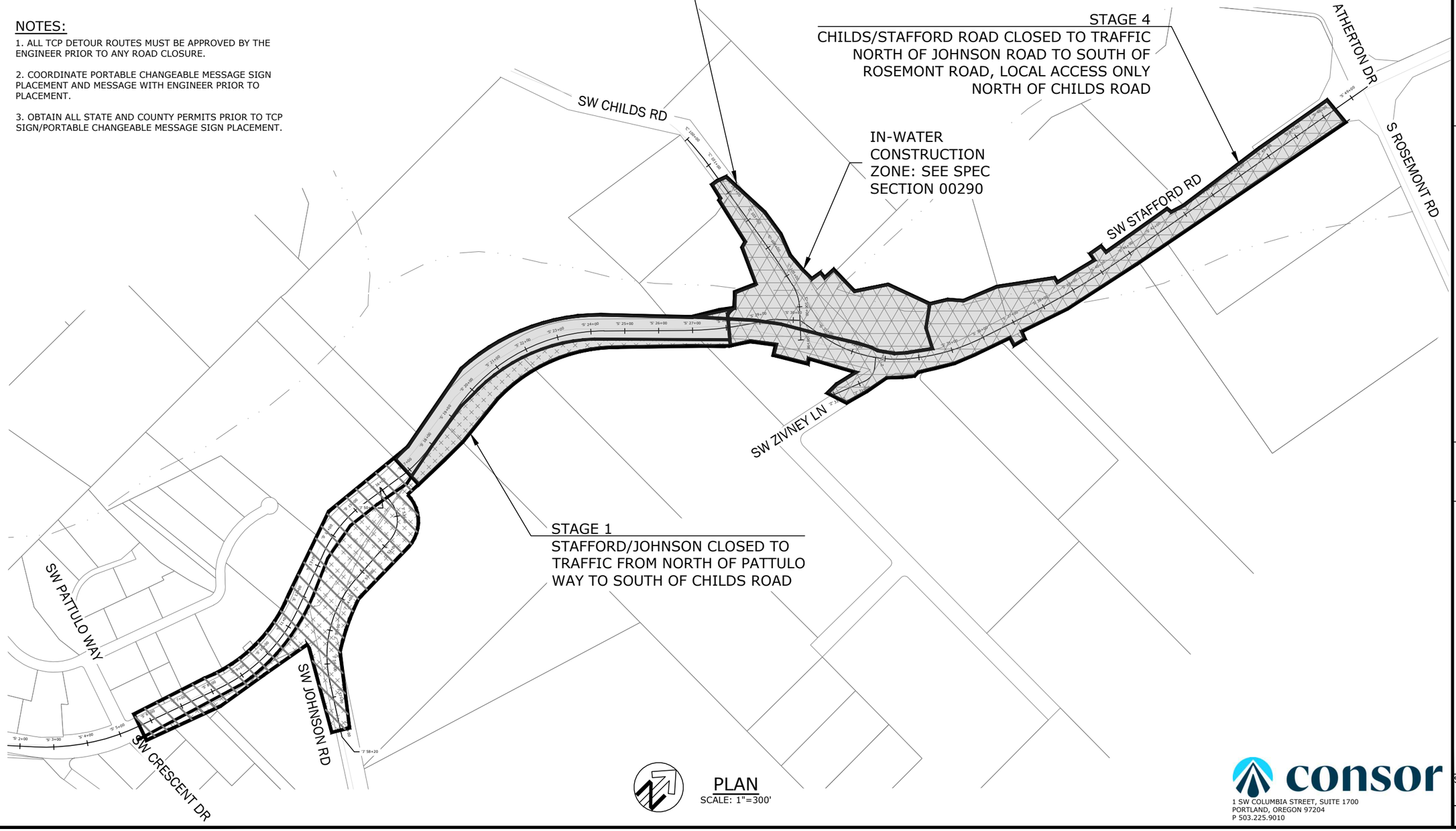
STAGE 3
WINTER SHUT-DOWN PERIOD, UTILITY RELOCATIONS, CHILDS ROAD CLOSED TO TRAFFIC AT STAFFORD ROAD, STAFFORD ROAD ALL LANES OPEN TO TRAFFIC.

STAGE 5
STAFFORD ROAD & JOHNSON ROAD CLOSED TO TRAFFIC FROM NORTH OF PATTULO WAY TO SOUTH OF CHILDS ROAD. FOLLOWED BY TWO-WAY TRAFFIC UNDER FLAGGING, PROJECT WIDE.

STAGE 4
CHILDS/STAFFORD ROAD CLOSED TO TRAFFIC NORTH OF JOHNSON ROAD TO SOUTH OF ROSEMONT ROAD, LOCAL ACCESS ONLY NORTH OF CHILDS ROAD

IN-WATER CONSTRUCTION ZONE: SEE SPEC SECTION 00290

STAGE 1
STAFFORD/JOHNSON CLOSED TO TRAFFIC FROM NORTH OF PATTULO WAY TO SOUTH OF CHILDS ROAD



PLAN
SCALE: 1"=300'

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

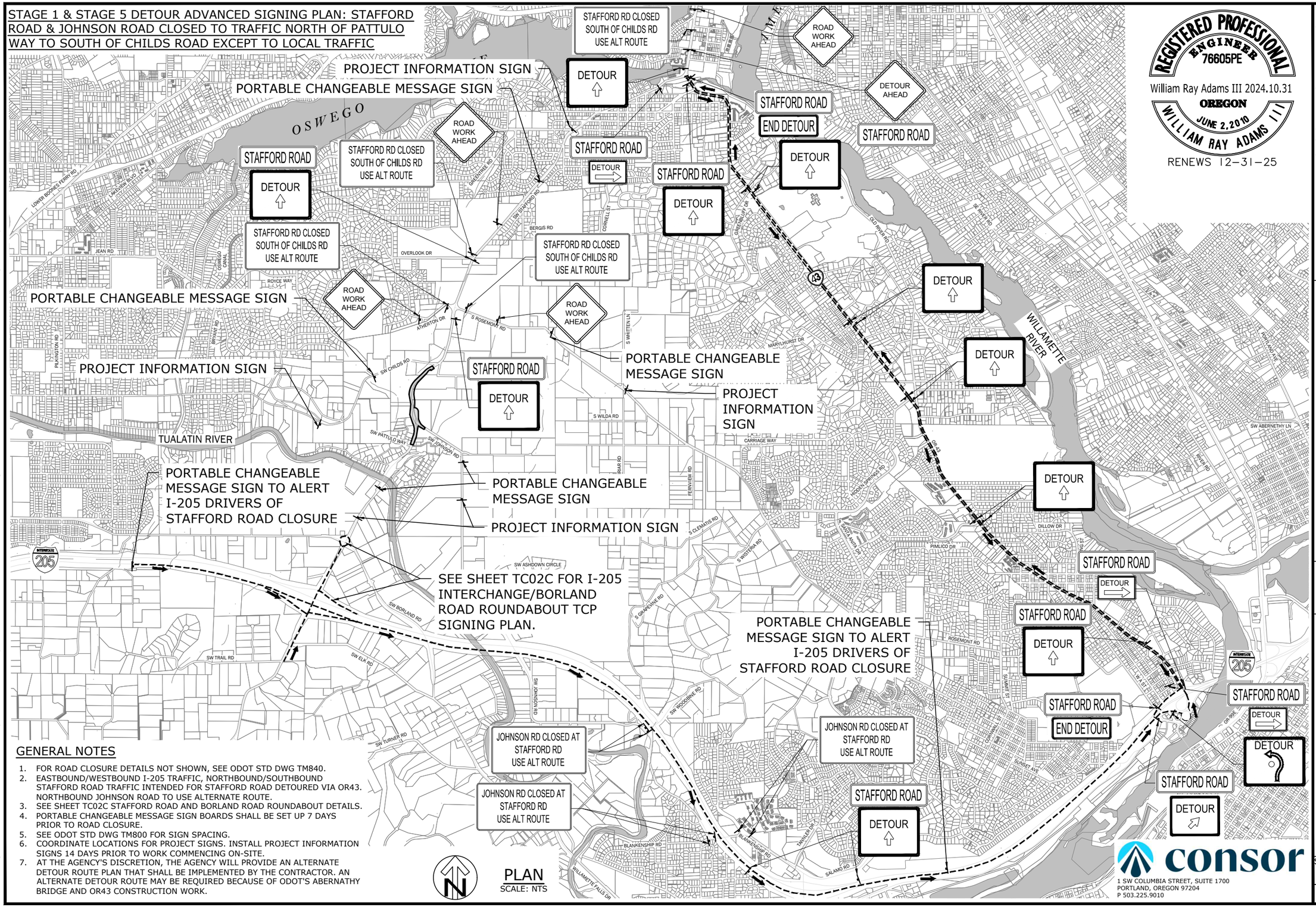
Sheet No.
TC01

134 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC01 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 1 & STAGE 5 DETOUR ADVANCED SIGNING PLAN: STAFFORD ROAD & JOHNSON ROAD CLOSED TO TRAFFIC NORTH OF PATTULO WAY TO SOUTH OF CHILDS ROAD EXCEPT TO LOCAL TRAFFIC



GENERAL NOTES

1. FOR ROAD CLOSURE DETAILS NOT SHOWN, SEE ODOT STD DWG TM840.
2. EASTBOUND/WESTBOUND I-205 TRAFFIC, NORTHBOUND/SOUTHBOUND STAFFORD ROAD TRAFFIC INTENDED FOR STAFFORD ROAD DETOURED VIA OR43. NORTHBOUND JOHNSON ROAD TO USE ALTERNATE ROUTE.
3. SEE SHEET TC02C STAFFORD ROAD AND BORLAND ROAD ROUNDABOUT DETAILS.
4. PORTABLE CHANGEABLE MESSAGE SIGN BOARDS SHALL BE SET UP 7 DAYS PRIOR TO ROAD CLOSURE.
5. SEE ODOT STD DWG TM800 FOR SIGN SPACING.
6. COORDINATE LOCATIONS FOR PROJECT SIGNS. INSTALL PROJECT INFORMATION SIGNS 14 DAYS PRIOR TO WORK COMMENCING ON-SITE.
7. AT THE AGENCY'S DISCRETION, THE AGENCY WILL PROVIDE AN ALTERNATE DETOUR ROUTE PLAN THAT SHALL BE IMPLEMENTED BY THE CONTRACTOR. AN ALTERNATE DETOUR ROUTE MAY BE REQUIRED BECAUSE OF ODOT'S ABERNATHY BRIDGE AND OR43 CONSTRUCTION WORK.

PLAN
SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

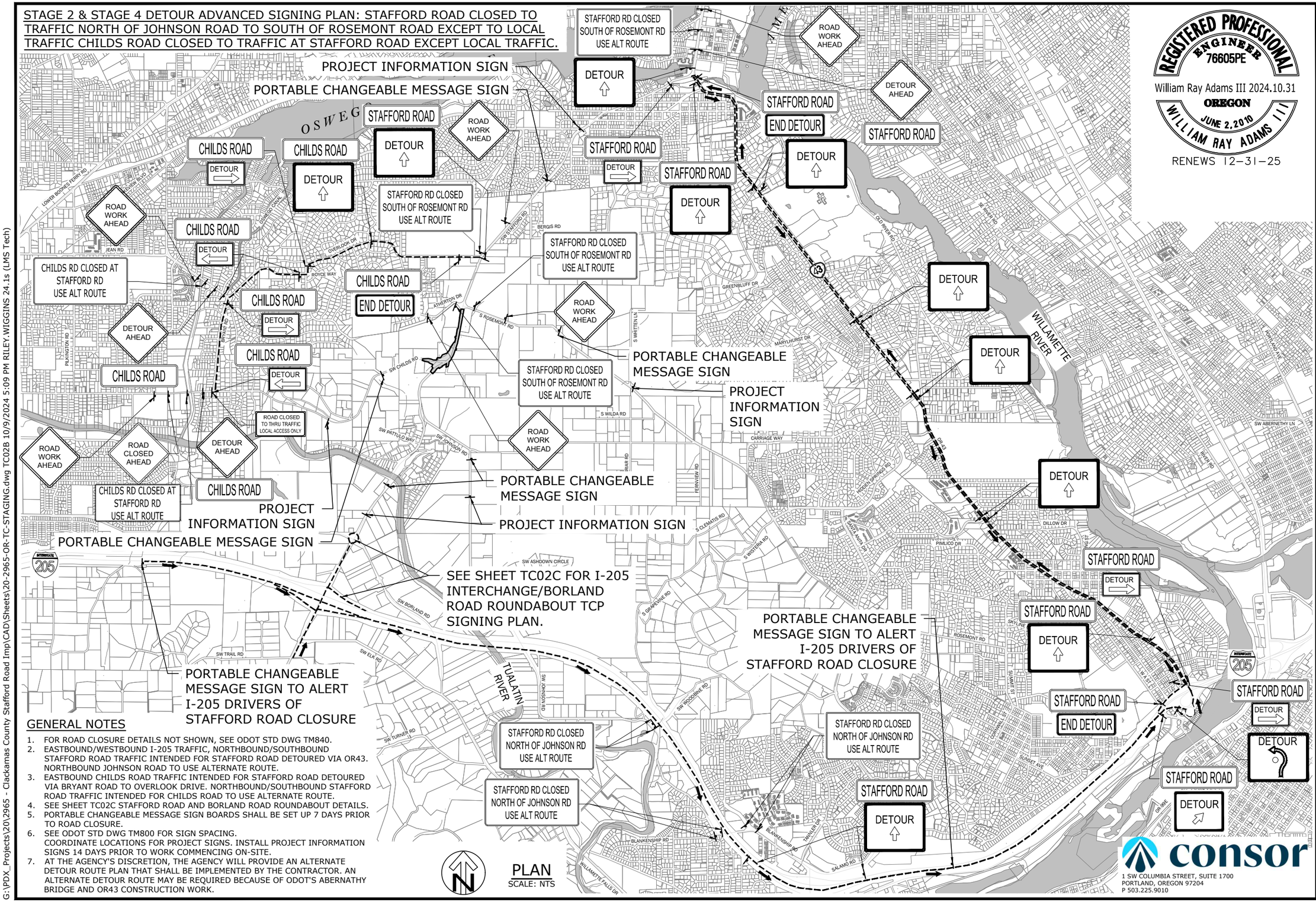
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
TC02A

135 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC02A 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 2 & STAGE 4 DETOUR ADVANCED SIGNING PLAN: STAFFORD ROAD CLOSED TO TRAFFIC NORTH OF JOHNSON ROAD TO SOUTH OF ROSEMONT ROAD EXCEPT TO LOCAL TRAFFIC CHILDS ROAD CLOSED TO TRAFFIC AT STAFFORD ROAD EXCEPT LOCAL TRAFFIC.



GENERAL NOTES

1. FOR ROAD CLOSURE DETAILS NOT SHOWN, SEE ODOT STD DWG TM840.
2. EASTBOUND/WESTBOUND I-205 TRAFFIC, NORTHBOUND/SOUTHBOUND STAFFORD ROAD TRAFFIC INTENDED FOR STAFFORD ROAD DETOURED VIA OR43. NORTHBOUND JOHNSON ROAD TO USE ALTERNATE ROUTE.
3. EASTBOUND CHILDS ROAD TRAFFIC INTENDED FOR STAFFORD ROAD DETOURED VIA BRYANT ROAD TO OVERLOOK DRIVE. NORTHBOUND/SOUTHBOUND STAFFORD ROAD TRAFFIC INTENDED FOR CHILDS ROAD TO USE ALTERNATE ROUTE.
4. SEE SHEET TC02C STAFFORD ROAD AND BORLAND ROAD ROUNDABOUT DETAILS.
5. PORTABLE CHANGEABLE MESSAGE SIGN BOARDS SHALL BE SET UP 7 DAYS PRIOR TO ROAD CLOSURE.
6. SEE ODOT STD DWG TM800 FOR SIGN SPACING. COORDINATE LOCATIONS FOR PROJECT SIGNS. INSTALL PROJECT INFORMATION SIGNS 14 DAYS PRIOR TO WORK COMMENCING ON-SITE.
7. AT THE AGENCY'S DISCRETION, THE AGENCY WILL PROVIDE AN ALTERNATE DETOUR ROUTE PLAN THAT SHALL BE IMPLEMENTED BY THE CONTRACTOR. AN ALTERNATE DETOUR ROUTE MAY BE REQUIRED BECAUSE OF ODOT'S ABERNATHY BRIDGE AND OR43 CONSTRUCTION WORK.

PLAN
SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No. TC02B

136 of 162

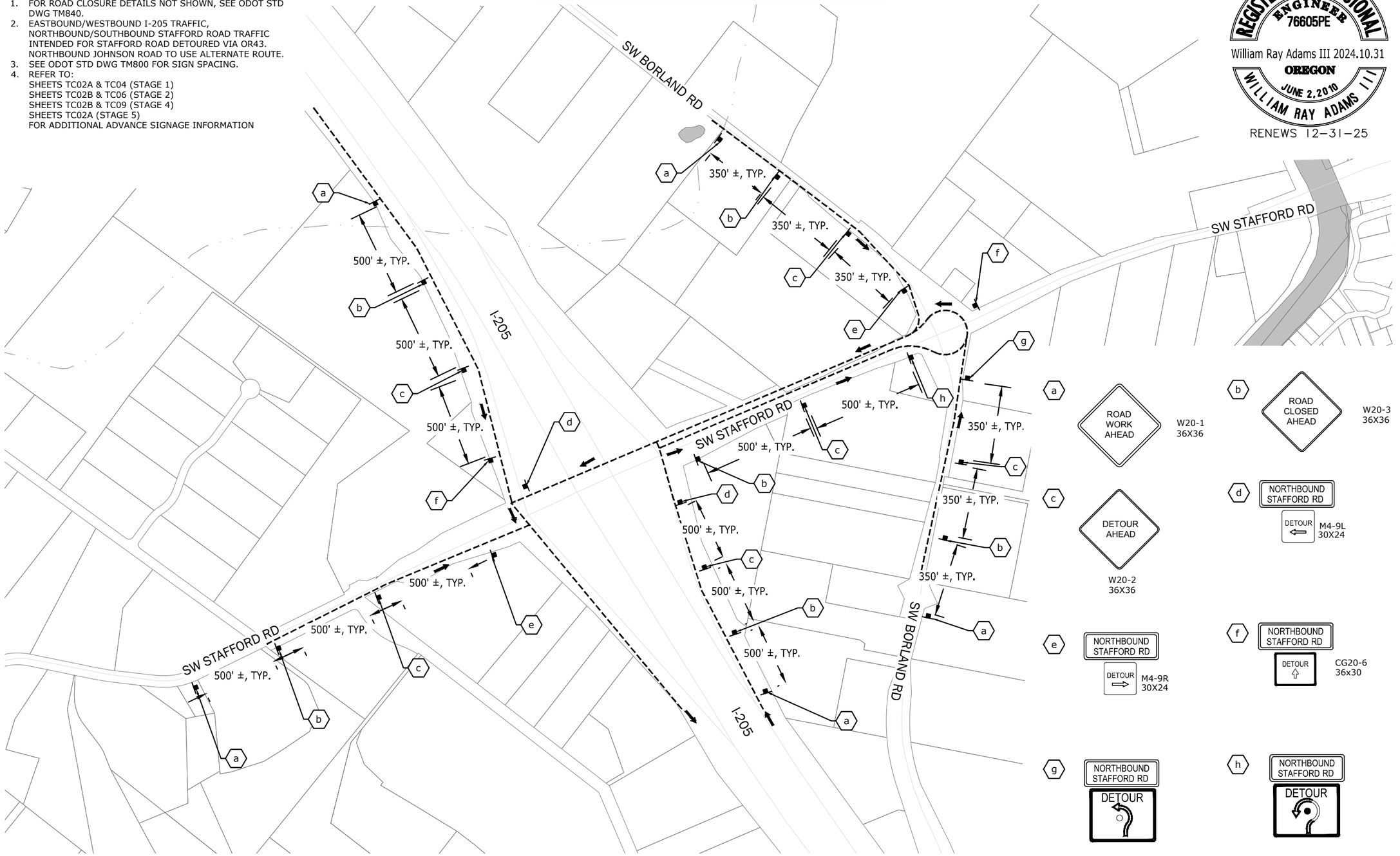
consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC02B 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

GENERAL NOTES

1. FOR ROAD CLOSURE DETAILS NOT SHOWN, SEE ODOT STD DWG TM840.
2. EASTBOUND/WESTBOUND I-205 TRAFFIC, NORTHBOUND/SOUTHBOUND STAFFORD ROAD TRAFFIC INTENDED FOR STAFFORD ROAD DETOURED VIA OR43. NORTHBOUND JOHNSON ROAD TO USE ALTERNATE ROUTE.
3. SEE ODOT STD DWG TM800 FOR SIGN SPACING.
4. REFER TO:
   SHEETS TC02A & TC04 (STAGE 1)
   SHEETS TC02B & TC06 (STAGE 2)
   SHEETS TC02B & TC09 (STAGE 4)
   SHEETS TC02A (STAGE 5)
   FOR ADDITIONAL ADVANCE SIGNAGE INFORMATION

STAGE 1, STAGE 2, STAGE 4 & STAGE 5 DETOUR ADVANCED SIGNING PLAN: I-205 INTERCHANGE & BORLAND ROAD ROUNDABOUT



a — ROAD WORK AHEAD — W20-1 36X36

b — ROAD CLOSED AHEAD — W20-3 36X36

c — DETOUR AHEAD — W20-2 36X36

d — NORTHBOUND STAFFORD RD / DETOUR M4-9L 30X24

e — NORTHBOUND STAFFORD RD / DETOUR M4-9R 30X24

f — NORTHBOUND STAFFORD RD / DETOUR CG20-6 36x30

g — NORTHBOUND STAFFORD RD / DETOUR

h — NORTHBOUND STAFFORD RD / DETOUR

PLAN
SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

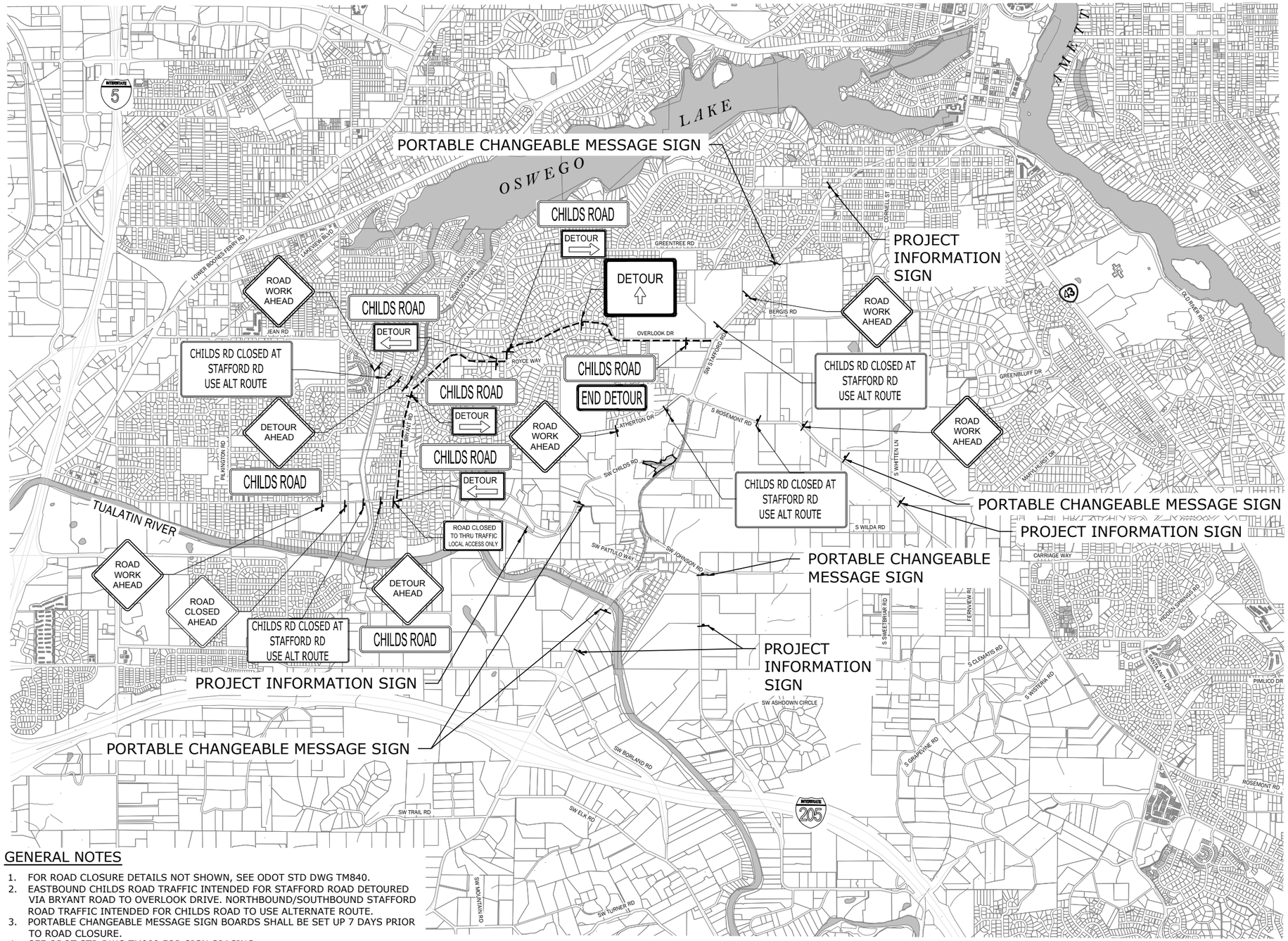
REVISIONS

NO.	DATE:

Sheet No.
TC02C

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC02C 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 3 DETOUR ADVANCED SIGNING PLAN: CHILDS ROAD CLOSED TO TRAFFIC AT STAFFORD ROAD EXCEPT TO LOCAL TRAFFIC



GENERAL NOTES

1. FOR ROAD CLOSURE DETAILS NOT SHOWN, SEE ODOT STD DWG TM840.
2. EASTBOUND CHILDS ROAD TRAFFIC INTENDED FOR STAFFORD ROAD DETOURED VIA BRYANT ROAD TO OVERLOOK DRIVE. NORTHBOUND/SOUTHBOUND STAFFORD ROAD TRAFFIC INTENDED FOR CHILDS ROAD TO USE ALTERNATE ROUTE.
3. PORTABLE CHANGEABLE MESSAGE SIGN BOARDS SHALL BE SET UP 7 DAYS PRIOR TO ROAD CLOSURE.
4. SEE ODOT STD DWG TM800 FOR SIGN SPACING.
5. COORDINATE LOCATIONS FOR PROJECT SIGNS. INSTALL PROJECT INFORMATION SIGNS 14 DAYS PRIOR TO WORK COMMENCING ON-SITE.
6. AT THE AGENCY'S DISCRETION, THE AGENCY WILL PROVIDE AN ALTERNATE DETOUR ROUTE PLAN THAT SHALL BE IMPLEMENTED BY THE CONTRACTOR. AN ALTERNATE DETOUR ROUTE MAY BE REQUIRED BECAUSE OF ODOT'S ABERNATHY BRIDGE AND OR43 CONSTRUCTION WORK.

N

PLAN
SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS
NO. | DATE:

Sheet No.
TC02D

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC02D 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 1

LEGEND

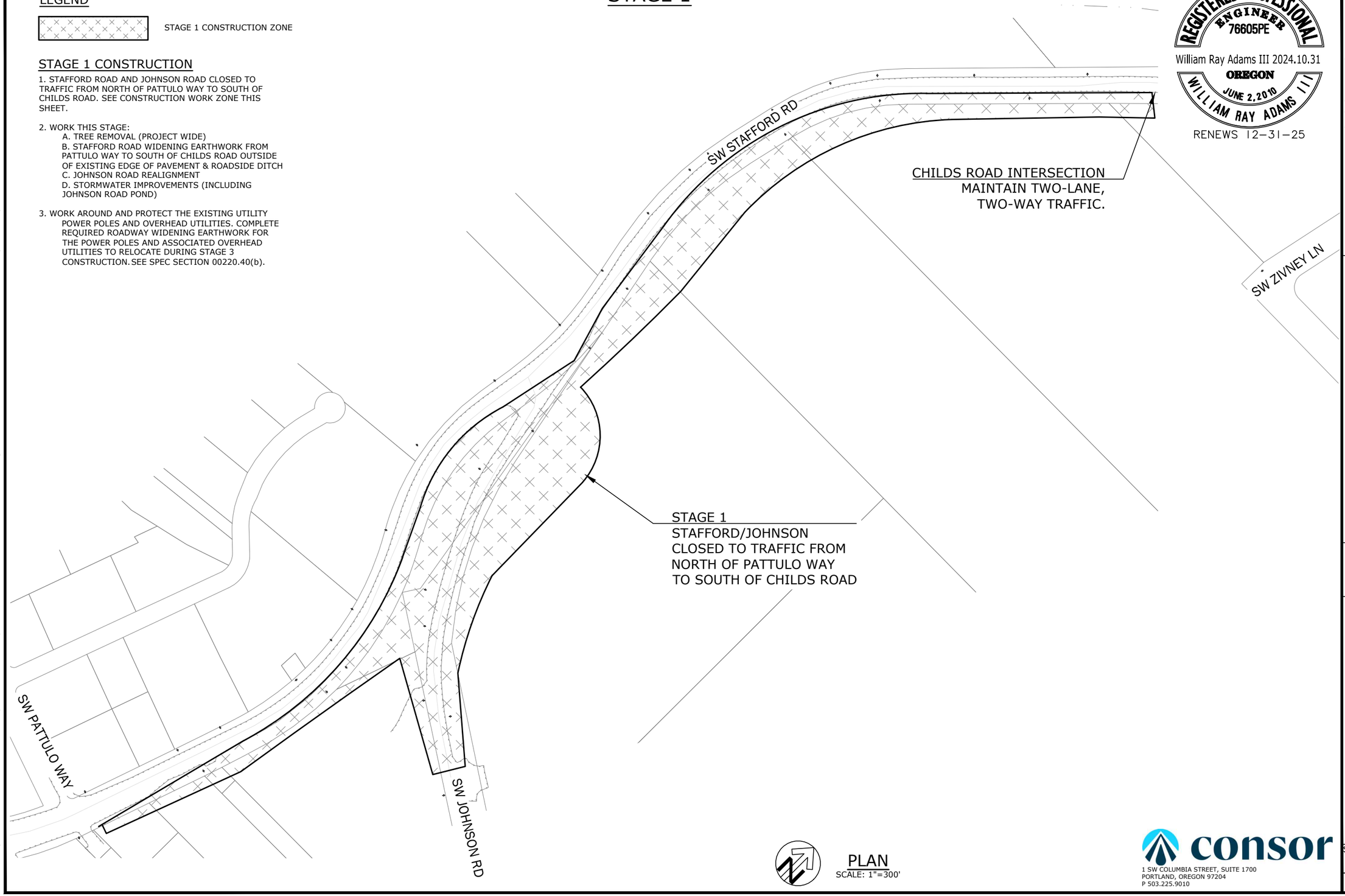
STAGE 1 CONSTRUCTION ZONE

STAGE 1 CONSTRUCTION

1. STAFFORD ROAD AND JOHNSON ROAD CLOSED TO TRAFFIC FROM NORTH OF PATTULO WAY TO SOUTH OF CHILDS ROAD. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. WORK THIS STAGE:
   A. TREE REMOVAL (PROJECT WIDE)
   B. STAFFORD ROAD WIDENING EARTHWORK FROM PATTULO WAY TO SOUTH OF CHILDS ROAD OUTSIDE OF EXISTING EDGE OF PAVEMENT & ROADSIDE DITCH
   C. JOHNSON ROAD REALIGNMENT
   D. STORMWATER IMPROVEMENTS (INCLUDING JOHNSON ROAD POND)

3. WORK AROUND AND PROTECT THE EXISTING UTILITY POWER POLES AND OVERHEAD UTILITIES. COMPLETE REQUIRED ROADWAY WIDENING EARTHWORK FOR THE POWER POLES AND ASSOCIATED OVERHEAD UTILITIES TO RELOCATE DURING STAGE 3 CONSTRUCTION. SEE SPEC SECTION 00220.40(b).



PLAN
SCALE: 1"=300'

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC03

139 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC03 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 1

SIGN LEGEND

a — R11-2, 48x30 — ROAD CLOSED

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

1 — OR11-4a, 60x30 (Mount on TSS) — ROAD CLOSED TO THRU TRAFFIC LOCAL ACCESS ONLY

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

2 — W20-1, 36X36 — ROAD WORK AHEAD

3 — W20-3, 36X36 — ROAD CLOSED 1000 FT

4 — W20-3, 36X36 — ROAD CLOSED 500 FT

5 — G20-2, 36X18 — END ROAD WORK

6 — W1-1, 30X30 (ORANGE); W13-1P, 18X18 (ORANGE) — 10 MPH

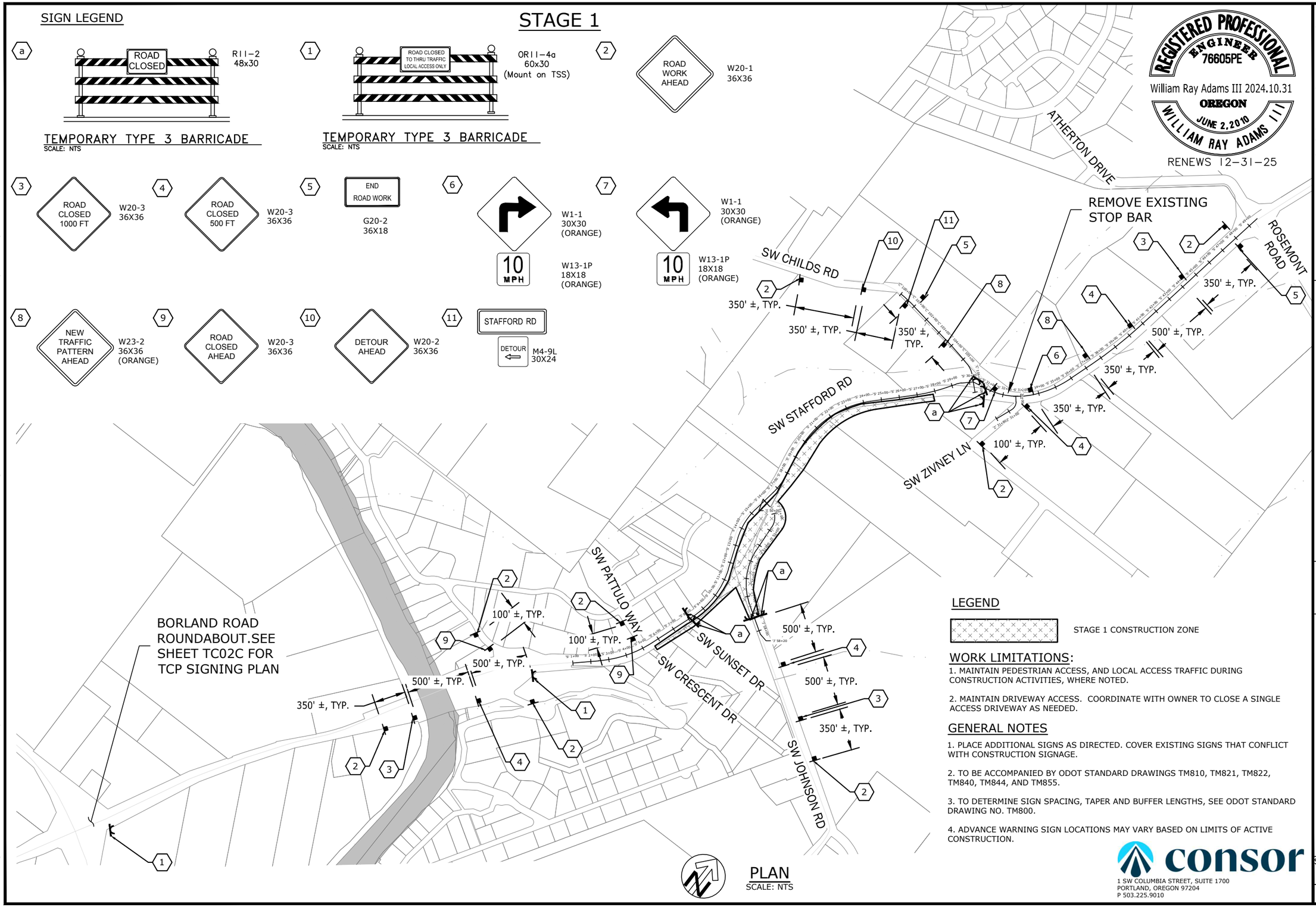
7 — W1-1, 30X30 (ORANGE); W13-1P, 18X18 (ORANGE) — 10 MPH

8 — W23-2, 36X36 (ORANGE) — NEW TRAFFIC PATTERN AHEAD

9 — W20-3, 36X36 — ROAD CLOSED AHEAD

10 — W20-2, 36X36 — DETOUR AHEAD

11 — M4-9L, 30X24 — STAFFORD RD / DETOUR



PLAN
SCALE: NTS

LEGEND

STAGE 1 CONSTRUCTION ZONE

WORK LIMITATIONS:

1. MAINTAIN PEDESTRIAN ACCESS, AND LOCAL ACCESS TRAFFIC DURING CONSTRUCTION ACTIVITIES, WHERE NOTED.

2. MAINTAIN DRIVEWAY ACCESS. COORDINATE WITH OWNER TO CLOSE A SINGLE ACCESS DRIVEWAY AS NEEDED.

GENERAL NOTES

1. PLACE ADDITIONAL SIGNS AS DIRECTED. COVER EXISTING SIGNS THAT CONFLICT WITH CONSTRUCTION SIGNAGE.

2. TO BE ACCOMPANIED BY ODOT STANDARD DRAWINGS TM810, TM821, TM822, TM840, TM844, AND TM855.

3. TO DETERMINE SIGN SPACING, TAPER AND BUFFER LENGTHS, SEE ODOT STANDARD DRAWING NO. TM800.

4. ADVANCE WARNING SIGN LOCATIONS MAY VARY BASED ON LIMITS OF ACTIVE CONSTRUCTION.

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC04

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC04 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 2

LEGEND

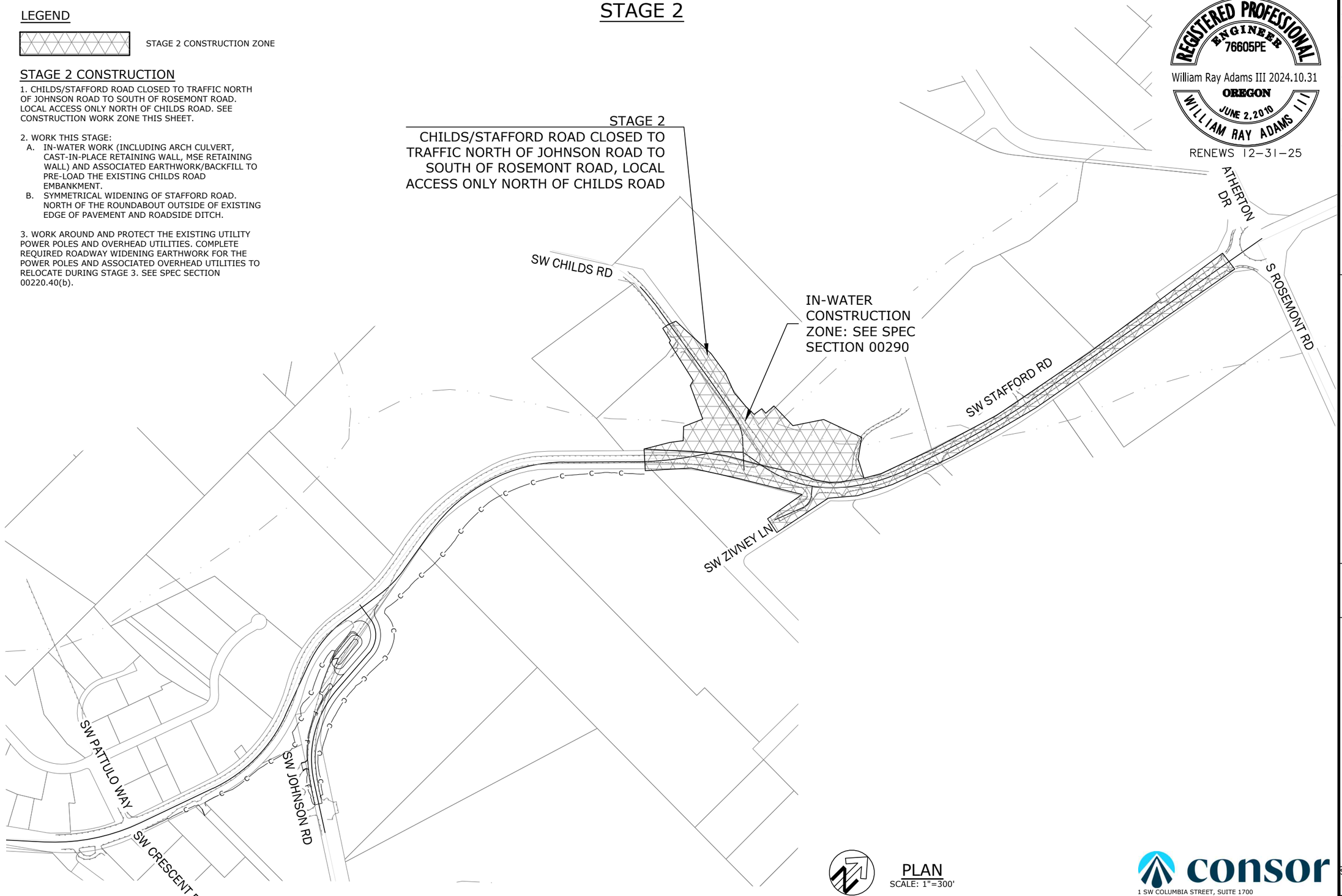
STAGE 2 CONSTRUCTION ZONE

STAGE 2 CONSTRUCTION

1. CHILDS/STAFFORD ROAD CLOSED TO TRAFFIC NORTH OF JOHNSON ROAD TO SOUTH OF ROSEMONT ROAD. LOCAL ACCESS ONLY NORTH OF CHILDS ROAD. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. WORK THIS STAGE:
   A. IN-WATER WORK (INCLUDING ARCH CULVERT, CAST-IN-PLACE RETAINING WALL, MSE RETAINING WALL) AND ASSOCIATED EARTHWORK/BACKFILL TO PRE-LOAD THE EXISTING CHILDS ROAD EMBANKMENT.
   B. SYMMETRICAL WIDENING OF STAFFORD ROAD. NORTH OF THE ROUNDABOUT OUTSIDE OF EXISTING EDGE OF PAVEMENT AND ROADSIDE DITCH.

3. WORK AROUND AND PROTECT THE EXISTING UTILITY POWER POLES AND OVERHEAD UTILITIES. COMPLETE REQUIRED ROADWAY WIDENING EARTHWORK FOR THE POWER POLES AND ASSOCIATED OVERHEAD UTILITIES TO RELOCATE DURING STAGE 3. SEE SPEC SECTION 00220.40(b).



PLAN
SCALE: 1"=300'

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC05

141 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC05 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 2

SIGN LEGEND

a — R11-2, 48x30

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

1 — OR11-4a, 60x30 (Mount on TSS)

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

2 — ROAD WORK AHEAD, W20-1, 36X36

3 — ROAD CLOSED 1000 FT, W20-3, 36X36

4 — ROAD CLOSED 500 FT, W20-3, 36X36

5 — R3-1, 24X24

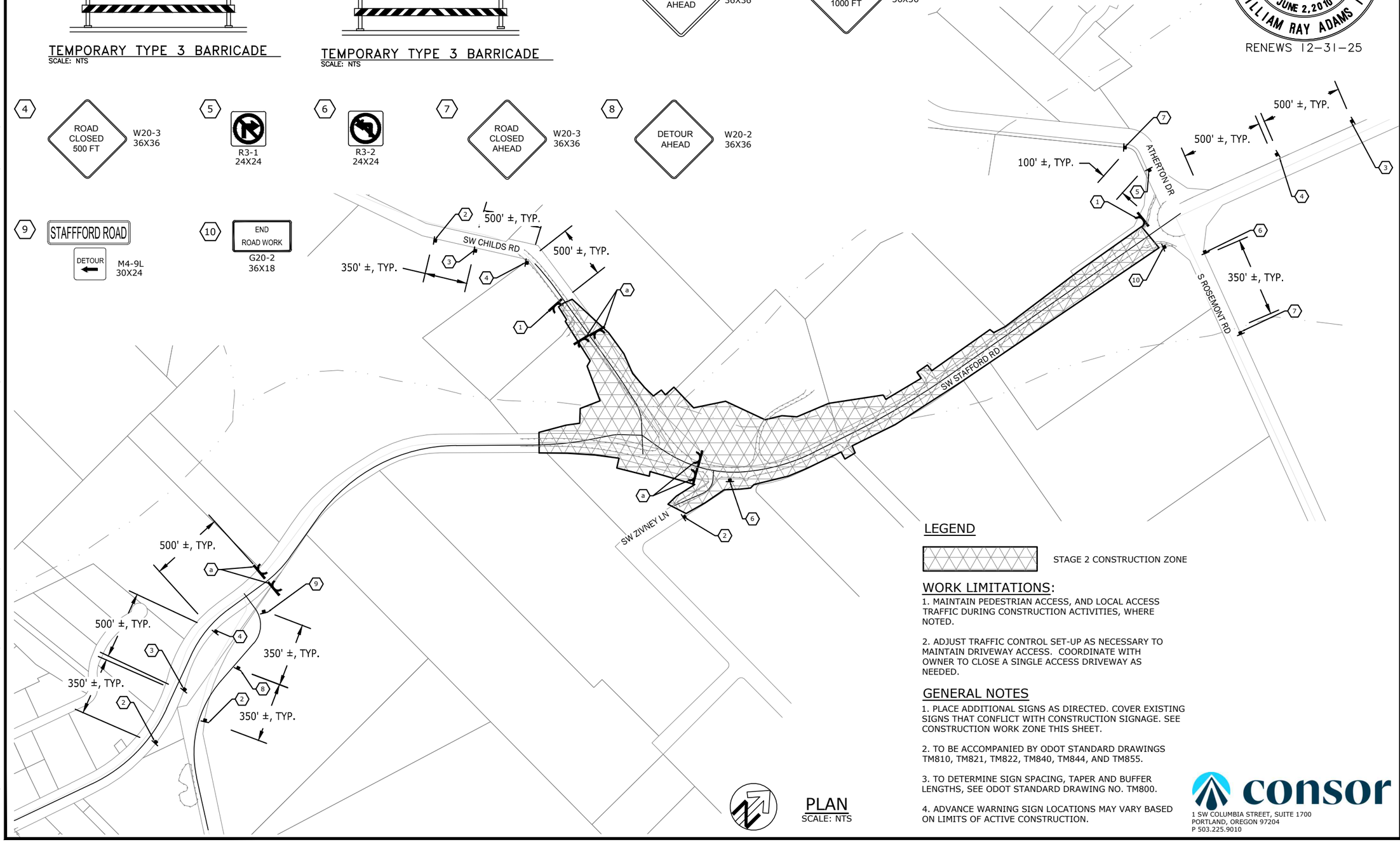
6 — R3-2, 24X24

7 — ROAD CLOSED AHEAD, W20-3, 36X36

8 — DETOUR AHEAD, W20-2, 36X36

9 — STAFFFORD ROAD / DETOUR, M4-9L, 30X24

10 — END ROAD WORK, G20-2, 36X18



LEGEND

STAGE 2 CONSTRUCTION ZONE

WORK LIMITATIONS:

1. MAINTAIN PEDESTRIAN ACCESS, AND LOCAL ACCESS TRAFFIC DURING CONSTRUCTION ACTIVITIES, WHERE NOTED.

2. ADJUST TRAFFIC CONTROL SET-UP AS NECESSARY TO MAINTAIN DRIVEWAY ACCESS. COORDINATE WITH OWNER TO CLOSE A SINGLE ACCESS DRIVEWAY AS NEEDED.

GENERAL NOTES

1. PLACE ADDITIONAL SIGNS AS DIRECTED. COVER EXISTING SIGNS THAT CONFLICT WITH CONSTRUCTION SIGNAGE. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. TO BE ACCOMPANIED BY ODOT STANDARD DRAWINGS TM810, TM821, TM822, TM840, TM844, AND TM855.

3. TO DETERMINE SIGN SPACING, TAPER AND BUFFER LENGTHS, SEE ODOT STANDARD DRAWING NO. TM800.

4. ADVANCE WARNING SIGN LOCATIONS MAY VARY BASED ON LIMITS OF ACTIVE CONSTRUCTION.

PLAN
SCALE: NTS

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC06

142 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC06 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 3

LEGEND

STAGE 3 CONSTRUCTION ZONE

STAGE 3 CONSTRUCTION

1. CHILDS ROAD CLOSED TO TRAFFIC AT STAFFORD ROAD. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. WORK THIS STAGE:
   A. WINTER SHUT-DOWN PERIOD FOR FRANCHISE UTILITY RELOCATIONS.
   B. CHILDS ROAD SETTLEMENT MONITORING. SEE SPEC SECTION 00330.

WORK LIMITATIONS:

1. MAINTAIN PEDESTRIAN ACCESS, AND LOCAL ACCESS TRAFFIC DURING CONSTRUCTION ACTIVITIES, WHERE NOTED.

2. ADJUST TRAFFIC CONTROL SET-UP AS NECESSARY TO MAINTAIN DRIVEWAY ACCESS. COORDINATE WITH OWNER TO CLOSE A SINGLE ACCESS DRIVEWAY AS NEEDED.

3. TWO-WAY TRAFFIC UNDER FLAGGING ON STAFFORD ROAD IS ALLOWED DURING UTILITY RELOCATION PERIOD.

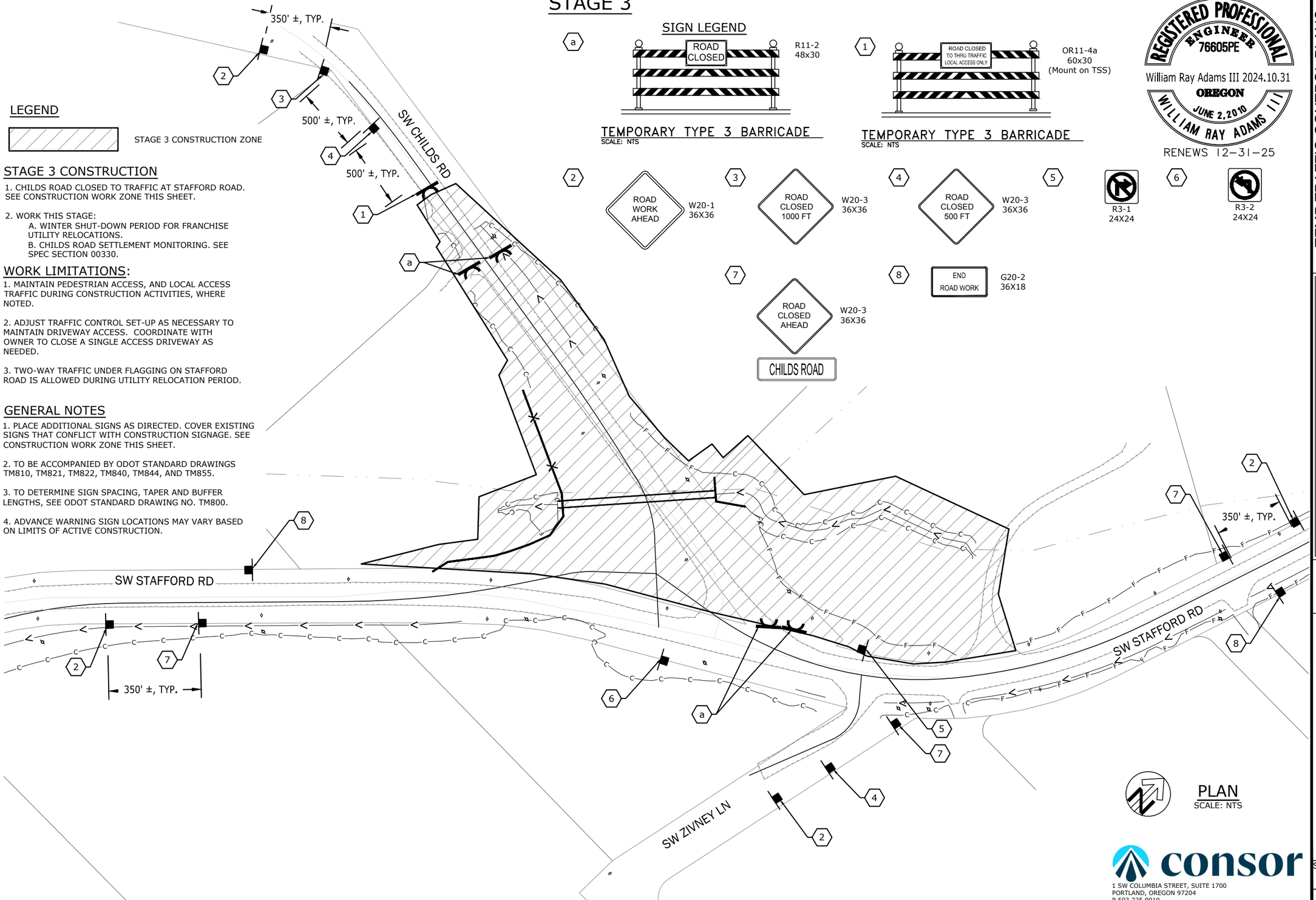
GENERAL NOTES

1. PLACE ADDITIONAL SIGNS AS DIRECTED. COVER EXISTING SIGNS THAT CONFLICT WITH CONSTRUCTION SIGNAGE. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. TO BE ACCOMPANIED BY ODOT STANDARD DRAWINGS TM810, TM821, TM822, TM840, TM844, AND TM855.

3. TO DETERMINE SIGN SPACING, TAPER AND BUFFER LENGTHS, SEE ODOT STANDARD DRAWING NO. TM800.

4. ADVANCE WARNING SIGN LOCATIONS MAY VARY BASED ON LIMITS OF ACTIVE CONSTRUCTION.



SIGN LEGEND

R11-2
48x30

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

OR11-4a
60x30
(Mount on TSS)

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

W20-1
36X36

W20-3
36X36

W20-3
36X36

R3-1
24X24

R3-2
24X24

W20-3
36X36

CHILDS ROAD

G20-2
36X18

PLAN
SCALE: NTS

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC07

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC07 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 4

LEGEND

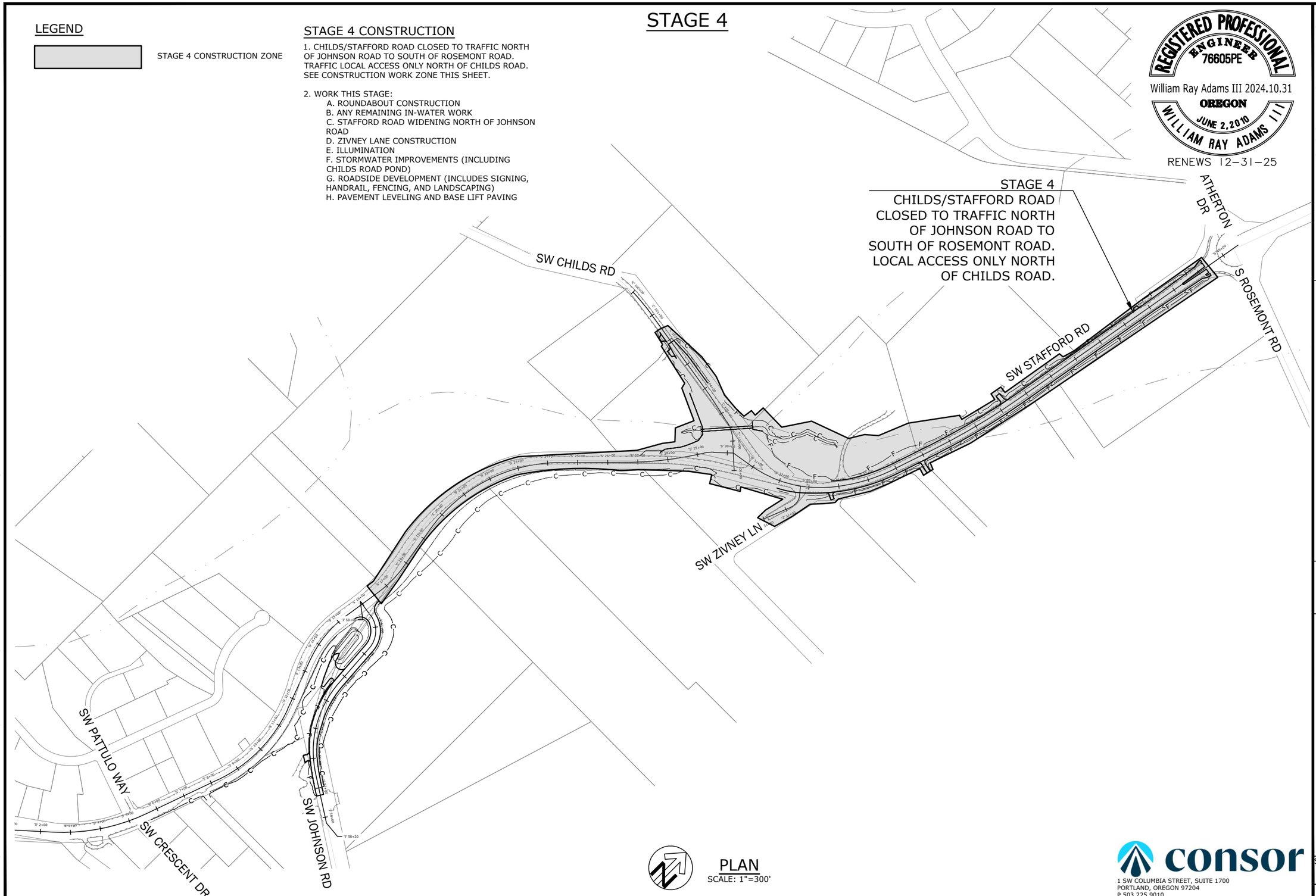
STAGE 4 CONSTRUCTION ZONE

STAGE 4 CONSTRUCTION

1. CHILDS/STAFFORD ROAD CLOSED TO TRAFFIC NORTH OF JOHNSON ROAD TO SOUTH OF ROSEMONT ROAD. TRAFFIC LOCAL ACCESS ONLY NORTH OF CHILDS ROAD. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. WORK THIS STAGE:
   - A. ROUNDABOUT CONSTRUCTION
   - B. ANY REMAINING IN-WATER WORK
   - C. STAFFORD ROAD WIDENING NORTH OF JOHNSON ROAD
   - D. ZIVNEY LANE CONSTRUCTION
   - E. ILLUMINATION
   - F. STORMWATER IMPROVEMENTS (INCLUDING CHILDS ROAD POND)
   - G. ROADSIDE DEVELOPMENT (INCLUDES SIGNING, HANDRAIL, FENCING, AND LANDSCAPING)
   - H. PAVEMENT LEVELING AND BASE LIFT PAVING

STAGE 4
CHILDS/STAFFORD ROAD CLOSED TO TRAFFIC NORTH OF JOHNSON ROAD TO SOUTH OF ROSEMONT ROAD. LOCAL ACCESS ONLY NORTH OF CHILDS ROAD.



PLAN
SCALE: 1"=300'

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC08

144 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC08 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 4

SIGN LEGEND

a — ROAD CLOSED — R11-2, 48x30

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

1 — ROAD CLOSED TO THRU TRAFFIC LOCAL ACCESS ONLY — OR11-4a, 60x30 (Mount on TSS)

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

2 — ROAD WORK AHEAD — W20-1, 36X36

3 — ROAD CLOSED 1000 FT — W20-3, 36X36

4 — ROAD CLOSED 500 FT — W20-3, 36X36

5 — R3-1, 24X24

6 — R3-2, 24X24

7 — ROAD CLOSED AHEAD — W20-3, 36X36

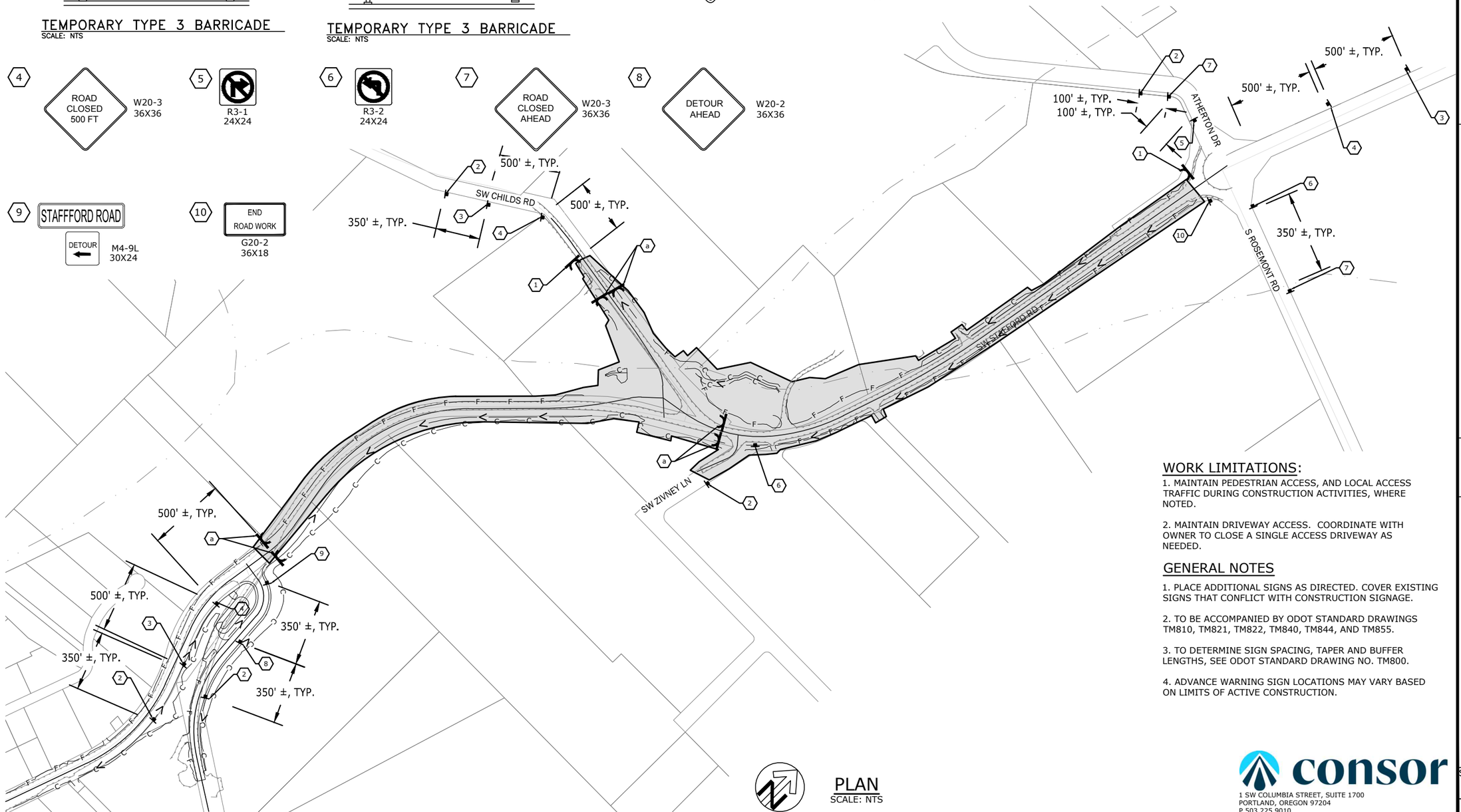
8 — DETOUR AHEAD — W20-2, 36X36

9 — STAFFFORD ROAD / DETOUR — M4-9L, 30X24

10 — END ROAD WORK — G20-2, 36X18

LEGEND

STAGE 4 CONSTRUCTION ZONE



WORK LIMITATIONS:

1. MAINTAIN PEDESTRIAN ACCESS, AND LOCAL ACCESS TRAFFIC DURING CONSTRUCTION ACTIVITIES, WHERE NOTED.

2. MAINTAIN DRIVEWAY ACCESS. COORDINATE WITH OWNER TO CLOSE A SINGLE ACCESS DRIVEWAY AS NEEDED.

GENERAL NOTES

1. PLACE ADDITIONAL SIGNS AS DIRECTED. COVER EXISTING SIGNS THAT CONFLICT WITH CONSTRUCTION SIGNAGE.

2. TO BE ACCOMPANIED BY ODOT STANDARD DRAWINGS TM810, TM821, TM822, TM840, TM844, AND TM855.

3. TO DETERMINE SIGN SPACING, TAPER AND BUFFER LENGTHS, SEE ODOT STANDARD DRAWING NO. TM800.

4. ADVANCE WARNING SIGN LOCATIONS MAY VARY BASED ON LIMITS OF ACTIVE CONSTRUCTION.

PLAN
SCALE: NTS

REGISTERED PROFESSIONAL ENGINEER
76605PE
William Ray Adams III 2024.10.31
OREGON
JUNE 2, 2010
WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC09

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC09 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

STAGE 5

SIGN LEGEND

a — ROAD CLOSED — R11-2, 48x30

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

1 — ROAD CLOSED TO THRU TRAFFIC LOCAL ACCESS ONLY — OR11-4a, 60x30 (Mount on TSS)

TEMPORARY TYPE 3 BARRICADE
SCALE: NTS

2 — ROAD WORK AHEAD — W20-1, 36X36

3 — ROAD CLOSED 1000 FT — W20-3, 36X36

4 — ROAD CLOSED 500 FT — W20-3, 36X36

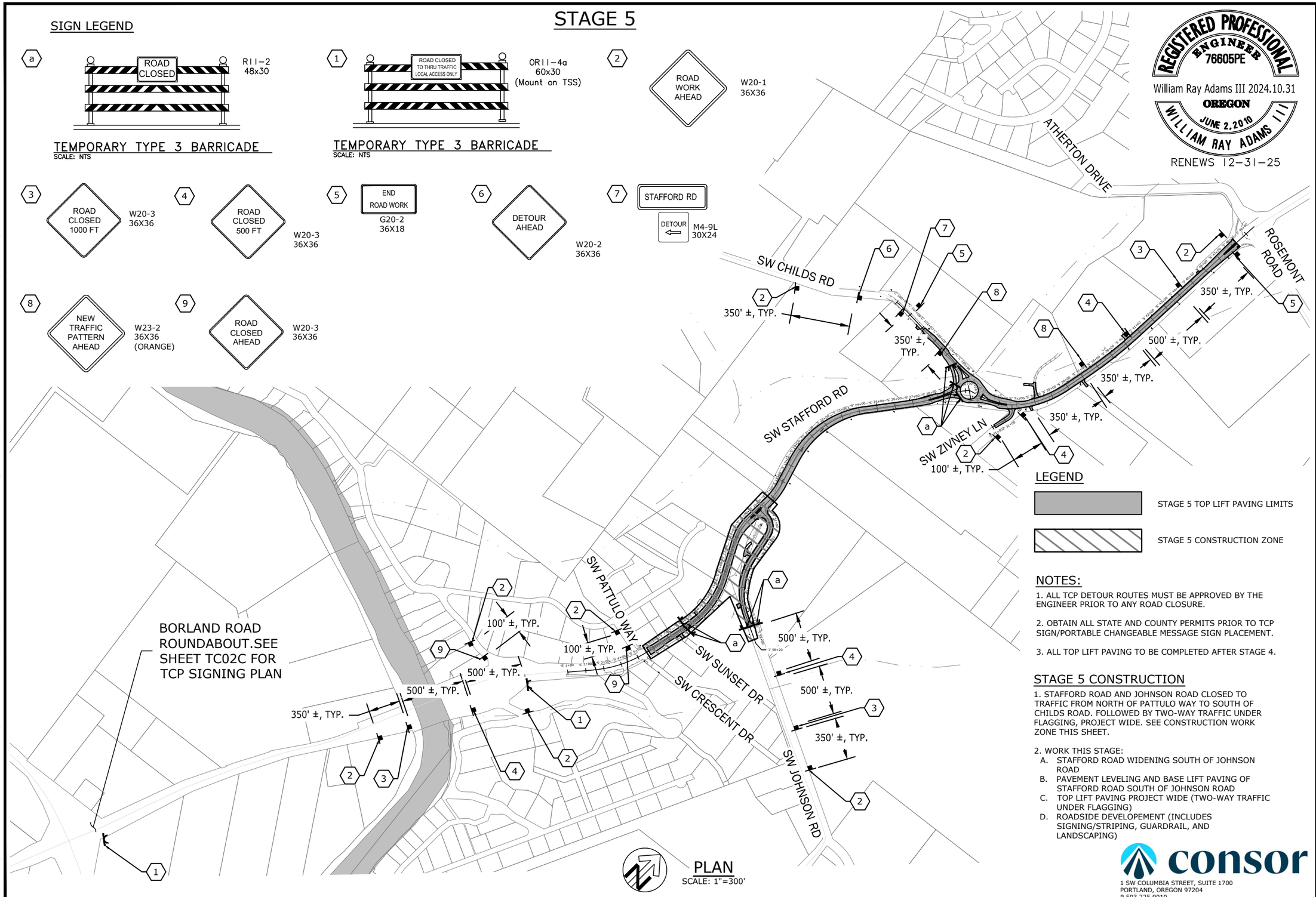
5 — END ROAD WORK — G20-2, 36X18

6 — DETOUR AHEAD — W20-2, 36X36

7 — STAFFORD RD / DETOUR — M4-9L, 30X24

8 — NEW TRAFFIC PATTERN AHEAD — W23-2, 36X36 (ORANGE)

9 — ROAD CLOSED AHEAD — W20-3, 36X36



PLAN
SCALE: 1"=300'

LEGEND

- STAGE 5 TOP LIFT PAVING LIMITS
- STAGE 5 CONSTRUCTION ZONE

NOTES:

1. ALL TCP DETOUR ROUTES MUST BE APPROVED BY THE ENGINEER PRIOR TO ANY ROAD CLOSURE.
2. OBTAIN ALL STATE AND COUNTY PERMITS PRIOR TO TCP SIGN/PORTABLE CHANGEABLE MESSAGE SIGN PLACEMENT.
3. ALL TOP LIFT PAVING TO BE COMPLETED AFTER STAGE 4.

STAGE 5 CONSTRUCTION

1. STAFFORD ROAD AND JOHNSON ROAD CLOSED TO TRAFFIC FROM NORTH OF PATTULO WAY TO SOUTH OF CHILDS ROAD. FOLLOWED BY TWO-WAY TRAFFIC UNDER FLAGGING, PROJECT WIDE. SEE CONSTRUCTION WORK ZONE THIS SHEET.

2. WORK THIS STAGE:
   - A. STAFFORD ROAD WIDENING SOUTH OF JOHNSON ROAD
   - B. PAVEMENT LEVELING AND BASE LIFT PAVING OF STAFFORD ROAD SOUTH OF JOHNSON ROAD
   - C. TOP LIFT PAVING PROJECT WIDE (TWO-WAY TRAFFIC UNDER FLAGGING)
   - D. ROADSIDE DEVELOPEMENT (INCLUDES SIGNING/STRIPING, GUARDRAIL, AND LANDSCAPING)

REGISTERED PROFESSIONAL ENGINEER 76605PE
William Ray Adams III 2024.10.31
OREGON JUNE 2, 2010 WILLIAM RAY ADAMS III
RENEWS 12-31-25

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP TRAFFIC CONTROL PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RPW/AJR | DRAFTED BY: JSD | CHECKED BY: WRA

REVISIONS

NO.	DATE:

Sheet No.
TC10

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-TC-STAGING.dwg TC10 10/9/2024 5:09 PM RILEY.WIGGINS 24.1s (LMS Tech)

APPROVED STREET LIGHTING EQUIPMENT

To be supplied and installed by the Contractor:

1. Junction boxes shall be PGE approved splice boxes. PGE approved boxes are:

Manufacturer:	Catalog Number:
New Basis	FCA132418T-00043
Quazite (Hubbell)	A42132418A017
Old Castle	13241712
Armorcast	A6001946TAX18-PGE
Highline	CHA132418HE1

To be supplied by PGE and installed by the Contractor:

1. Anchor pole footing shall be PGE approved pre-cast concrete.

Manufacturer:	Catalog number:
Old Castle	5CL-LB

To be supplied and installed by PGE:

1. 25 ft street light pole and 6 ft luminaire arm with breakaway base shall be:

Manufacturer:	Catalog Number:
Hapco	111420

2. 30 ft street light pole and 6 ft luminaire arm with breakaway base shall be:

Manufacturer:	Catalog Number:
Hapco	111421

3. Cobra head style lumunaires shall be:

Manufacturer:	Catalog Number:
Leotek	GCM2-40H-MV-WW-2R-GY-700-PCR7-RWG-WL-FDC-PGE
Leotek	GCJ2-20H-MV-WW-2R-GY-700-PCR7-RWG-WL-FDC-PGE

4. The photoelectric control shall be PGE approved twistlock, fail-on, electronic, 105-300 VAC, 60 HZ, per ANSI 136.10, bronze housing, 1.5 lumen turn-on, rated 1000 W tungsten (1800 VA ballast), 1.5:1 turn-off/turn-on ration, solid brass plug blades, conformally coated CDS cell, 160 joule mov, 2-4 sec. Turn-off delay.

Manufacturer:	Catalog Number:
Ripley	RD8645
DTL	DLL1271.5J50
Intermactic	EK4536SB

GENERAL NOTES:

1. All electrical equipment shall conform to the current standards of the National Electrical Manufacturers Association (NEMA) and the Underwriters Laboratories, Inc. (U.L.) wherever applicable. In addition to the requirements of the plans, standards specifications, and the special provisions, all materials and workmanship shall conform to the current requirements of the National Electrical Code (NEC) the National Electrical Safety Code, standards of the American National Standards Institute (ANSI), and any local ordinances which may apply.

2. All materials and workmanship shall conform to PGE Schedule 95, Option A specifications. All materials and installation shall be approved by PGE. Light pole bases, junction boxes, conduits, to be installed by Electrical Contractor.

3. Lighting contractor/installer is solely responsible for installation of correct material based on current PGE approved material list. Contractor to provide material submittals first to the Engineer and then to PGE for review and approval.

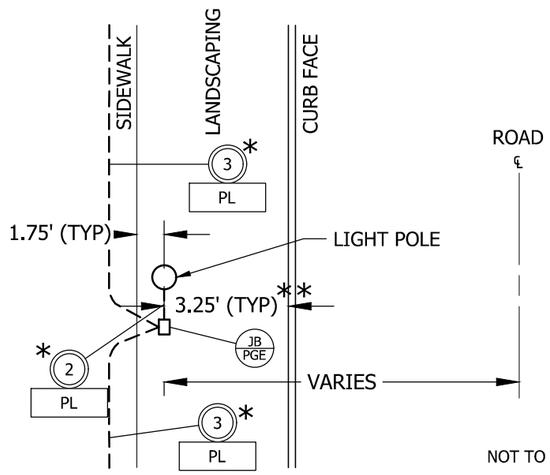
4. The contractor shall coordinate work with Rico Torres Solis of PGE at 503.403.9084 to verify the power source for the system. Work order #M3341739.

5. Location of illumination conduits and junction boxes are approximate. Contractor shall coordinate with other utilities to ensure proper installation.

6. Install #12 stranded copper (orange) tracer wire in all conduits.

7. PGE will provide the grounding rod units for junction boxes for contractor to install.

8. PGE Field Construction Coordinator will review and approve all trench and conduit prior to backfilling.



TYPICAL STREET LIGHT DETAIL

NOT TO SCALE

* Wiring to be installed by PGE

** Where no curb is present, install light pole 3.25' from edge of pavement

LIGHT LEVELS TABLE

ROAD SEGMENT/INTERSECTION		AVG HORZONTAL LIGHT LEVEL (FC)	UNIFORMITY (AVG:MIN)	AVG VERTICAL LIGHT LEVEL (FC)
INTERSECTION - Stafford Rd/Childs Rd	TARGET	>0.7	<6.0 : 1	NA
	ACHIEVED	1.6	2.3 : 1	
SEGMENT - West-Childs Rd	TARGET	>0.7	<6.0 : 1	NA
	ACHIEVED	1.2	2.9 : 2	
SEGMENT - East-Stafford Rd	TARGET	>0.7	<6.0 : 1	NA
	ACHIEVED	1.1	2.7 : 1	
SEGMENT - South-Stafford Rd	TARGET	>0.7	<6.0 : 1	NA
	ACHIEVED	0.8	2.5 : 1	
WEST LEG CROSSING - Westbound Direction	TARGET	NA	<6.0 : 0	>0.7
	ACHIEVED		1.1: 0	1.3
WEST LEG CROSSING - Eastbound Direction, Inside Lane	TARGET	NA	<6.0 : 1	>0.7
	ACHIEVED		1.2: 1	1.2
WEST LEG CROSSING - Eastbound Direction, Outside Lane	TARGET	NA	<6.0 : 1	>0.7
	ACHIEVED		1.2 : 1	1.2
East LEG CROSSING - Westbound Direction	TARGET	NA	<6.0 : 1	>0.7
	ACHIEVED		1.1 : 1	1.3
EAST LEG CROSSING - Eastbound Direction	TARGET	NA	<6.0 : 1	>0.7
	ACHIEVED		1.2 : 1	1.2
SOUTH LEG CROSSING - Northbound Direction	TARGET	NA	<6.0 : 1	>0.7
	ACHIEVED		1.3 : 1	1.2
SOUTH LEG CROSSING - Southbound Direction	TARGET	NA	<6.0 : 1	>0.7
	ACHIEVED		1.2 : 1	1.2

LIGHT POLE LOCATION TABLE

POLE NO.	STREET	STATION	OFFSET	POLE STYLE	MOUNTING HEIGHT	ARM LENGTH	LUMINAIRE TYPE	WATTAGE	DISTRIBUTION	INITIAL LUMENS
1	SW Stafford Rd	'S'26+67.49	21.25' R	COBRAHEAD	25'-0"	6'-0"	GCJ2-20H-MV-WW-2R-GY-700	45W	TYPE 2	5,020
2	SW Stafford Rd	'S'27+78.53	25.23' R	COBRAHEAD	25'-0"	6'-0"	GCJ2-20H-MV-WW-2R-GY-700	45W	TYPE 2	5,020
3	SW Stafford Rd	'S'28+85.79	25.80' R	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
4	SW Stafford Rd	'S'29+28.42	37.95' L	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
5	SW Stafford Rd	'S'29+75.31	58.04' R	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
6	SW Stafford Rd	'S'30+70.27	68.10' L	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
7	SW Stafford Rd	'S'31+00.50	38.70' R	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
8	SW Stafford Rd	'S'31+58.95	37.21' L	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
9	SW Stafford Rd	'S'32+71.81	29.06' L	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
10	SW Stafford Rd	'S'33+80.34	22.89' L	COBRAHEAD	30'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
11	SW Childs Rd	'C'102+61.60	21.06' R	COBRAHEAD	25'-0"	6'-0"	GCJ2-20H-MV-WW-2R-GY-700	45W	TYPE 2	5,020
12	SW Childs Rd	'C'103+72.44	23.97' R	COBRAHEAD	25'-0"	6'-0"	GCJ2-20H-MV-WW-2R-GY-700	45W	TYPE 2	5,020
13	SW Childs Rd	'C'105+02.36	56.53' R	COBRAHEAD	25'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
14	SW Childs Rd	'C'104+86.55	18.60' L	COBRAHEAD	25'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
15	SW Childs Rd	'C'105+60.38	35.06' L	COBRAHEAD	25'-0"	6'-0"	GCM2-40H-MV-WW-2R-GY-700	88W	TYPE 2	10,230
16	SW Stafford Rd	'S'47+10.72	26.84' R	EX	EX	N/A	EX	EX	EX	EX
17	SW Stafford Rd	EX	EX	EX	EX	N/A	EX	EX	EX	EX
18	SW Stafford Rd	EX	EX	EX	EX	N/A	EX	EX	EX	EX
19	SW Stafford Rd	'S'47+59.20	26.70' L	EX	EX	N/A	EX	EX	EX	EX
20	SW Stafford Rd	EX	EX	EX	EX	N/A	EX	EX	EX	EX

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29 14:09:22-07'00'
OREGON
JULY 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

ILLUMINATION DETAILS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX | DRAFTED BY: D. SHADRIN | CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No. IL01

147 of 162

Plot Stamp: 10/28/2024 8:50:12 AM - Fred Wismer
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Illumination Plans-25094.dwg

ILLUMINATION LEGEND

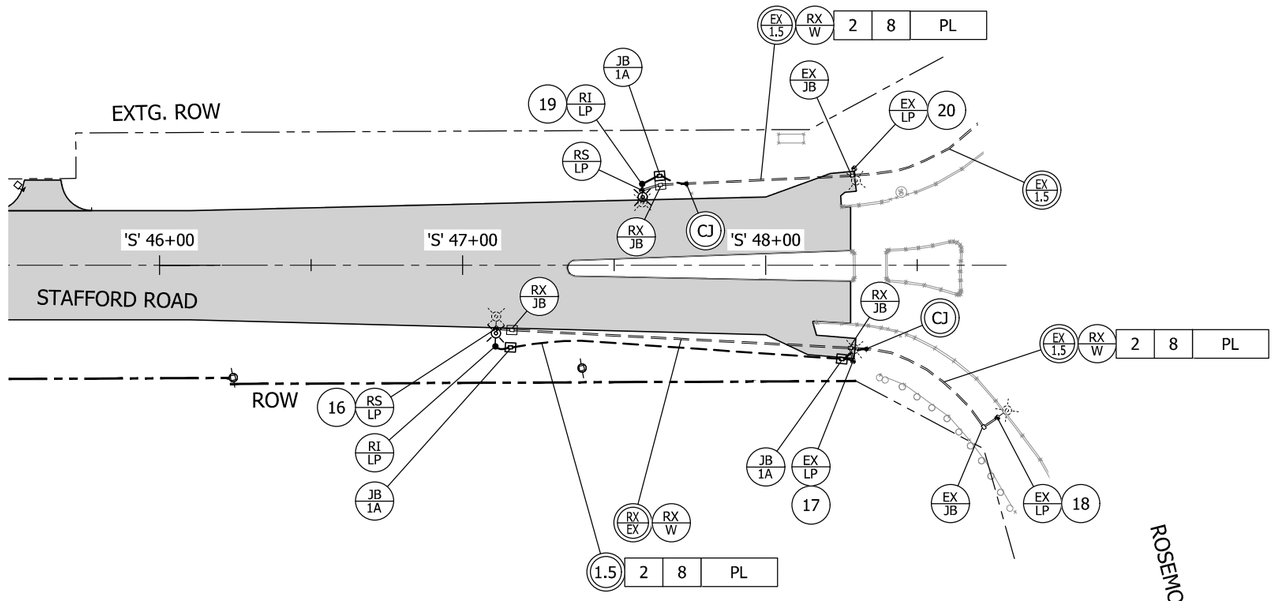
- (N) — Light pole number (N)
- LP (N) — Install luminaire light pole, pole number (N) direct buried per manufacturer's direction. See lighting notes and light pole table on IL-01.
- EX JB — Retain and protect existing junction box
- JB 1A — Install 17"x10"x12" (min. dimension) precast concrete junction box with concrete apron
- JB PGE — Install PGE-Approved 17"x30"x18" (min. dimension) precast concrete junction box.
- JB IC — Interconnect junction box. See roadway plans.
- RX JB — Remove existing junction box
- EX LP — Retain and protect existing illumination pole and appurtenances
- RS LP — Remove and salvage existing wood illumination pole and appurtenances
- RI LP — Reinstall existing illumination pole and appurtenances
- EX S — Retain and protect existing (S=size) inch conduit
- S — Install (S=size) inch electrical conduit.
- EX W — Retain and protect existing wiring
- RX W — Remove existing wiring
- CJ — Install Splice new electrical conduit to existing electrical conduit
- PL — Install poly pull line
- N | G — Install (N=Number) no. (G-AWG wire size) XHHW wires

RRFB LEGEND

- XR PP — Install (X=Number) sided rectangular rapid flashing beacon system (pedestrian pedestal). See detail on sheet IL05
- BMC — Install base mounted service cabinet, 120/240V metered, for RRFB system, see sheet IL04 for BMCL wiring diagram
- G | S — Install one (S) gauge copper ground wire (S=size)
- N | G — Install (N=Number) no. (G-AWG wire size) XHHW wires
- CC — Install actuated beacon system controller cabinet
- JB 1A — Install 17"x30"x18" (min. dimension) precast concrete junction box with concrete apron.

COMMUNICATION LEGEND

- COM — Install equipment listed in communications component schedule on sheet IL04
- PTZ — Install Pan Tilt Zoom camera and mounting hardware. Camera should be field located. See detail on sheet IL06
- PFO / (N) — Install (N=Number) single mode fiber optic cable for fiber optic patch panel
- HH 1A — Install 24"x30"x24" (min. dimension) precast concrete fiber optic hand hole with concrete apron.
- X UFC — Coil (X=number) feet of each fiber optic cable in hand hole
- FOSC — Install Fiber Optic Splice Case, see component schedule on on sheet IL04



REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

ILLUMINATION PLAN

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

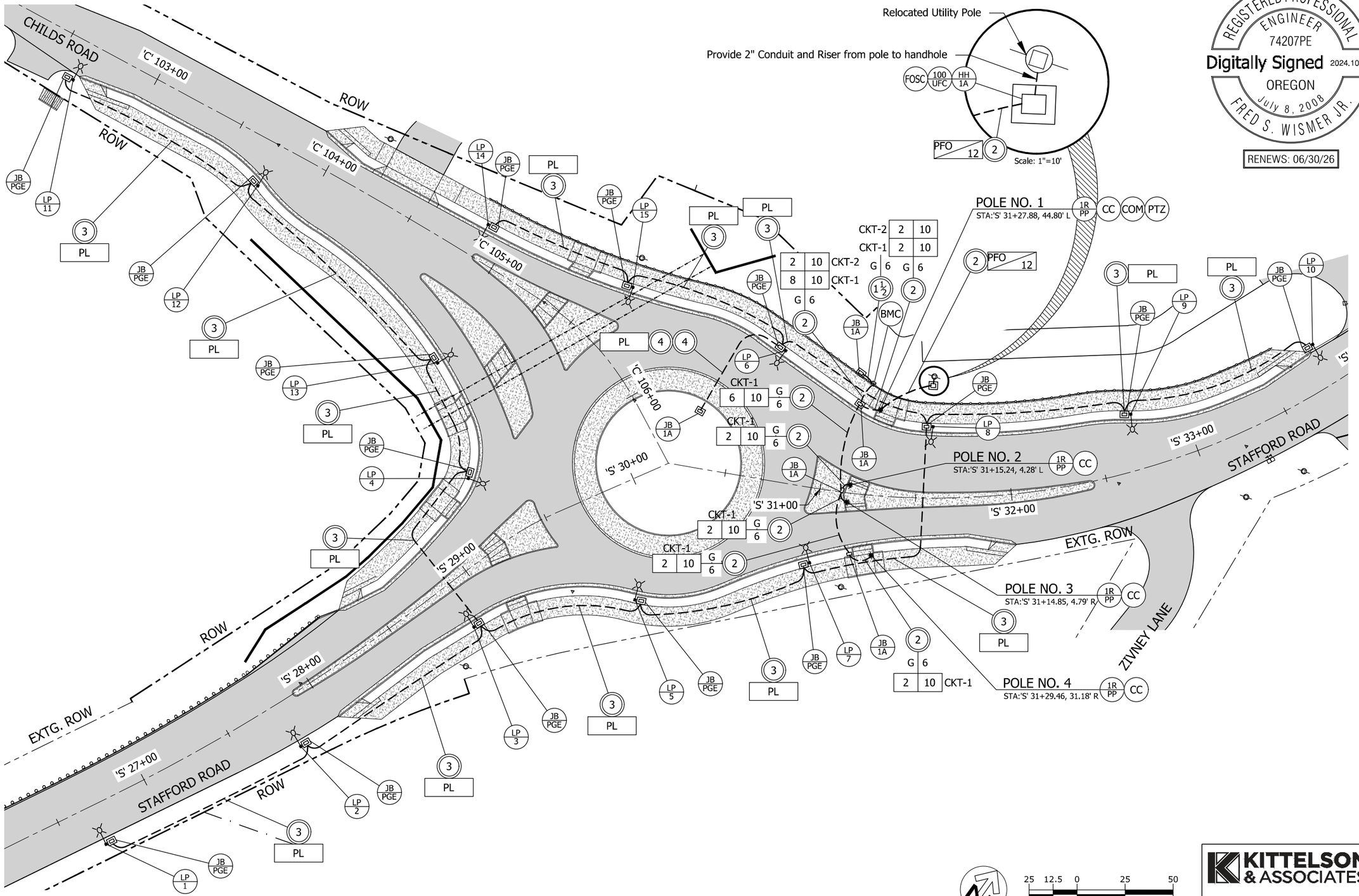
REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
IL02
148 of 162

Plot Stamp: 10/28/2024 8:50:19 AM - Fred Wismer
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Illumination Plans-25094.dwg



REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

ILLUMINATION AND RRFB PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
C. COX	D. SHADRIN	F. WISMER

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
IL03

149 of 162

Plot Stamp: 10/28/2024 8:50:28 AM - Fred Wismer
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Illumination Plans-250904.dwg

Sheet	Location	Cabinet	Equipment Type	Equipment Model Options	Quantity
IL03	Southbound Approach	New McCain ATC Backpack Cabinet	Communication Bracket	Fiber Interconnect, Hinged	1
			Fiber Edge Switch*	SIEMENS 6GK6090-0GS23-0BA0-ZA01 RUGGEDCOM RS900G-HI-D-2SFP-XX	1
			Fiber SFP Module	SIEMENS 6GK6000-8FG53-0AA0 RUGGEDCOM SFP1132-1LX25	2
			PoE Injector	Axis T8134 60W Midspan	1
			Fiber Optic Patch Panel (FCPP)	Fiber Connections INC Gator Patch LC G62LUO 12 FRB-300-0	1
			Power Cable without Lugs	SIEMENS 6GK6000-8BB00-0AA0	1
			Network Ethernet Cord	2 ft length (Cat 6)	1
			Network Ethernet Cord	12 ft length (Cat 6)	1
			Fiber Optic Patch Cable	Duplex LC-LC (1 meter min. length)	4
		HH/1A	Fiber Optic Splice Closure	COMMSCOPE FOSC 450-D6-6-72-0-D6V	1

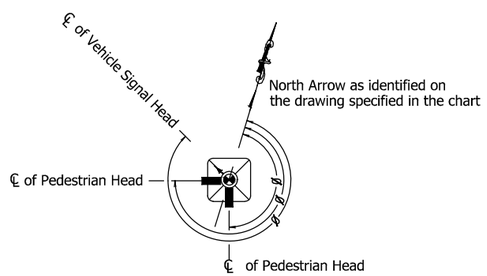
* = Configured and installed by others

COMMUNICATIONS COMPONENT SCHEDULE

POLE ENTRANCE CHART

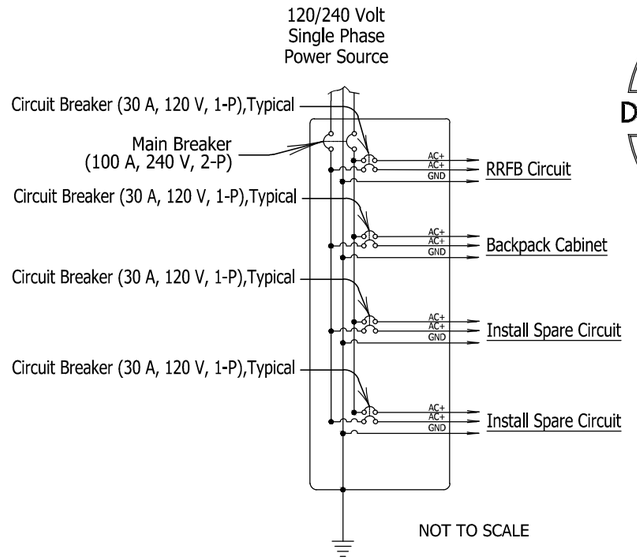
See TM457 and special provisions.				EQUIPMENT ON POLE			FOUNDATION INFORMATION See Foundation Detail on this sheet and Special Provisions	
POLE NO.	DWG. NO.	POLE HEIGHT**	TYPE	FLASHING BEACON DEG.	PUSH BUTTON DEG.	PUSH BUTTON ARROW	REQUIRED FOUNDATION DEPTH	TOP OF ANCHOR ROD ELEVATION **
1	IL02	20'-0"	PP/3	92	92	LT	8'-0"	SEE TM457
2	IL02	14'-0"	PP/3	92	92	RT	8'-0"	SEE TM457
3	IL02	14'-0"	PP/3	241	61	LT	8'-0"	SEE TM457
4	IL02	14'-0"	PP/3	240	240	LT	8'-0"	SEE TM457

* = Foundation Control Point and Top of Anchor Rod Elevations to be Field Verified Prior to Foundation Installation.
** = Height is measured from top of foundation.



PEDESTRIAN PEDESTAL / VEHICLE PEDESTAL
ORIENTATION DIAGRAM

NOTE:
Equipment shown on the orientation diagram is a clarification of angles of equipment that may be located on a Pedestrian Pedestal or Vehicle Pedestal.



RRFB SERVICE CABINET WIRING DIAGRAM
PROPOSED BMC ON THE NORTH CORNER OF
THE STAFFORD ROAD & CHILDS ROAD INTERSECTION

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

GENERAL RRFB NOTES:

1. All materials and workmanship shall conform to Clackamas County ordinances and special provisions, the 2021 Oregon standard specifications for construction, and the Oregon standard drawings listed below.
2. The contractor shall verify the locations of existing utilities and coordinate this work with the utility companies/agencies to eliminate any conflicts.
3. All junction boxes shall be placed in sidewalk or concrete apron.
4. Install #12 stranded copper (orange) tracer wire in all conduits.
5. Conduit shall be placed in the same trench with other conduits when possible.
6. Top of signal and pedestrian pole foundations shall match top of finished grade of sidewalk.
7. All conduit runs shall be placed within the right-of-way.
8. Install poly pull tape (1200 lbf min. Strength, non-conductive) in all conduits.
9. All underground conduits and fittings shall be schedule 80 pvc.
10. Pothole at locations of utility crossings shown on the plans.

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

RRFB DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

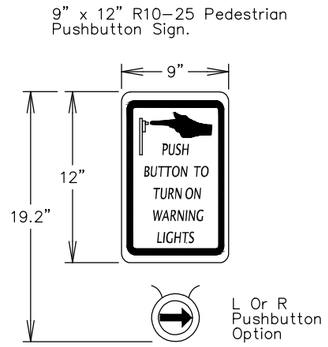
CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

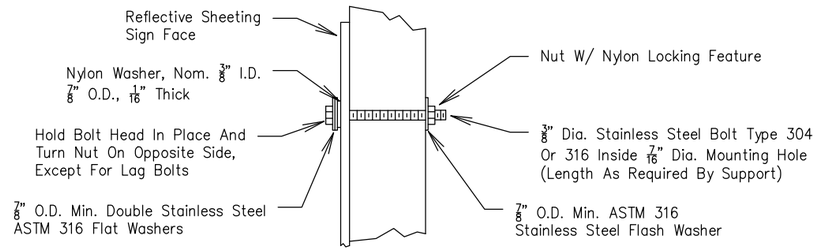
REVISIONS
NO. | DATE:

Sheet No.
IL04

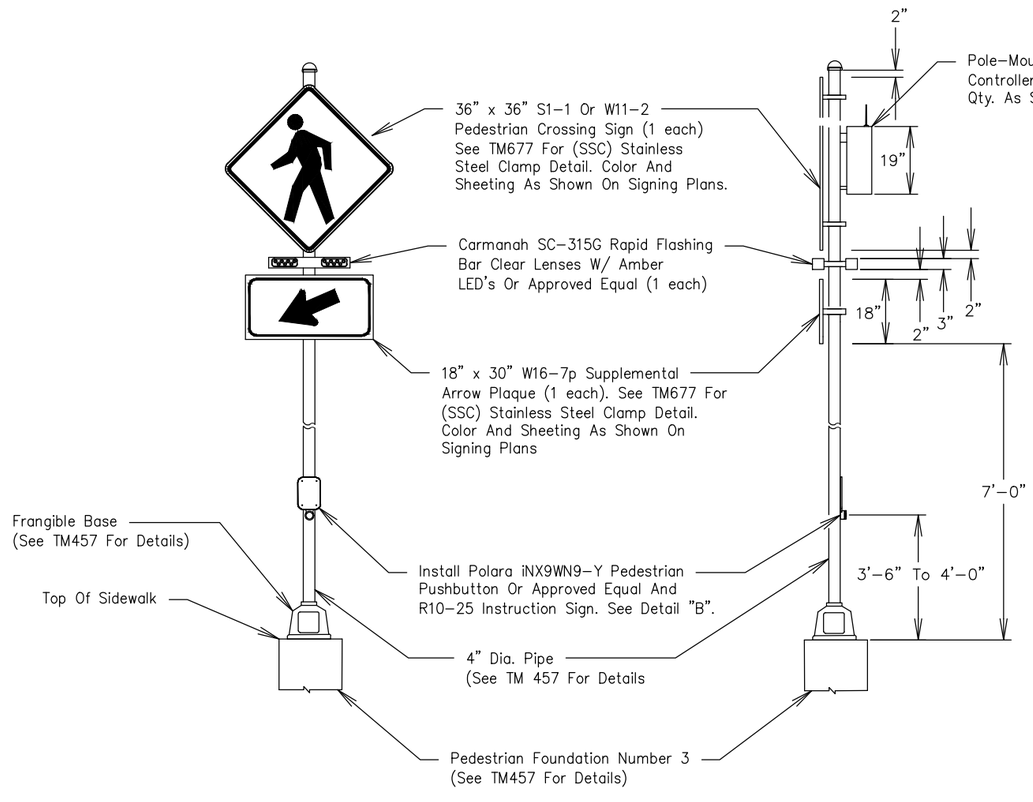
Plot Stamp: 10/28/2024 8:50:33 AM - Fred Wismer
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Illumination Plans-25094.dwg



Detail "B"



Sign Attachment
Detail



Front View

Side View
(One-Sided)

ONE-SIDED SIGN INSTALLATION

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

RRFB DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

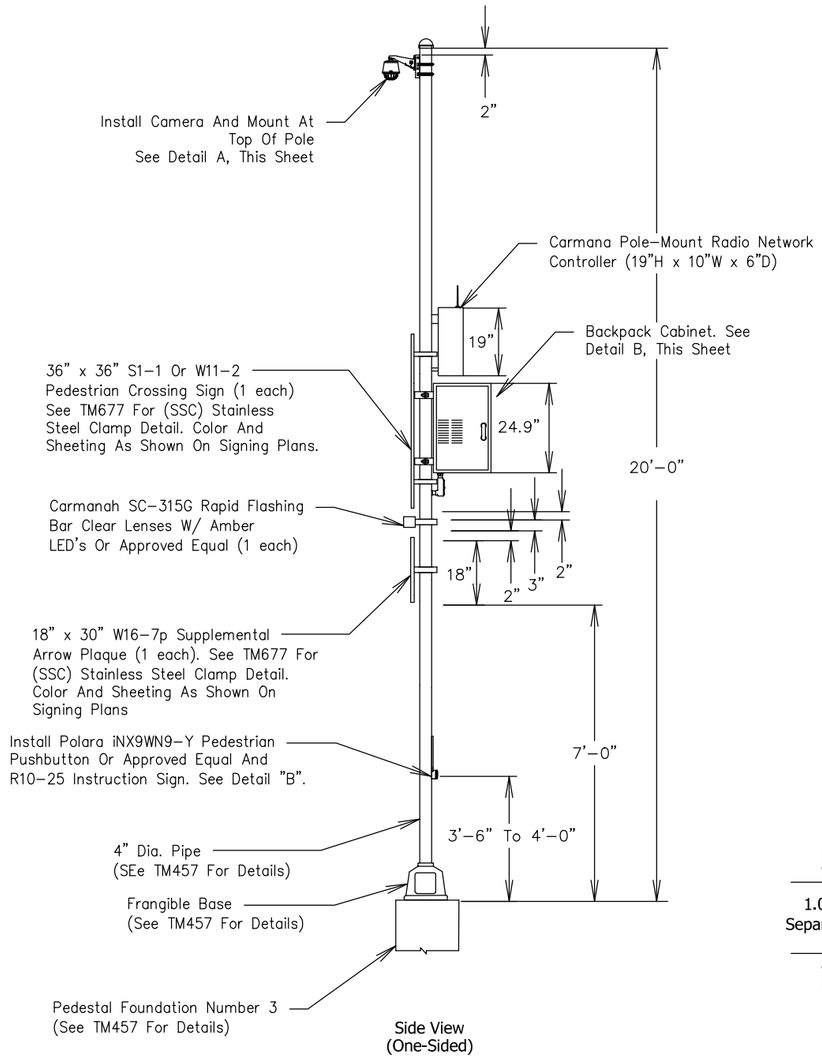
REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
IL05

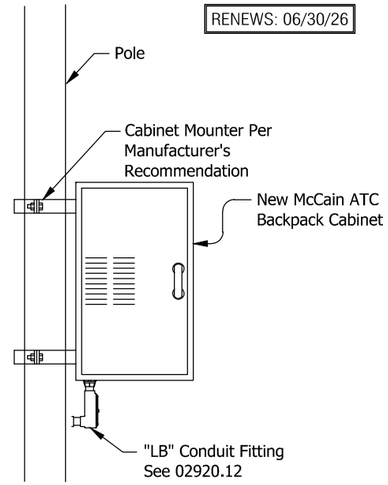
Plot Stamp: 10/28/2024 8:50:38 AM - Fred Wismer
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Illumination Plans-25094.dwg



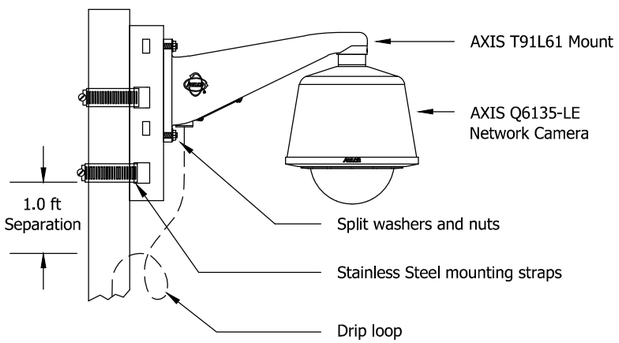
One-sided Sign (with PTZ) Installation (Pole No. 1)

GENERAL NOTE

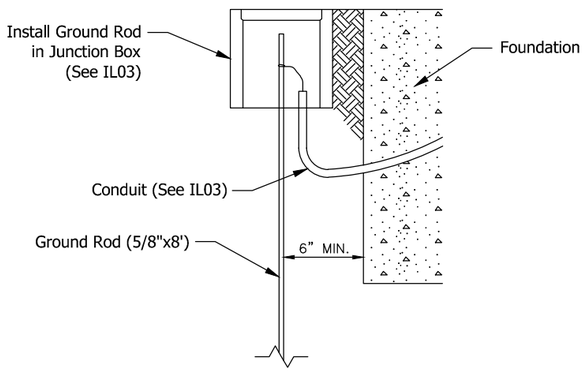
Provide McCain ATC Backpack cabinet with the following equipment: Service Assembly, Shelf, Thermostat Assembly, Lamp, and Fan. All other items related to traffic signal operation may be omitted.



Detail B - BACKPACK CABINET POLE MOUNTING
N.T.S.



Detail A - Camera and Mount



Ground Rod Installation Details
N.T.S.

REGISTERED PROFESSIONAL ENGINEER
74207PE
Digitally Signed 2024.10.29
OREGON
July 8, 2008
FRED S. WISMER JR.
RENEWS: 06/30/26

RRFB DETAILS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT. 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: C. COX
DRAFTED BY: D. SHADRIN
CHECKED BY: F. WISMER

REVISIONS

NO.	DATE:

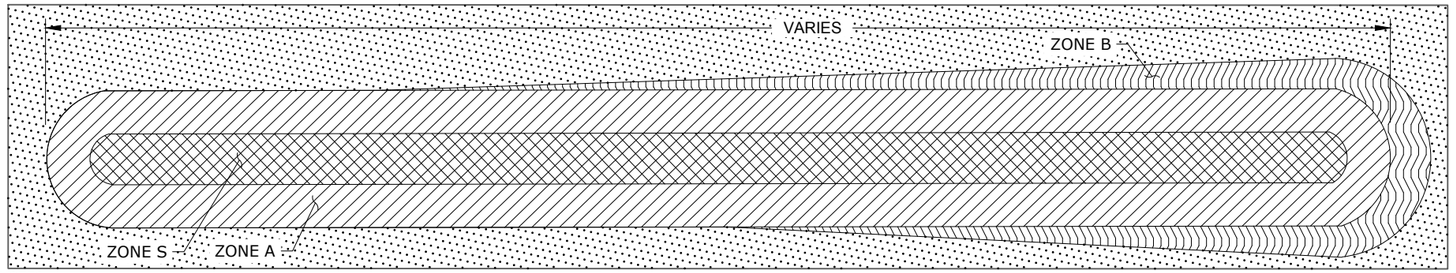
KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Sheet No.
IL06

Plot Stamp: 10/28/2024 8:50:42 AM • Fred Wismer
File: H:\25\25094 - Stafford Road - Rosemont to Pattulo\design_CD\CD-Stafford Rd-Illumination Plans-25094.dwg

PLANT SCHEDULE - STORMWATER FACILITIES & PLANTER STRIPS

	SYMBOL	BOTANICAL NAME / COMMON NAME	WATER QUALITY SWALES & BIORETENTION PONDS										UNIT	TOTAL QTY	PLANT TYPE	SPACING	PLANTING SIZE
			Stafford Swale		Rosemont Swale		Johnson Bioretention Pond			Childs Bioretention Pond							
			Zone S	Zone A	Zone S	Zone A	Zone S	Zone A	Zone B	Zone S	Zone A	Zone B					
			948 SF	1478 SF	742 SF	1193 SF	1685 SF	3095 SF	2467 SF	1650 SF	5348 SF	11990 SF					
ZONE S		Carex obnupta / Slough Sedge	545		427		1141			910			EACH	3023	HERBACEOUS	115 PLANTS PER/100 SF	#SP4 CONTAINER
ZONE S		Juncus patens / Spreading Rush	545		427		1141			910			EACH	3023	HERBACEOUS		#SP4 CONTAINER
ZONE B		Water quality seed mix (lb)		1.5		1.5		3.5	2.5		5.5	7.5	LB	22.0	GRASS AS GROUNDCOVER	53600 SEEDS PER/100 SF	1.0 LB PER 1000 SF
ZONE A		Symphoricarpos albus / Common Snowberry		60		48		124	100		216	448	EACH	996	SMALL SHRUB	4 PLANTS PER/100 SF	#1 CONTAINER
ZONE A		Polysocarpus capitatus / Pacific Ninebark		60		48		124	100		216	448	EACH	996	SMALL SHRUB		#1 CONTAINER
ZONE A		Spriaea douglasi / Douglas Spirea		45		36		90	75		162	336	EACH	747	LARGE SHRUB	3 PLANTS PER/100 SF	#5 CONTAINER
ZONE A		Ceanothus velutinus / Snowbrush		45		36		90	75		162	336	EACH	747	LARGE SHRUB		#5 CONTAINER
ZONE B		Acer circintum / Vine Maple							25			112	EACH	137	TREE	1 PLANT PER/100 SF	1" CALIPER



NOTES:

1. SEE SHEETS LS02 & LS10 FOR PLANTING DETAILS.
2. SEE SHEET LS03 FOR PLANTING NOTES.

1 TYPICAL SWALES & BIORETENTION PLANTING

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

PERMANENT SEEDING NO. 1

BOTANICAL NAME	COMMON NAME	LBS. PER ACRE
HORDEUM BRACHVANTHERUM	MEADOW BARLEY	17.45
BROMUS CARINATUS	CALIFORNIA BROME	15.27
FESTUCA RUBRA RUBRA	NATIVE RED FESCUE	8.73
DESCHAMPSIA CESPITOSA	TUFTED HAIRGRASS	1.31
AGROSTIS EXERATA	SPIKE BENTGRASS	0.87
TOTALS:		43.63

SEEDING RATE

1	PLS LBS PER 1000 SQ. FT.
43.63	PLS LBS PER ACRE

STORMWATER FACILITIES PLANTING TOTAL AREAS

SYMBOL	PLANTING TYPE	TOTAL AREA ALL SITES	QTY
	PERMANENT SEEDING, MIX NO. 1	143,486 SF	144.0 LB
	ZONE S	5,025 SF	SEE PLANT SCHEDULE
	ZONE A	11,115 SF	SEE PLANT SCHEDULE
	ZONE B	9,110 SF	SEE PLANT SCHEDULE

PLANT SCHEDULE - UPLAND / RIPARIAN FOREST MITIGATION

BOTANICAL NAME	COMMON NAME	TYPE	SPACING	PLANTING SIZE	QUANTITIES		UNIT	TOTAL QTY
					RIPARIAN 11261 SF	UPLAND 41126 SF		
ALNUS RUBRA	RED ALDER	TREE	10 FT O.C.	1" CALIPER	58	83	EACH	141
ACER MACROPHYLLUM)	BIG LEAF MAPLE	TREE	10 FT O.C.	1" CALIPER		83	EACH	83
ACER CIRCINATUM	VINE MAPLE	TREE	10 FT O.C.	1" CALIPER		83	EACH	83
THUJA PLICATA	WESTERN RED CEDAR	TREE	10 FT O.C.	6' HEIGHT	58		EACH	58
PSEUDOTSUGA MENZIESII	DOUGLAS FIR	TREE	10 FT O.C.	6' HEIGHT		83	EACH	83
ABIES GRANDIS	GRAND FIR	TREE	10 FT O.C.	6' HEIGHT		83	EACH	83
CORNUS SERICEA	RED-OSIER DOGWOOD	SHRUB	4 FT O.C.	#1 CONTAINER	116		EACH	116
OEMLERIS CERASIFORMIS	INDIAN PLUM	SHRUB	4 FT O.C.	#1 CONTAINER	116		EACH	162
RUBUS SPECTABILIS	SALMONBERRY	SHRUB	4 FT O.C.	#1 CONTAINER	116		EACH	116
SAMBUCUS RACEMOSA	RED ELDERBERRY	SHRUB	4 FT O.C.	#1 CONTAINER	116	431	EACH	593
SYMPHORICARPOS ALBUS	COMMON SNOWBERRY	SHRUB	4 FT O.C.	#1 CONTAINER	116	431	EACH	593
HOLODISCUS DISCOLOR	OCEANSPRAY	SHRUB	4 FT O.C.	#1 CONTAINER		431	EACH	431
RIBES SANGUINEUM	RED FLOWERING CURRANT	SHRUB	4 FT O.C.	#1 CONTAINER		431	EACH	613
ROSA GYMNOCARPA	BALIDHIP ROSE	SHRUB	4 FT O.C.	#1 CONTAINER		431	EACH	431
NATIVE RIPARIAN SEED MIX (LB)		GRASS	1.0LB/1000SF		12		LB	12
NATIVE UPLANDS SEED MIX (LB)		GRASS	1.0LB/1000SF			43	LB	43

PLANT SCHEDULE - ROUNDABOUT (CENTER ISLAND, PLANTER STRIP & SIDE PLANTING AREA)

SYMBOL	BOTANICAL NAME	COMMON NAME	TYPE	PLANTING SIZE	UNIT	TOTAL QTY
	ACER MACROPHYLLUM	BIG LEAF MAPLE	TREE	1" CALIPER	EACH	5
	PSUEDOTSUGA MENZIESII	DOUGLAS FIR	TREE	6' HEIGHT	EACH	3
	ACER CIRCINATUM	VINE MAPLE	TREE	1" CALIPER	EACH	40
	MAHONIA REPENS	CREEPING OREGON GRAPE 3' O.C.	GROUND COVER	#1 CONTAINER	EACH	200
	PLANTER STRIP AREA (5,276 SF)		3" WOOD CHIP MULCH		CY	33
			6" TOPSOIL		CY	66
	SIDE PLANTING AREA (2,372 SF)		3" WOOD CHIP MULCH		CY	48
			6" TOPSOIL		CY	96
	ROUNDABOUT CENTER ISLAND AREA (3570 SF)		3" WOOD CHIP MULCH		CY	22
			6" TOPSOIL		CY	44

NATIVE RIPARIAN SEED MIX

BOTANICAL NAME	COMMON NAME	% BY WEIGHT
ELYMUS GLAUCUS	BLUE WILDRYE	60%
HORDEUM BRACHYANTHERUM	MEADOW BARLEY	30%
BROMUS CARINATUS	CALIFORNIA BROME	10%
		100%
SEEDING RATE	1 PLS LBS. PER 1000 SQ. FT. 43 PLS LBS. PER ACRE	

NATIVE UPLANDS SEED MIX

BOTANICAL NAME	COMMON NAME	% BY WEIGHT
ELYMUS GLAUCUS	BLUE WILDRYE	50%
FESTUCA RUBRA RUBRA	NATIVE RED FESCUE	30%
BROMUS CARNATIUS	CALIFORNIA BROME	10%
AGROSTIS EXARATA	SPIKE BENTGRASS	10%
		100%
SEEDING RATE	1.00 PLS LBS. PER 1000 SQ. FT. 43.71 PLS LBS. PER ACRE	

WATER QUALITY SEED MIX

BOTANICAL NAME	COMMON NAME	% BY WEIGHT
ELYMUS GLAUCUS	BLUE WILDRYE	10%
FESTUCA RUBRA RUBRA	NATIVE RED FESCUE	15%
HORDEUM BRACHYANTHERUM	MEADOW BARLEY	5%
GLYCERIA OCCIDENTALLIS	NORTHWESTERN MANNAGRASS	30%
BECKMANNIA SYZIGACHNE	AMERICAN SLOUGHGRASS	15%
DESCHAMPSIA CAESPITOSA	TUFTED HAIRGRASS	25%
		100%
SEEDING RATE	1.00 PLS LBS. PER 1000 SQ. FT. 43.71 PLS LBS. PER ACRE	

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

PLANTING SCHEDULE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE | DRAFTED BY: JSD | CHECKED BY: NJM

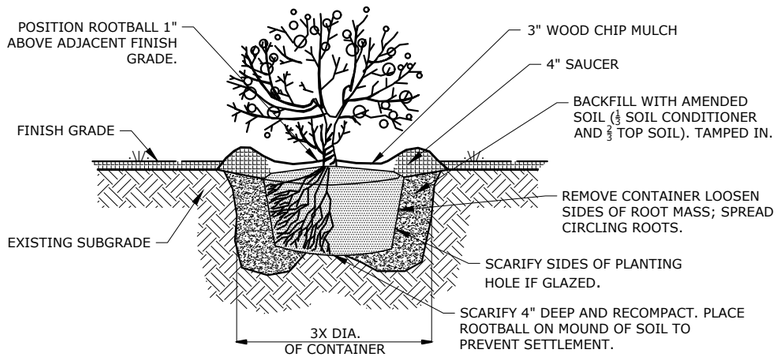
REVISIONS

NO.	DATE:

Sheet No.
LS01

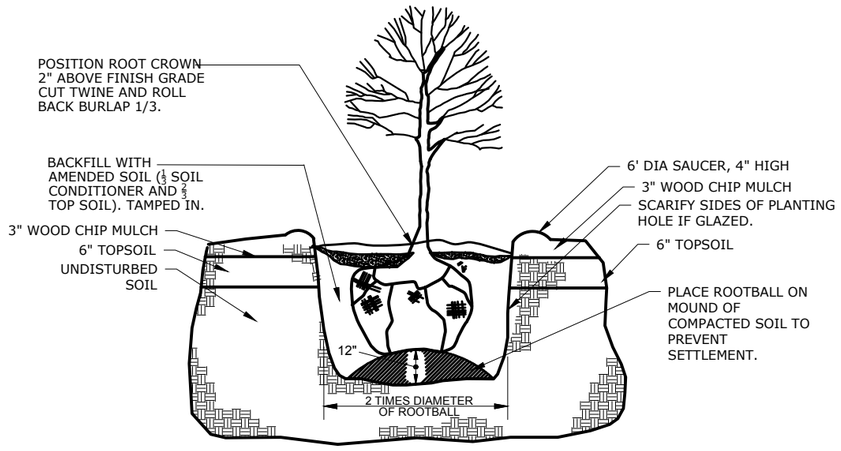
153 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS01 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



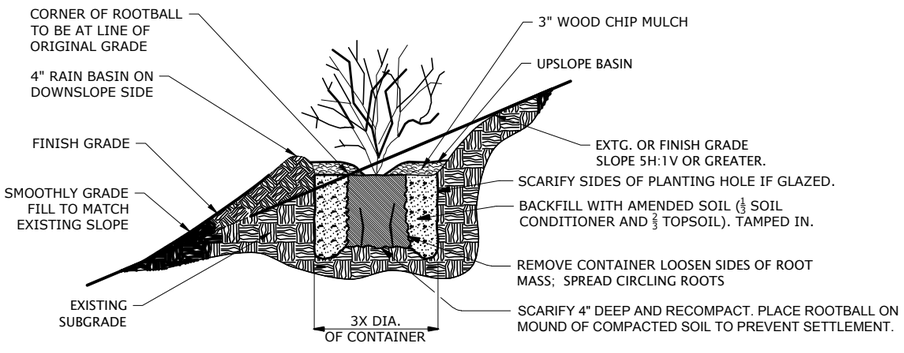
1 ROUNDABOUT PLANTER STRIP SHRUB PLANTING

Not to scale



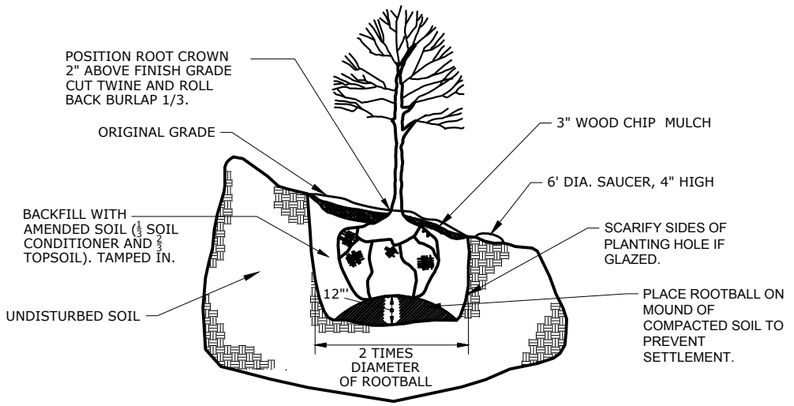
2 ROUNDABOUT CENTER ISLAND TREE PLANTING

Not to scale



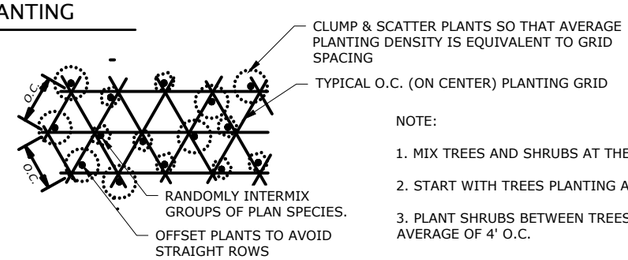
3 MITIGATION AREA & SWALE SHRUB SLOPE PLANTING

Not to scale



4 MITIGATION AREA TREE SLOPE PLANTING

Not to scale

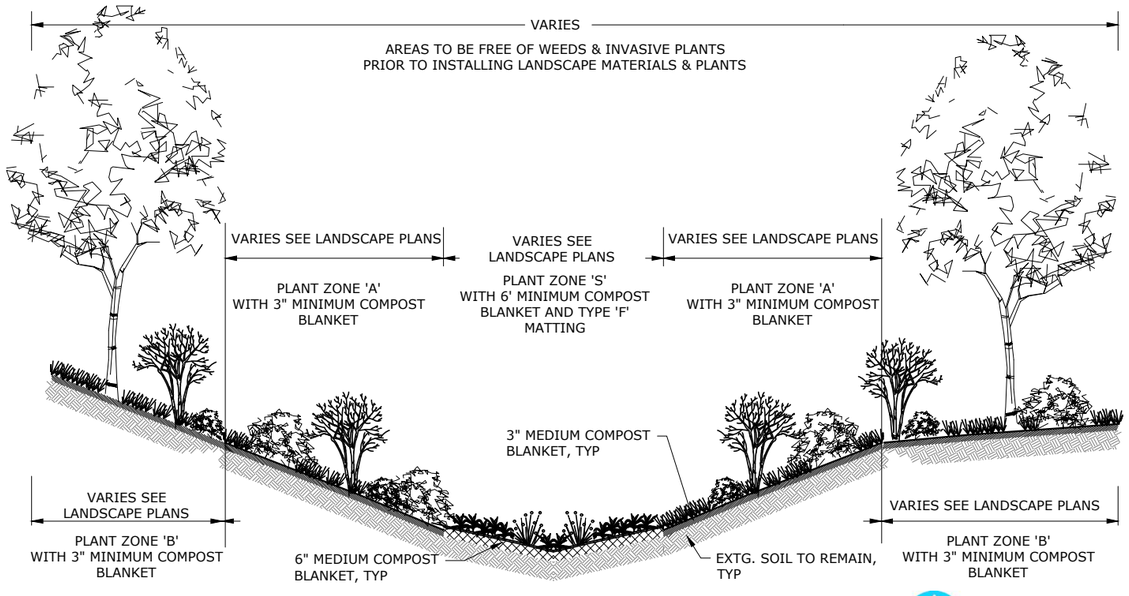


NOTE:

1. MIX TREES AND SHRUBS AT THE SAME SITE.
2. START WITH TREES PLANTING AT 10' O.C.
3. PLANT SHRUBS BETWEEN TREES AT AVERAGE OF 4' O.C.

5 MITIGATION AREA PLANTING LAYOUT MIX

NOT TO SCALE



6 TYPICAL SWALE PLANTING

NOT TO SCALE

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

PLANTING DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
LS02

154 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS02 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)

GENERAL NOTES:

1. VERIFY WITH ENGINEER PRIOR TO PLANTING. ENGINEER SHALL APPROVE ALL WORK OUTSIDE DESIGNATED WORK LIMITS PRIOR TO CONSTRUCTION.

2. LOCATE UNDERGROUND UTILITY LINES PRIOR TO ANY DIGGING OR GROUND DISTURBANCE.

3. ADJUST PLANTING LOCATIONS SO VEGETATION DOES NOT CONFLICT WITH ABOVE - OR BELOW-GROUND UTILITIES.

4. SEE THE CURRENT ISSUE OF THE AMERICAN STANDARD FOR NURSERY STOCK FOR PLANT QUALITY MINIMUM STANDARDS, SUCH AS SIZE OF ROOT BALL/MASS, CALIPER OF TRUNK, OR HEIGHT.

5. ALL DIMENSIONS SHOWN ON DETAILS ARE MINIMUM DIMENSIONS.

6. SEE PLANT SCHEDULE FOR PLANTS AND LANDSCAPE MATERIAL, SHEET LS01.

7. PLAN IS SCHEMATIC. PLANTING MAY BE ADJUSTED TO FIT SITE CONDITIONS WITH PRIOR ENGINEER APPROVAL.

8. TREE AND SHRUB BACKFILL MIX: 1/3 SOIL CONDITIONER AND 2/3 TOPSOIL. TREE AND SHRUB BACKFILL MIX TO BE FREE OF NOXIOUS WEEDS AND STATE LISTED INVASIVE PLANTS.

9. LAY OUT PLANT MATERIAL IN GROUPS AS INDICATED IN PLANT SCHEDULE, DETAILS AND PLAN SHEETS.

10. PLANTING AREAS SHALL BE STAKED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PLANTING.

11. NO PLANT MATERIAL SHALL BE PLANTED PRIOR TO INSPECTION AND APPROVAL BY THE ENGINEER.

12. ALL PLANT MATERIAL SHALL BE THOROUGHLY WATERED (SATURATED BACKFILL) WITHIN 24-HOURS OF INSTALLATION REGARDLESS OF RAINFALL EVENTS.

13. CONTRACTOR SHALL COMPLY WITH THE TERMS AND CONDITIONS FROM NOAA-FISHERIES AND FEDERAL AID HIGHWAY PROGRAM - ENDANGERED SPECIES ACT FOR ENDANGERED SPECIES FAHP-ESA REQUIRING THE UTMOST CARE WHEN CONSTRUCTION ACTIVITY IS TAKING PLACE IN OR NEAR WATER.

14. PROTECT ALL TREES NOT SPECIFICALLY IDENTIFIED FOR REMOVAL. TREE REMOVALS ARE IDENTIFIED WITHIN THE EROSION CONTROL SHEETS. DO NOT DAMAGE NATURAL (NON-INVASIVE) VEGETATION.

15. CONTRACTOR SHALL COMPLY WITH EROSION CONTROL MEASURES PER SECTION 00280 AND ALL APPLICABLE PERMITS DURING CONSTRUCTION.

16. WHERE DISCREPANCIES BETWEEN THE PLANTING SCHEDULE AND THE LANDSCAPE PLANS EXIST, LANDSCAPE PLANS SHALL PREVAIL.

17. PLANTING TO OCCUR FROM SEPT 1 TO MAY 15.

18. IDENTIFICATION TAGS SHALL REMAIN ON PLANT MATERIAL AFTER PLANTING FOR MONITORING PURPOSES.

19. SEE 01040 FOR MAINTENANCE REQUIREMENTS.

MAINTENANCE NOTES:

1. MAINTENANCE WILL BE PERFORMED BY CONTRACTOR AND WILL OCCUR AS NEEDED DURING THE 3-YEAR ESTABLISHMENT PERIOD. CONDUCT MAINTENANCE ACTIVITIES IN ACCORDANCE WITH SECTION 1040.

2. THE AGENCY WILL ROUTINELY EXAMINE THE VEGETATED CORRIDOR AREAS. INSPECTIONS TO OCCUR A MINIMUM OF THREE TIMES DURING GROWING SEASON. EXAMINATIONS WILL REVIEW NOXIOUS VEGETATION CONTROL AND THE GENERAL HEALTH OF PLANTED AND DESIRABLE VOLUNTEER SPECIES. CONTRACTOR WILL MARK INSTALLED PLANTS AS NEEDED TO PREVENT DAMAGE DURING MAINTENANCE ACTIVITIES SUCH AS STRING TRIMMING AND MOWING ACTIVITIES.

3. USE APPROVED HERBICIDE, SHEARING OR STRING TRIMMING TO PHYSICALLY CONTROL NON-NATIVE SPECIES SUCH AS, REED CANARY GRASS AND BLACKBERRY. FIRST TRIM SHOULD OCCUR EARLY ENOUGH TO ALLOW SETTING OF SEEDING. IT MAY BE NECESSARY TO TRIM NATIVE GRASSES IF THEY GROW TOO TALL AND COVER PLANTED TREES AND SHRUBS. PROTECT NATIVE SPECIES FROM MECHANICAL DAMAGE AND HERBICIDES.

4. APPLY TREATMENTS OF HERBICIDE TO CONTROL GRASSES AS NEEDED. TREATMENT FOR GRASSES INCLUDE APPLICATION OF A GLYPHOSATE-BASED HERBICIDE (E.G., RODEO) AND U 700 SURFACTANT IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS REGARDING CONCENTRATION, TIMING AND DRIFT MINIMIZATION. ADD DYE TO HERBICIDE SOLUTION AS A TRACING AGENT.

5. TREATMENT FOR BLACKBERRY AND REED CANARYGRASS INCLUDES APPROVED HERBICIDE IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS REGARDING CONCENTRATION. ADD DYE TO HERBICIDE SOLUTION AS A TRACING AGENT.

6. USE HERBICIDE WITHIN THE IDENTIFIED WATERS OR BUFFERS AREAS REQUIRES PRIOR APPROVAL BY CLACKAMAS COUNTY WATER ENVIRONMENT SERVICES.

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

PLANTING NOTES

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

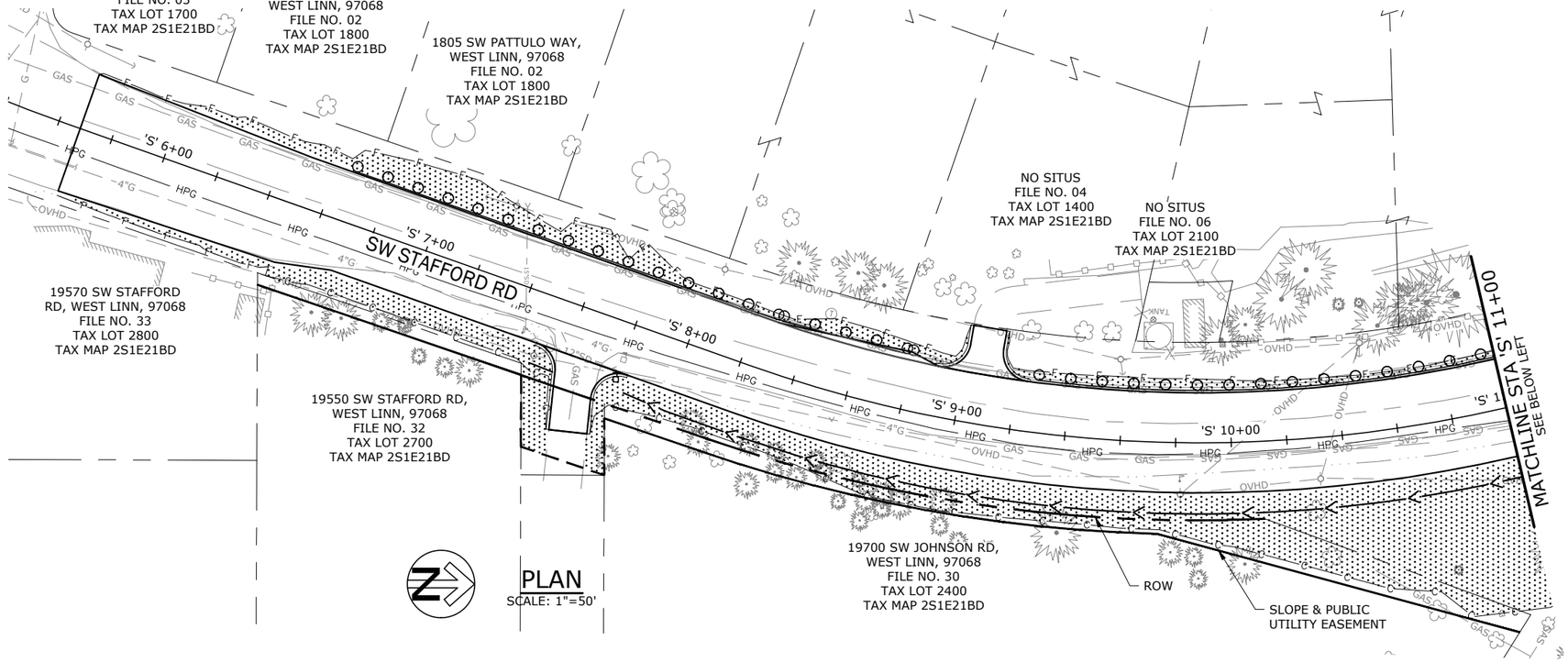
NO.	DATE:

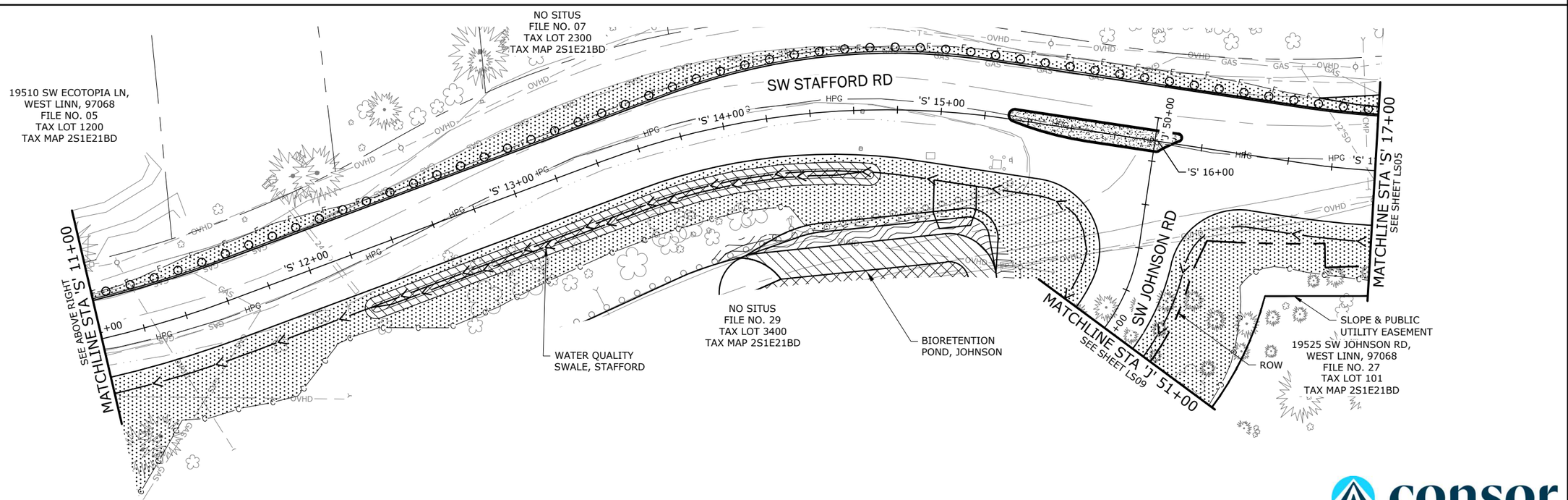
Sheet No.
LS03

155 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS03 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)





REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LEGEND

- PERMANENT SEEDING, MIX NO. 1
- SWALE ZONE S
- SWALE ZONE A
- SWALE ZONE B

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

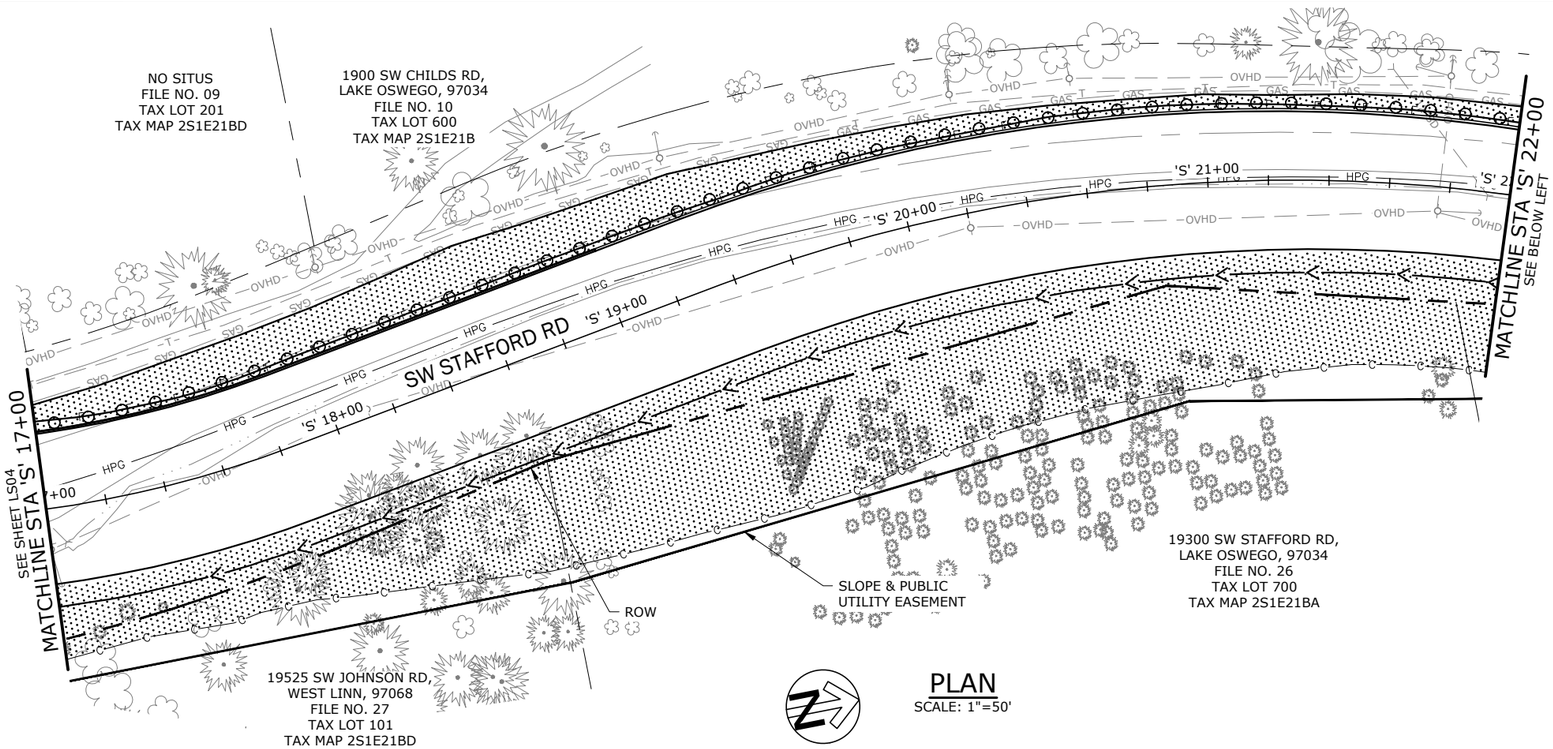
NO.	DATE:

Sheet No.
LS04

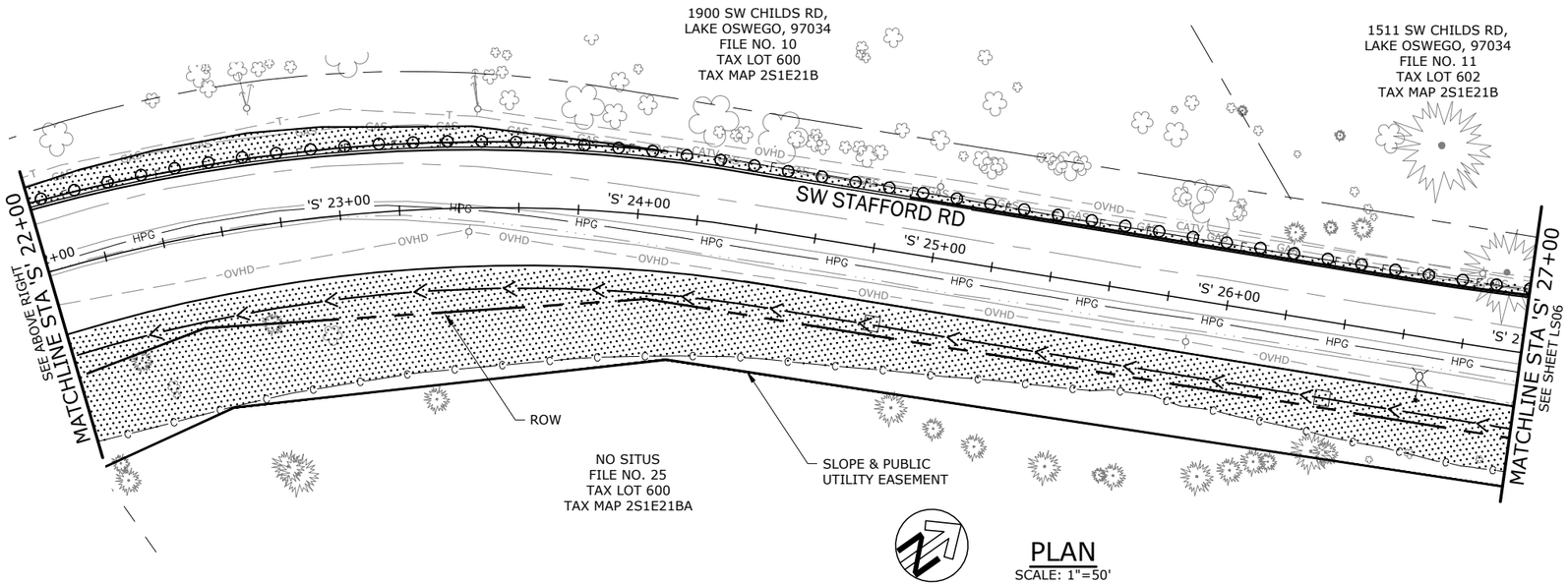
156 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS04 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LEGEND

PERMANENT SEEDING, MIX NO. 1

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
LS05

157 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS05 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)

NOTES:

1. FOR ROUNDABOUT CENTER ISLAND LANDSCAPING PLAN, SEE SHEET LS10.

LEGEND

PERMANENT SEEDING, MIX NO. 1
ZONE S
ZONE A
ZONE B
UPLAND FOREST MITIGATION AREA
RIPARIAN FOREST MITIGATION AREA
SIDE PLANTING AREA
PLANTER STRIP AREA

SLOPE & PUBLIC UTILITY EASEMENT
TCE LIMITS OF PROPOSED ENCROACHMENT
ROW
BIORETENTION POND, CHILDS
RESTRICTED DEVELOPMENT EASEMENT
VISION CLEARANCE ZONE (TYP.)

1551 SW CHILDS RD, LAKE OSWEGO, 97034
FILE NO. 14
TAX LOT 400
TAX MAP 2S1E21BA

18783 SW STAFFORD RD, LAKE OSWEGO, 97034
FILE NO. 15
TAX LOT 302
TAX MAP 2S1E21BA

1511 SW CHILDS RD, LAKE OSWEGO, 97034
FILE NO. 11
TAX LOT 602
TAX MAP 2S1E21B

1500 SW ZIVNEY LN, LAKE OSWEGO, 97034
FILE NO. 24
TAX LOT 500
TAX MAP 2S1E21BA

SW CHILDS RD
SW STAFFORD RD
SW ZIVNEY LN
'C' 103+00
'C' 104+00
'C' 105+00
'C' 106+00
'C' 106+98
'S' 27+00
'S' 28+00
'S' 29+00
'S' 30+00
'S' 31+00
'S' 32+00
'S' 33+00
MATCHLINE STA 'S' 27+00 SEE SHEET LS05
MATCHLINE STA 'S' 33+00 SEE SHEET LS07

PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

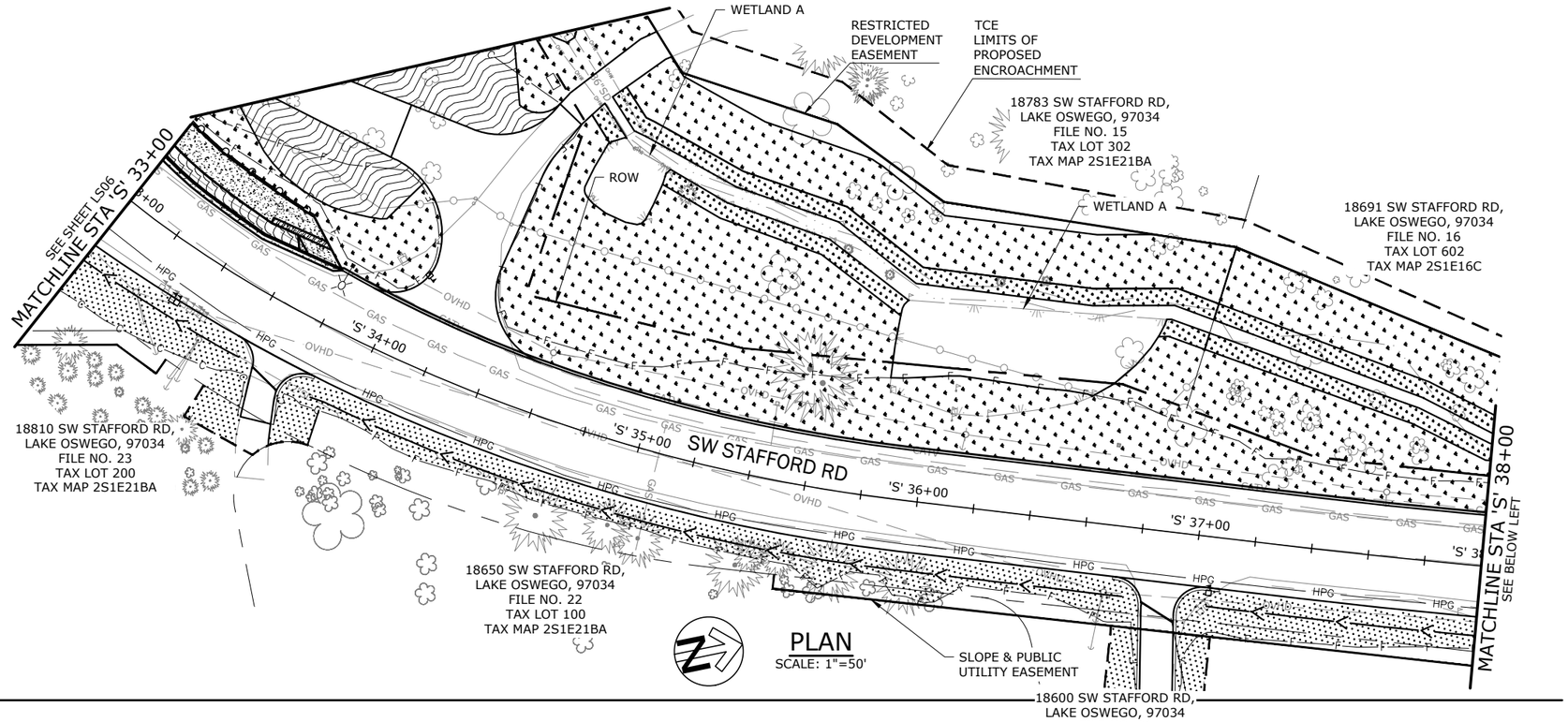
NO.	DATE:

Sheet No.
LS06

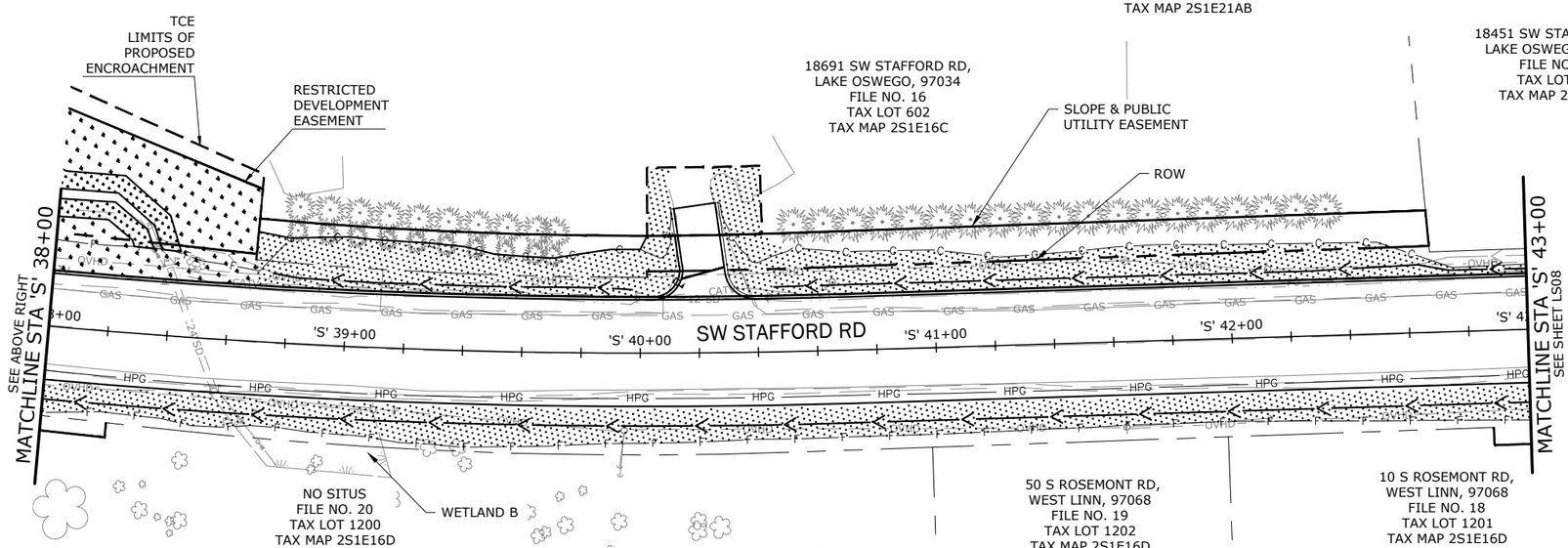
158 of 162

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS06 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'



PLAN
SCALE: 1"=50'

LEGEND

- PERMANENT SEEDING, MIX NO. 1
- UPLAND FOREST MITIGATION AREA
- RIPARIAN FOREST MITIGATION AREA
- SWALE ZONE B

25 12.5 0 25 50
SCALE IN FEET

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

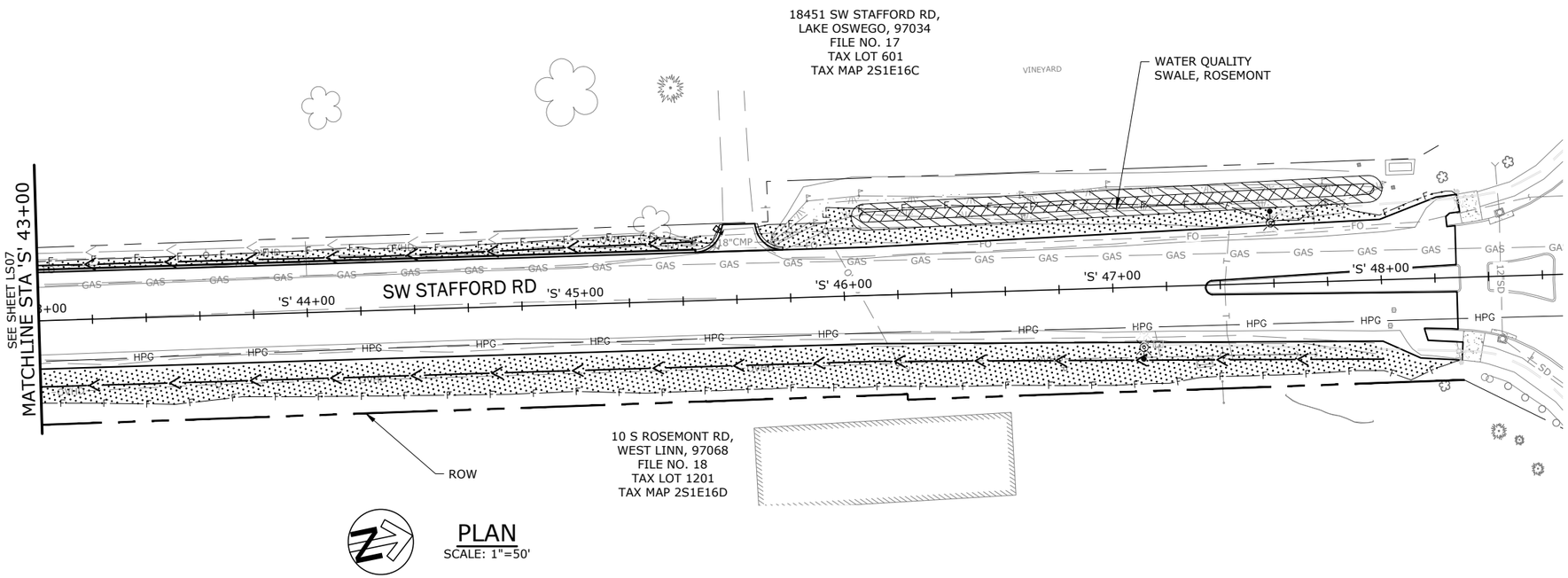
NO.	DATE:

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

Sheet No.
LS07

159 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS07 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



PLAN
SCALE: 1"=50'

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LEGEND

PERMANENT SEEDING, MIX NO. 1	
ZONE S	
ZONE A	

25 12.5 0 25 50
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
LS08

160 of 162

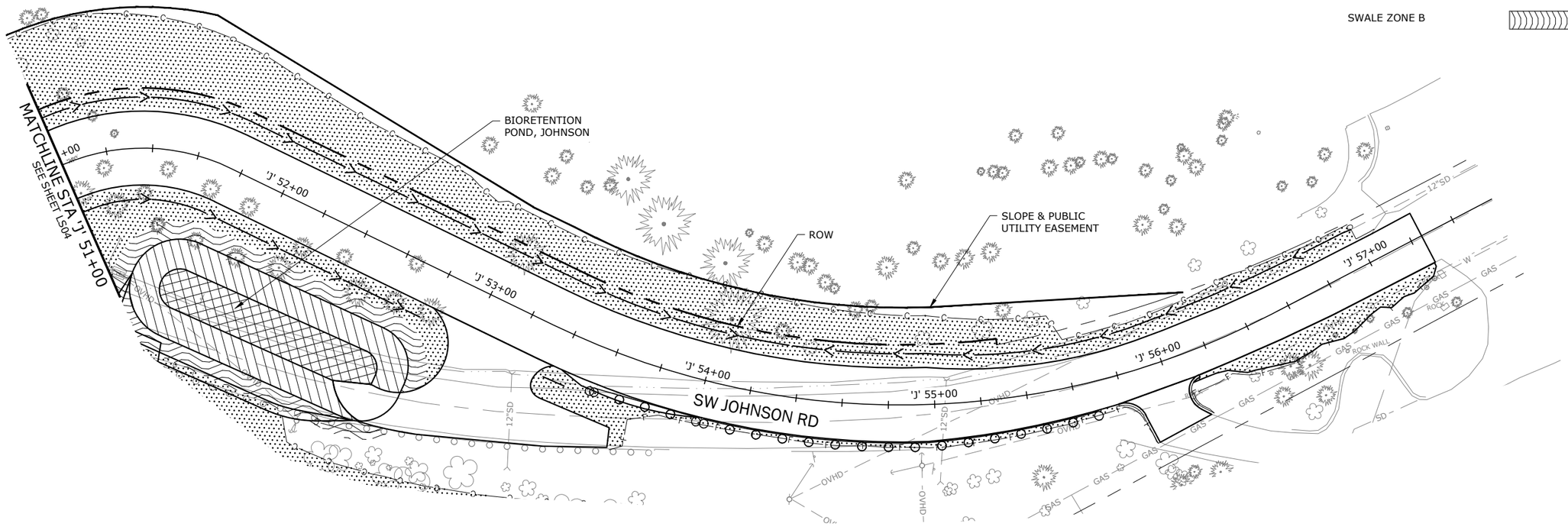
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS08 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS09 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LEGEND

- PERMANENT SEEDING, MIX NO. 1
- SWALE ZONE S
- SWALE ZONE A
- SWALE ZONE B



PLAN
SCALE: 1"=50'

25 12.5 0 25 50
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

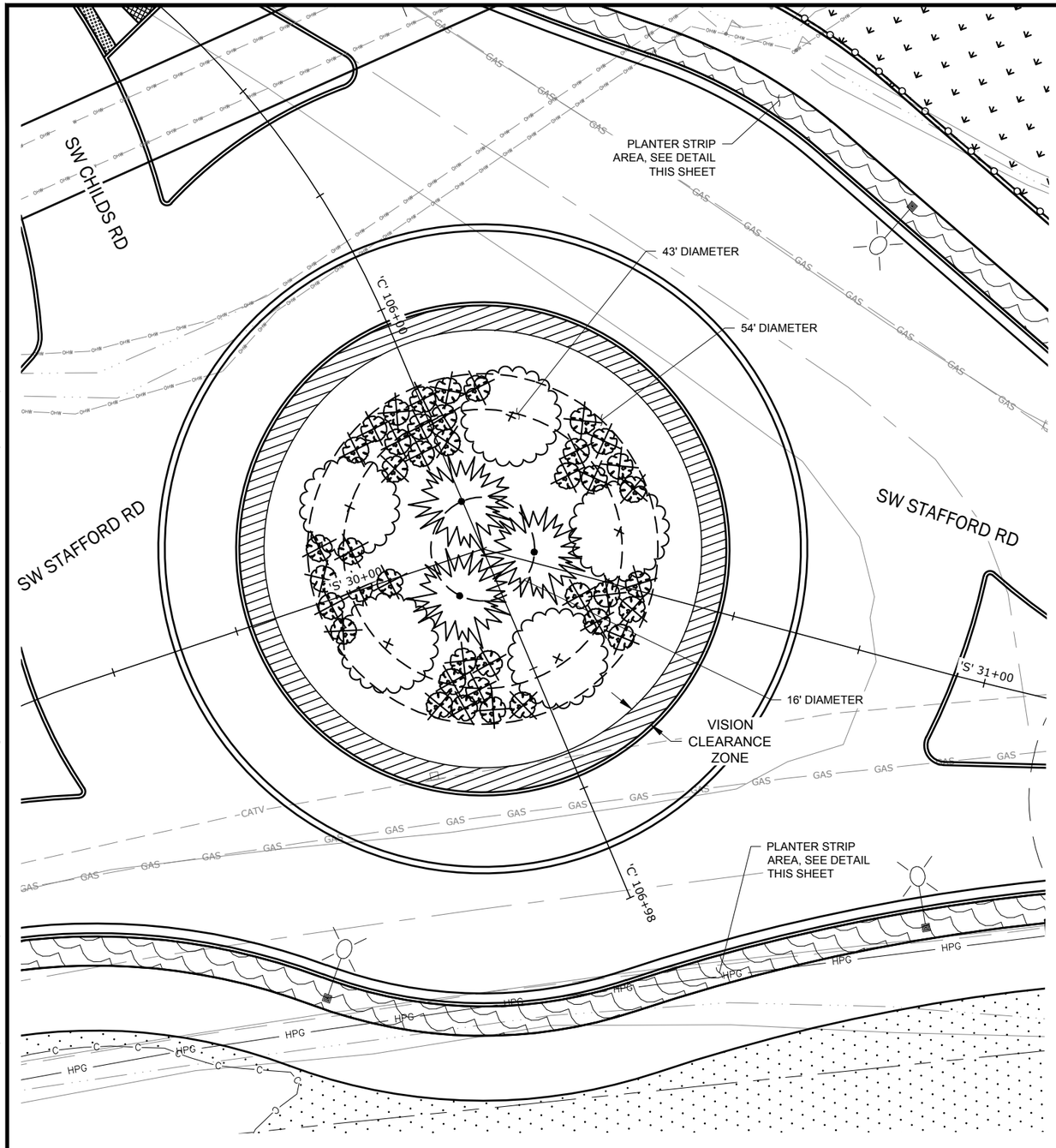
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: FE
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
LS09



PLAN
SCALE: 1"=20'

VISION CLEARANCE ZONE

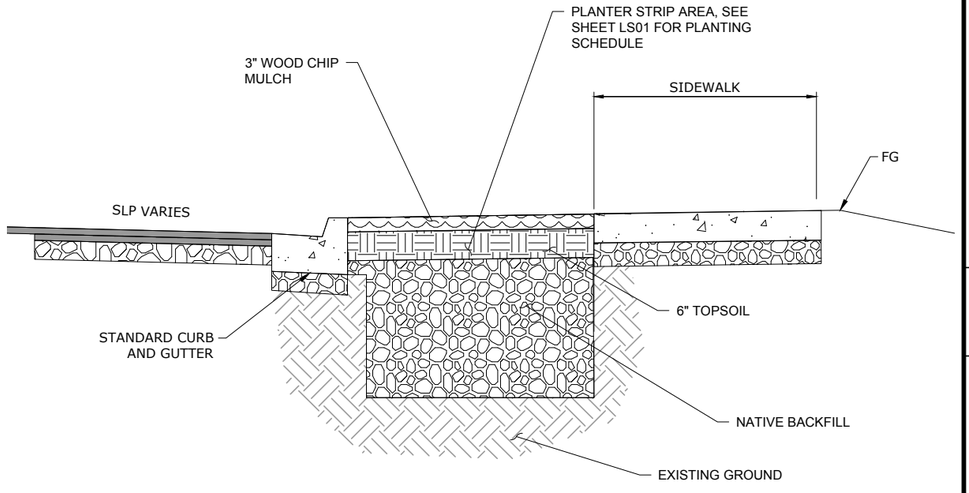
NOTES:

1. SEE SHEET LS01 FOR PLANTING SCHEDULE.

REGISTERED
748
Fouad Elgharabli 2024.10.31
FOUAD ELGHARABLI
OREGON
5/13/2011
LANDSCAPE ARCHITECT
RENEWS 5-31-25

LEGEND

SYMBOL	PLANT NAME	PLANTING SIZE	QTY
	ACER MACROPHYLLUM BIGLEAF MAPLE	1" CALIPER	5
	PSEUDOTSUGA MENZIESII DOUGLAS FIR	6' HEIGHT	3
	ACER CIRCINATUM VINE MAPLE	1" CALIPER	40



TYPICAL SECTION - PLANTER STRIP AREA
SCALE: NOT TO SCALE

10 5 0 10 20
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

LANDSCAPE PLANS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2024 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

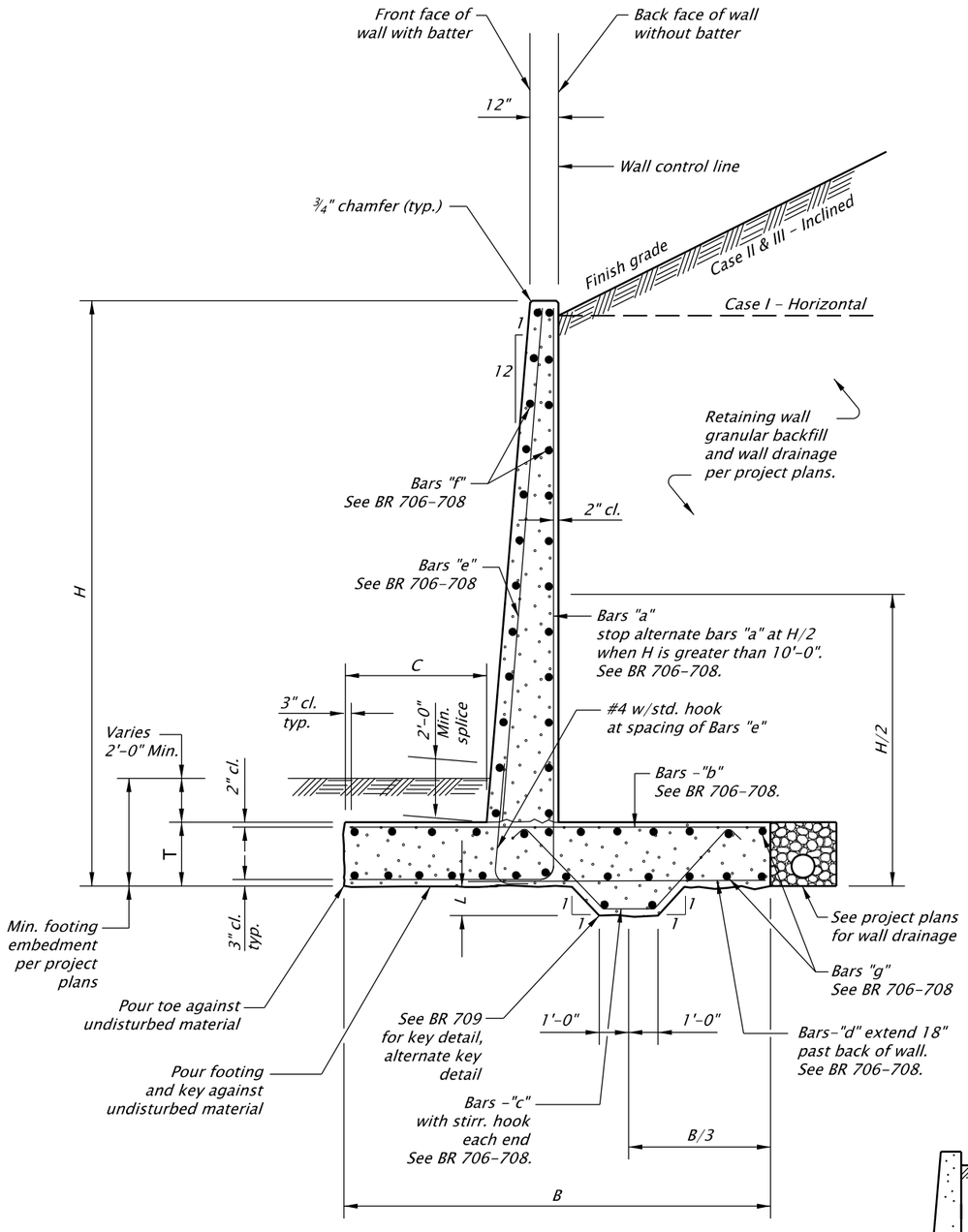
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
LS10
162 of 162

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-LS.dwg LS10 10/31/2024 9:11 AM RILEY.WIGGINS 24.1s (LMS Tech)



CROSS - SECTION
NONE

GENERAL NOTES:

1. Cast-in-Place Semi-Gravity Standard Retaining Wall is designed in accordance with the AASHTO LRFD Bridge Design Specifications - seventh edition (including 2016 interim revisions) and the ODOT Geotechnical Design Manual (GDM), 2016.
2. Cast-in-Place Semi-Gravity Standard Retaining Wall design is based on the following soil properties:

   Backfill & Retained Soil: Soil angle of internal friction = 34°; Soil Cohesion = 0 psf; Soil weight = 125 pcf

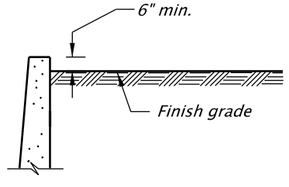
   Foundation Soil: Soil angle of internal friction = 30°; Soil cohesion = 0 psf
3. The internal stability and external stability design for overturning and sliding stability is addressed in the standard design. Overall stability, bearing resistance and settlement are addressed in site specific design.
4. Cast-in-Place Semi-Gravity Standard Retaining Wall is not designed for traffic barrier vehicular collision load or hydrostatic or seepage forces.
5. See Project Plans for drainage details.
6. Provide Class 4000 structural concrete.
7. Provide reinforcing steel according to ASTM Specification A706, or AASHTO M31 (ASTM A615) Grade 60. Use the following splice lengths unless shown otherwise:

Reinforcing Splice Lengths (Class B) Grade 60 f'c = 4.0 ksi									
Bar Size	#3	#4	#5	#6	#7	#8	#9	#10	#11
Uncoated	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-3"	4'-1"	5'-2"	6'-4"

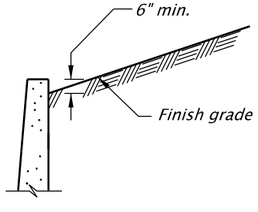
   Increase all splice lengths 30% for horizontal or nearly horizontal bars so placed that more than 12" of fresh concrete is cast below the bar.

   Splice reinforcing steel at alternate bars, staggered at least one splice length or as far as possible, unless shown otherwise.
8. Place bars 2" clear of the nearest face of concrete unless shown otherwise.
9. If not shown, place expansion joints through wall stem at intervals not to exceed 90'-0" and contraction joints through wall stem at joint intervals not to exceed 30'-0". Transverse construction joints in footing are acceptable providing clean and roughened surface and continuous reinforcement through the joint.
10. Perform shear key excavation with care to provide key dimensions indicated. Remove loose material and pour concrete against undisturbed foundation soil in the footing and key excavation.
11. Do not backfill wall until all trenching that may be necessary in front of wall is backfilled and compacted, and compacted toe fill is in place to top of subgrade.
12. For intermediate wall heights that are between the wall height values given in the wall data tables, use the tabular data for the next higher wall height. For intermediate values of seismic lateral wall coefficient, kh, use tabular data for the next higher kh.
13. See Project Plans for required footing embedment.
14. See Project Plans for architectural treatment, if required. Increase concrete cover on reinforcement as required to provide architectural treatment.

Accompanied by drawings - BR706, BR707, BR708 and BR709



CASE I: Horizontal Backfill with 250 PSF Surcharge. See BR 706.



Inclined Backfill
CASE II: 3H:1V. See BR 707.
CASE III: 2H:1V. See BR 708.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

STANDARD RETAINING WALL CAST-IN-PLACE SEMI-GRAVITY FRONT FACE BATTER

2024

DATE	REVISION DESCRIPTION
01-2024	Revised notes 7,9

CALC. BOOK NO. N/A | SDR DATE 19-JAN-2024 | **BR705**

Effective Date: June 1, 2024 - November 30, 2024

01-JUL-2020

BR708.dgn

CASE III: 2H:1V BACKFILL

SEISMIC LATERAL WALL COEFFICIENT, kh=0.10																	
H	B	C	T	L	Bars a	Bars b	Bars c	Bars d, g	Bars e, f	Conc. Cu. Yd./Lin.Ft.	Reinf. Lb./Lin.Ft.	Effective Bearing Width, B' (ft) & Factored Soil Pressure, qu/ϕ (psf)					
												Service		Strength-I		Extreme-I; kh=0.1	
4'-0"	3'-2"	1'-2"	1'-0"	-----	#4 @ 18"	#4 @ 18"	-----	#4 @ 18"	#4 @ 18"	0.24	16	2.8 ft	500 psf	2.9 ft	1200 psf	3.1 ft	600 psf
6'-0"	4'-6"	1'-3"	1'-0"	-----	#4 @ 18"	#4 @ 18"	-----	#4 @ 18"	#4 @ 18"	0.39	22	4.3 ft	800 psf	4.4 ft	1800 psf	4.1 ft	1100 psf
8'-0"	6'-6"	1'-6"	1'-2"	-----	#5 @ 12"	#5 @ 12"	-----	#4 @ 12"	#4 @ 12"	0.61	48	6.3 ft	1100 psf	6.4 ft	2500 psf	5.6 ft	1600 psf
10'-0"	8'-0"	1'-9"	1'-4"	-----	#6 @ 12"	#7 @ 12"	-----	#4 @ 12"	#4 @ 12"	0.83	73	7.9 ft	1300 psf	8.0 ft	3100 psf	6.7 ft	2000 psf
12'-0"	8'-3"	2'-0"	1'-4"	1'-0"	#6 @ 9"	#6 @ 9"	#4 @ 18"	#4 @ 12"	#4 @ 12"	1.09	85	8.1 ft	1600 psf	7.9 ft	3900 psf	6.4 ft	2700 psf
14'-0"	10'-0"	3'-0"	1'-4"	1'-0"	#6 @ 6"	#6 @ 6"	#4 @ 18"	#4 @ 12"	#4 @ 12"	1.32	125	9.8 ft	1700 psf	10 .0ft	4000 psf	8.2 ft	2700 psf
16'-0"	11'-4"	3'-6"	1'-6"	1'-6"	#7 @ 8"	#8 @ 8"	#4 @ 16"	#4 @ 12"	#4 @ 12"	1.69	153	11.1 ft	2000 psf	11.3 ft	4600 psf	9.3 ft	3100 psf
18'-0"	12'-9"	3'-6"	1'-6"	1'-6"	#7 @ 6"	#9 @ 6"	#4 @ 18"	#4 @ 12"	#4 @ 12"	1.93	223	12.7 ft	2200 psf	12.5 ft	5500 psf	10.1 ft	3700 psf
20'-0"	14'-2"	4'-3"	1'-7"	2'-0"	#8 @ 6"	#9 @ 6"	#4 @ 12"	#5 @ 12"	#5 @ 12"	2.33	314	14.0 ft	2400 psf	14.0 ft	5800 psf	11.4 ft	4000 psf
22'-0"	15'-6"	4'-6"	2'-0"	2'-6"	#8 @ 6"	#9 @ 6"	#5 @ 12"	#5 @ 12"	#5 @ 12"	2.92	343	15.4 ft	2700 psf	15.2 ft	6700 psf	12.3 ft	4500 psf
24'-0"	16'-6"	5'-0"	2'-6"	2'-6"	#9 @ 6"	#9 @ 6"	#5 @ 12"	#5 @ 12"	#5 @ 12"	3.45	405	16.4 ft	2900 psf	15.9 ft	7300 psf	12.8 ft	5000 psf

SEISMIC LATERAL WALL COEFFICIENT, kh=0.20																	
H	B	C	T	L	Bars a	Bars b	Bars c	Bars d, g	Bars e, f	Conc. Cu. Yd./Lin.Ft.	Reinf. Lb./Lin.Ft.	Effective Bearing Width, B' (ft) & Factored Soil Pressure, qu/ϕ (psf)					
												Service		Strength-I		Extreme-I; kh=0.20	
4'-0"	3'-2"	1'-2"	1'-0"	-----	#4 @ 18"	#4 @ 18"	-----	#4 @ 18"	#4 @ 18"	0.24	16	2.8 ft	500 psf	2.9 ft	1200 psf	2.7 ft	800 psf
6'-0"	4'-6"	1'-3"	1'-0"	-----	#4 @ 18"	#4 @ 18"	-----	#4 @ 18"	#4 @ 18"	0.39	22	4.3 ft	800 psf	4.4 ft	1800 psf	3.2 ft	1400 psf
8'-0"	6'-6"	1'-6"	1'-2"	-----	#5 @ 12"	#5 @ 12"	-----	#4 @ 12"	#4 @ 12"	0.61	48	6.3 ft	1100 psf	6.4 ft	2500 psf	4.7 ft	2000 psf
10'-0"	7'-0"	2'-3"	1'-4"	1'-0"	#6 @ 12"	#7 @ 12"	#4 @ 24"	#4 @ 12"	#4 @ 12"	0.89	72	6.7 ft	1300 psf	6.9 ft	2900 psf	4.8 ft	2500 psf
12'-0"	8'-6"	2'-6"	1'-6"	1'-0"	#6 @ 9"	#6 @ 9"	#4 @ 18"	#4 @ 12"	#4 @ 12"	1.14	85	8.3 ft	1500 psf	8.5 ft	3600 psf	5.5 ft	3200 psf
14'-0"	10'-0"	3'-0"	2'-0"	1'-6"	#6 @ 6"	#6 @ 6"	#4 @ 18"	#5 @ 12"	#4 @ 12"	1.60	136	9.8 ft	1800 psf	9.9 ft	4200 psf	6.5 ft	3800 psf
16'-0"	12'-0"	3'-3"	2'-4"	2'-0"	#7 @ 8"	#8 @ 8"	#4 @ 16"	#5 @ 12"	#4 @ 12"	2.13	171	11.8 ft	2100 psf	12.0 ft	5000 psf	8.0 ft	4400 psf
18'-0"	16'-0"	4'-6"	2'-6"	2'-0"	#7 @ 6"	#9 @ 6"	#4 @ 18"	#5 @ 12"	#4 @ 12"	2.72	274	14.7 ft	2500 psf	14.9 ft	5900 psf	12.6 ft	4100 psf
20'-0"	18'-0"	5'-3"	3'-0"	2'-6"	#8 @ 6"	#9 @ 6"	#4 @ 12"	#6 @ 12"	#5 @ 12"	3.49	378	16.7 ft	2800 psf	16.6 ft	6600 psf	14.3 ft	4500 psf
22'-0"	20'-0"	6'-0"	3'-0"	3'-0"	#8 @ 6"	#9 @ 6"	#5 @ 12"	#6 @ 12"	#5 @ 12"	4.04	419	18 ft	3100 psf	18.3 ft	7300 psf	16.2 ft	4800 psf
24'-0"	22'-0"	7'-0"	3'-8"	3'-0"	#9 @ 6"	#10 @ 6"	#5 @ 12"	#6 @ 12"	#5 @ 12"	4.93	537	19.7 ft	3300 psf	20.0 ft	7900 psf	18.0 ft	5100 psf

SEISMIC LATERAL WALL COEFFICIENT, kh=0.30																	
H	B	C	T	L	Bars a	Bars b	Bars c	Bars d, g	Bars e, f	Conc. Cu. Yd./Lin.Ft.	Reinf. Lb./Lin.Ft.	Effective Bearing Width, B' (ft) & Factored Soil Pressure, qu/ϕ (psf)					
												Service		Strength-I		Extreme-I; kh=0.30	
4'-0"	3'-2"	1'-2"	1'-0"	-----	#4 @ 18"	#4 @ 18"	-----	#4 @ 18"	#4 @ 18"	0.24	16	2.8 ft	500 psf	2.9 ft	1200 psf	2.3 ft	900 psf
6'-0"	4'-6"	1'-3"	1'-0"	1'-0"	#4 @ 18"	#4 @ 18"	#4 @ 24"	#4 @ 18"	#4 @ 18"	0.50	24	4.1 ft	900 psf	4.2 ft	2100 psf	3.0 ft	1800 psf
8'-0"	6'-6"	1'-6"	1'-2"	1'-0"	#5 @ 12"	#5 @ 12"	#4 @ 24"	#4 @ 12"	#4 @ 12"	0.72	51	6.2 ft	1200 psf	6.2 ft	2700 psf	4.1 ft	2500 psf
10'-0"	7'-0"	2'-3"	1'-6"	1'-6"	#6 @ 12"	#7 @ 12"	#4 @ 24"	#4 @ 12"	#4 @ 12"	1.01	71	6.7 ft	1300 psf	6.8 ft	3100 psf	3.9 ft	3400 psf
12'-0"	8'-6"	2'-6"	2'-6"	2'-0"	#6 @ 9"	#6 @ 9"	#4 @ 18"	#5 @ 12"	#4 @ 12"	1.57	95	8.4 ft	1700 psf	8.4 ft	3900 psf	4.5 ft	4600 psf
14'-0"	10'-0"	3'-0"	3'-0"	3'-0"	#6 @ 6"	#6 @ 6"	#4 @ 18"	#6 @ 12"	#4 @ 12"	2.26	150	9.8 ft	2000 psf	10.0 ft	4700 psf	5.5 ft	5300 psf
16'-0"	12'-0"	3'-3"	3'-6"	3'-6"	#8 @ 8"	#8 @ 8"	#4 @ 16"	#6 @ 12"	#4 @ 12"	2.97	202	11.7 ft	2400 psf	12.0 ft	5500 psf	6.8 ft	6100 psf
18'-0"	16'-0"	4'-6"	4'-0"	4'-0"	#7 @ 6"	#9 @ 6"	#4 @ 18"	#7 @ 12"	#4 @ 12"	4.08	321	14.8 ft	2800 psf	15.0 ft	6500 psf	11.0 ft	5400 psf
20'-0"	18'-0"	5'-3"	4'-6"	4'-6"	#8 @ 6"	#9 @ 6"	#4 @ 12"	#7 @ 12"	#4 @ 12"	5.03	384	16.9 ft	3000 psf	16.7 ft	7200 psf	12.5 ft	5900 psf
22'-0"	20'-0"	6'-0"	5'-0"	5'-0"	#8 @ 6"	#9 @ 6"	#5 @ 12"	#7 @ 12"	#4 @ 12"	6.08	427	18.2 ft	3400 psf	18.5 ft	7900 psf	14.1 ft	6400 psf
24'-0"	21'-0"	7'-0"	5'-6"	5'-6"	#9 @ 6"	#10 @ 6"	#5 @ 12"	#7 @ 12"	#5 @ 12"	7.02	553	19.1 ft	3600 psf	19.4 ft	8400 psf	14.6 ft	6900 psf

Accompanied by drawings - BR705, BR706, BR707, and BR709

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

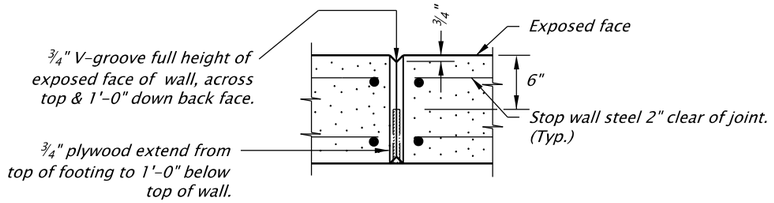
STANDARD RETAINING WALL REINFORCEMENT DETAILS CASE III: 2H:1V INCLINED BACKFILL

2024

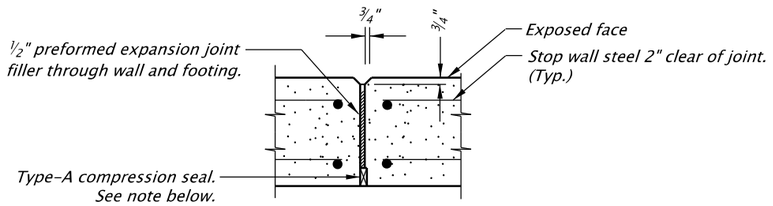
DATE	REVISION DESCRIPTION

CALC. BOOK NO. 6402, 6406, 6407 | SDR DATE 01-JUL-2020 | **BR708**

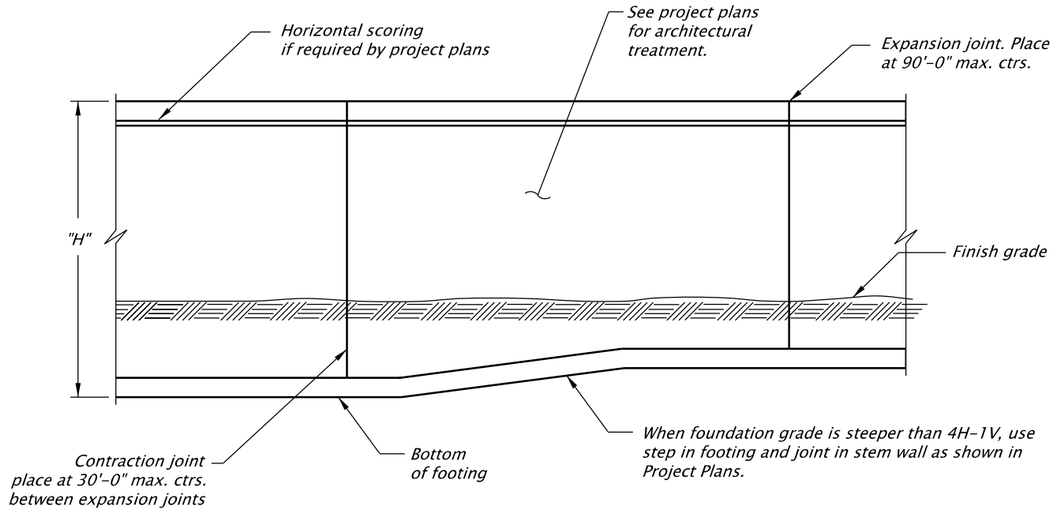
Effective Date: June 1, 2024 - November 30, 2024



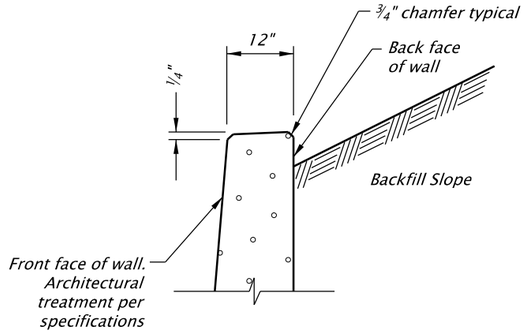
CONTRACTION JOINT
(without scoring)



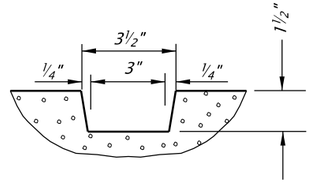
EXPANSION JOINT
(without scoring)



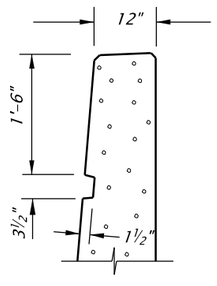
LONGITUDINAL JOINT VIEW
NONE



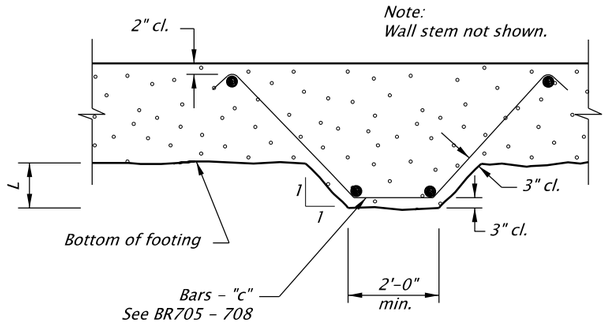
WALL TOP DETAIL



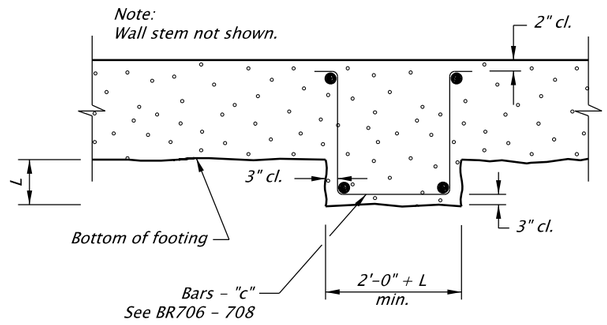
TYPICAL SCORING



HORIZONTAL SCORING
(If shown on project plans)



KEY DETAIL



ALTERNATE KEY DETAIL

NOTES:
Type-A Compression Joint Seal.

1. Install in accordance with manufacturer's recommendations from top of wall to top of footing.

2. See drg. BR139 for nominal size, joint and installation width.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

STANDARD RETAINING WALL CAST-IN-PLACE SEMI-GRAVITY JOINTS AND DETAILS

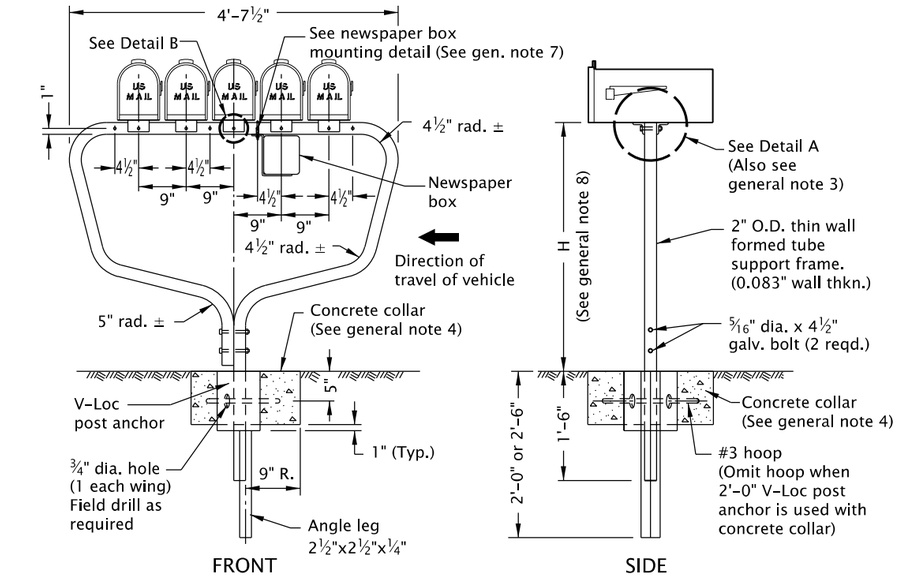
2024

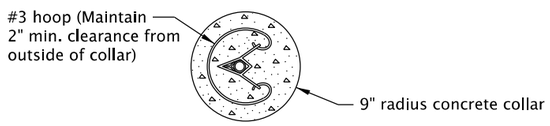
DATE	REVISION DESCRIPTION
01-2024	Note edit

CALC. BOOK NO. 6402, 6406, 6407 | SDR DATE 19-JAN-2024 | **BR709**

Effective Date: June 1, 2024 - November 30, 2024

19-JAN-2024
BR709.dgn

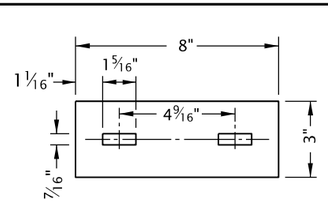




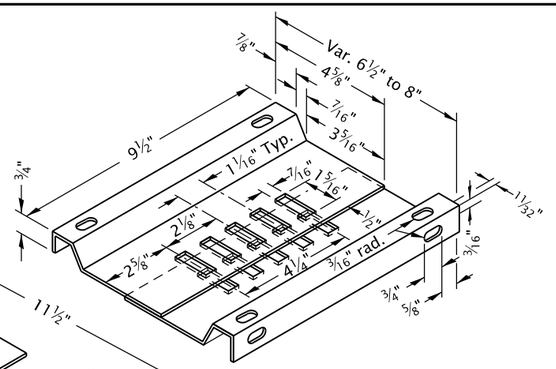
CONCRETE COLLAR
(See general note 4)

MULTIPLE SUPPORT

(Supports 5 standard (Sizes 1 & 1½) mailboxes or 4 large (Size 2) mailboxes)

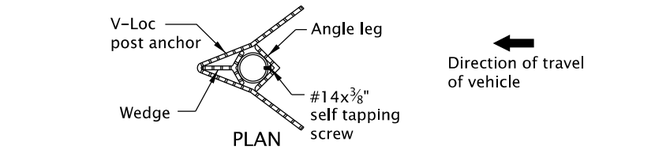


ADAPTOR PLATE
(14 ga.)



SIZE 1 & 1½
MOUNTING BRACKET
(16 ga.)

SIZE 2
MOUNTING BRACKET (16 ga.)
WITH ADAPTOR PLATE (14 ga.)



Direction of travel of vehicle

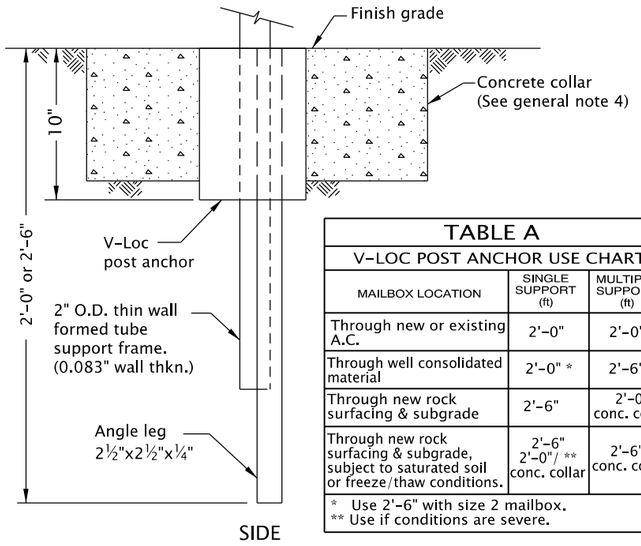


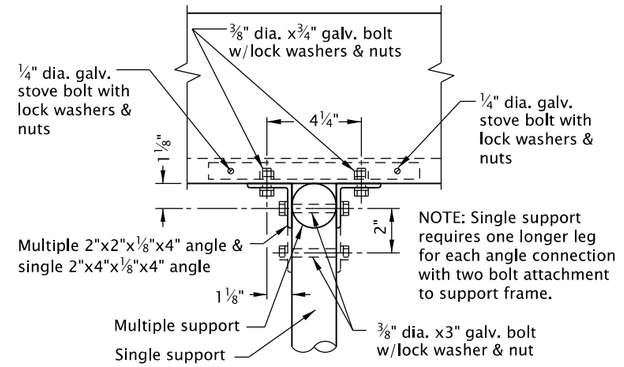
TABLE A

V-LOC POST ANCHOR USE CHART

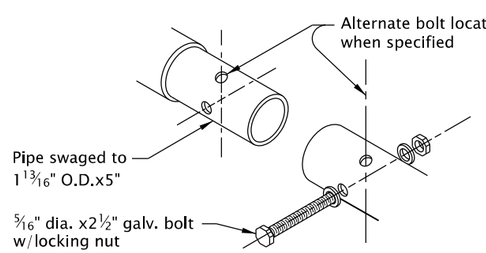
MAILBOX LOCATION	SINGLE SUPPORT (ft)	MULTIPLE SUPPORT (ft)
Through new or existing A.C.	2'-0"	2'-0"
Through well consolidated material	2'-0" *	2'-6"
Through new rock surfacing & subgrade	2'-6"	2'-0" conc. collar
Through new rock surfacing & subgrade, subject to saturated soil or freeze/thaw conditions.	2'-6" 2'-0"/ ** conc. collar	2'-6"/ conc. collar

* Use 2'-6" with size 2 mailbox.
** Use if conditions are severe.

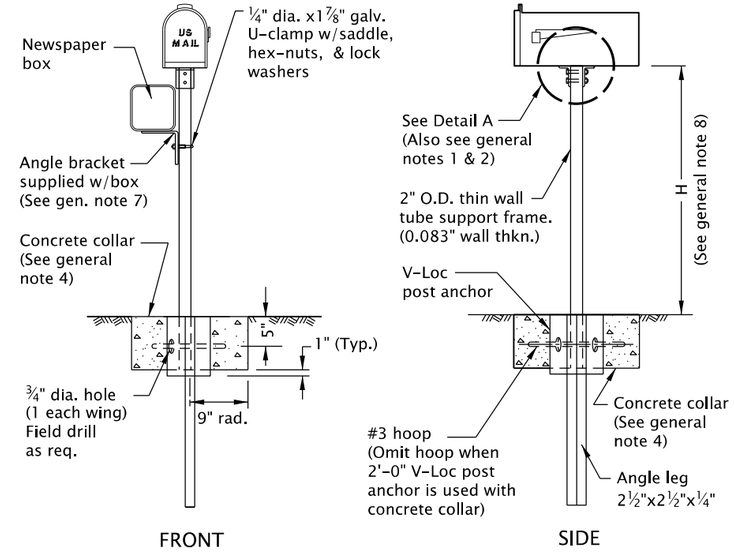
POST MOUNTING SOCKET



DETAIL A



DETAIL B



SINGLE SUPPORT

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Angle connections to be parallel to traffic flow for Size 2 mailbox mounted on single post.
2. All holes in the tube support frame are to be predrilled by the manufacturer.
3. Size 2 mailbox mounted on a multiple support requires 2 each ⅜" dia. x⅝" galv. bolts with lock washers and nuts to attach the adaptor plate to the mounting bracket. The unit will then require 4 angle connections to attach to the formed tube support frame. See Detail A.
4. Provide concrete collar when any of the following conditions exist:
   a) when required in Table A
   b) when required by project plans
   c) as directed by the Engineer
   Concrete collar, when required, to be poured in place after V-Loc post anchor has been installed, level and plumb. Do not excavate below bottom of V-Loc post anchor. Care shall be taken that no concrete is placed within anchor.
5. Other proprietary products available as listed in ODOT's QPL.
6. For mailbox installation locations, see Std. Dwg. RD101 and project plans.
7. For Newspaper Box Mounting Detail, see Std. Dwg. RD101.
8. Mounting height (H) shall be from 41″ Min. to 45″ Max. (42" nominal), measured from vehicle driving surface.
9. See project plans for detail not shown.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MAILBOX SUPPORT

2024

DATE	REVISION DESCRIPTION
12-2023	REVISED NOTES AND DETAILS

CALC. BOOK NO. N/A | SDR DATE 19-JAN-2024 | **RD100**

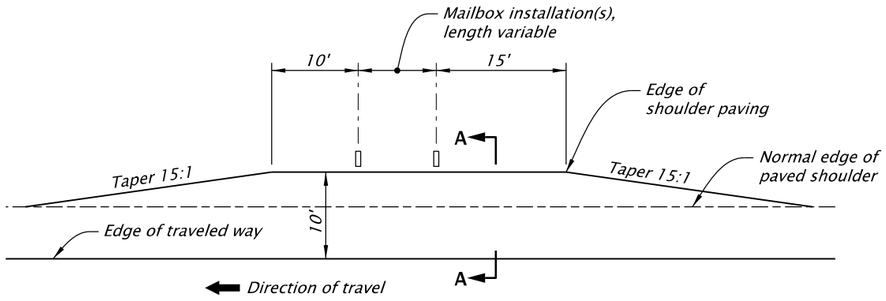
19-JAN-2024

RD100.dgn

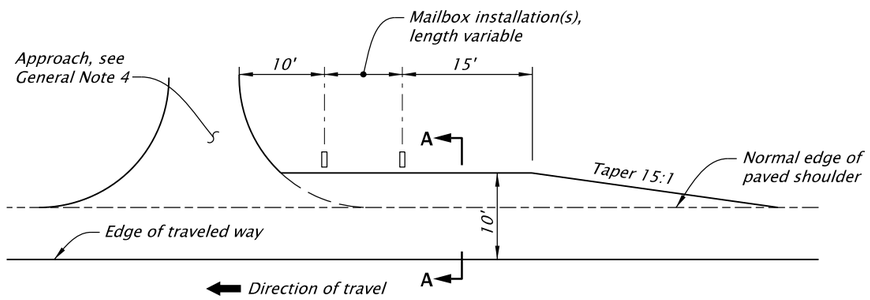
Effective Date: June 1, 2024 - November 30, 2024

19-JAN-2024

RD101.dgn

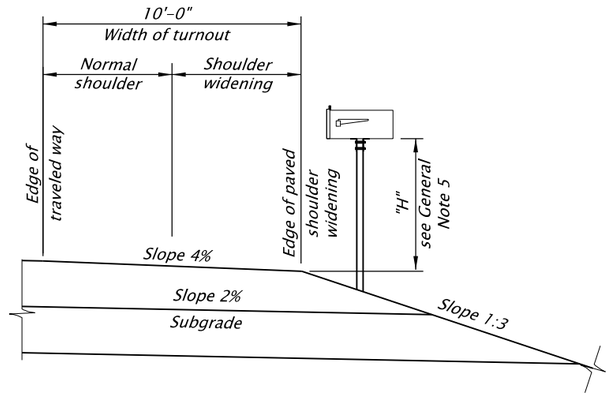


MAILBOX SERVICE TURNOUT



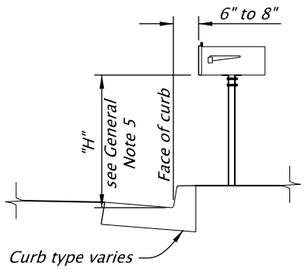
MAILBOX SERVICE TURNOUT BEFORE APPROACH

MAILBOX SERVICE TURNOUT AFTER APPROACH

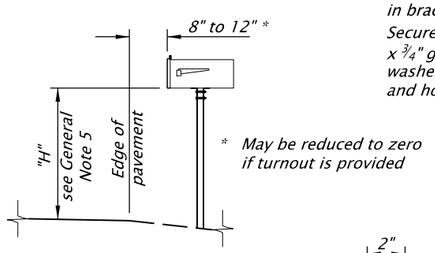


INSTALLATION AT MAILBOX TURNOUT

SECTION A-A

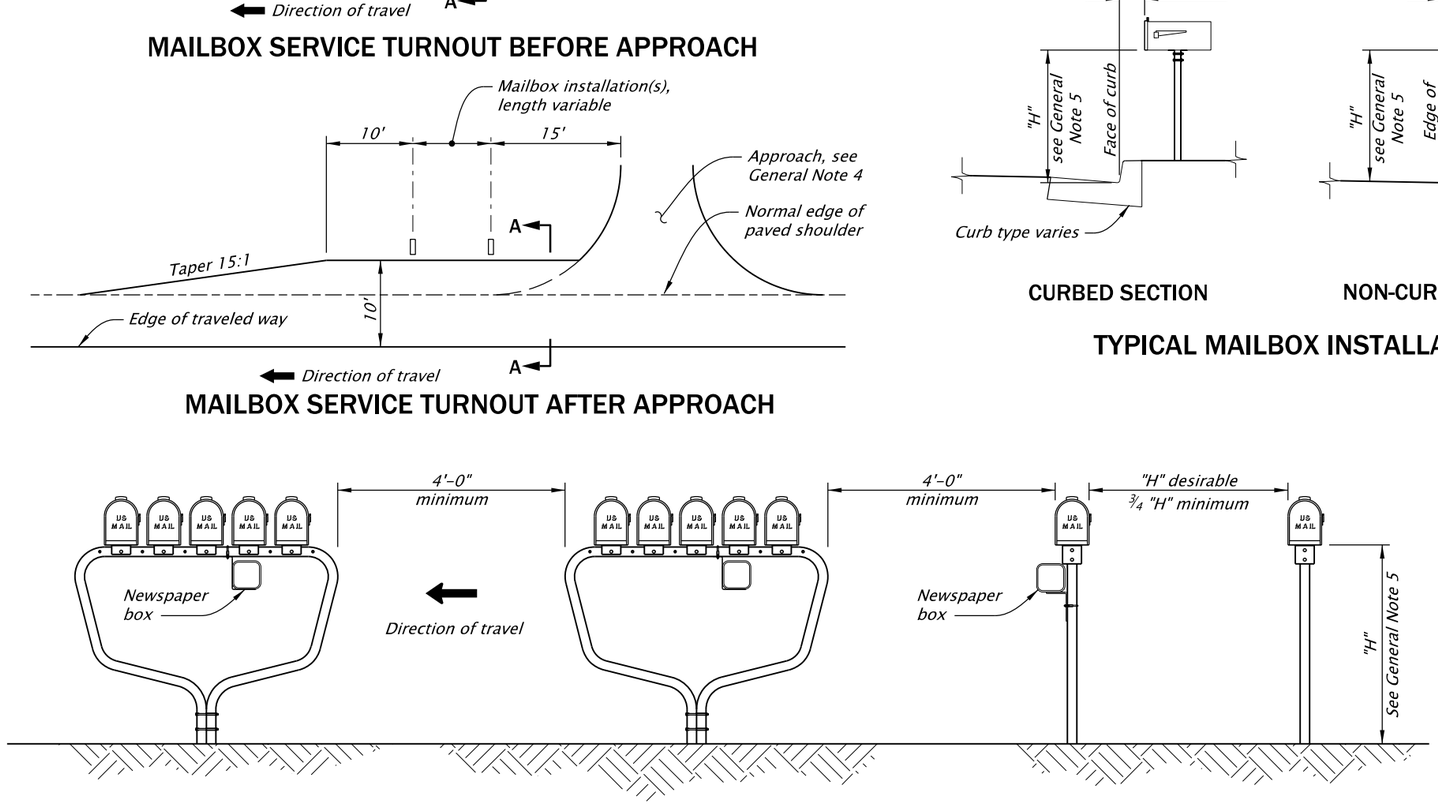


CURBED SECTION



NON-CURBED SECTION

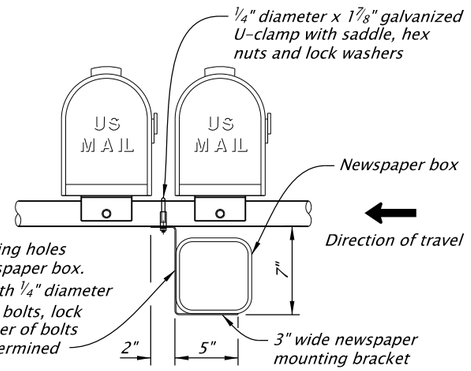
TYPICAL MAILBOX INSTALLATIONS



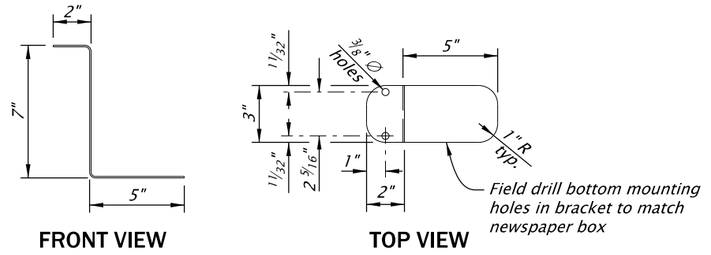
TYPICAL MAILBOX SUPPORT SPACING

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. *All holes in the tube support frame are to be predrilled by the manufacturer.*
2. *Other proprietary products available as listed in ODOT's QPL.*
3. *For mailbox support details, see Std. Dwg. RD100.*
4. *For approach details, see Std. Dwg. RD715.*
5. *Mounting height ("H") shall be from 41 inches minimum to 45 inches maximum (42 inches nominal), measured from vehicle driving surface.*
6. *See project plans for details not shown.*



NEWSPAPER BOX MOUNTING DETAIL



NEWSPAPER BOX MOUNTING BRACKET

(14 ga.)

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

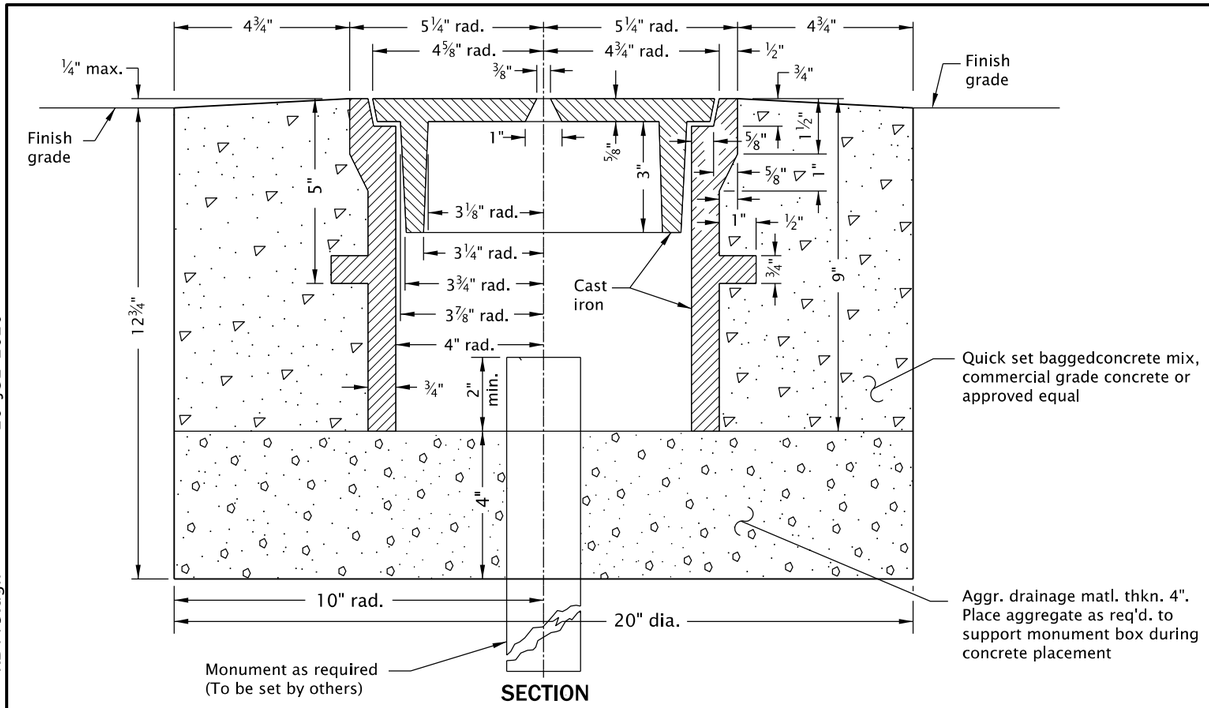
MAILBOX INSTALLATION

2024

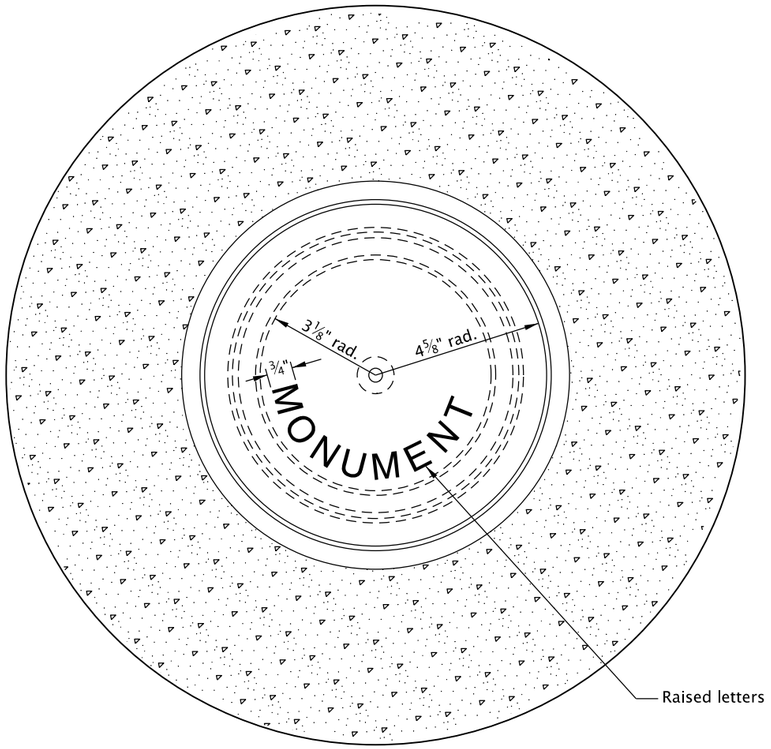
DATE	REVISION DESCRIPTION
01-2024	REVISED NOTES AND DETAILS, UPDATED DRAWING CAD STANDARDS

CALC. BOOK NO. N/A | SDR DATE 19-JAN-2024 | **RD101**

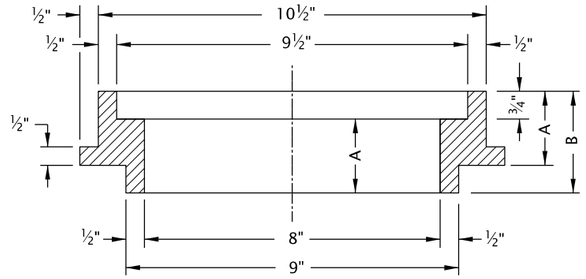
Effective Date: June 1, 2024 - November 30, 2024



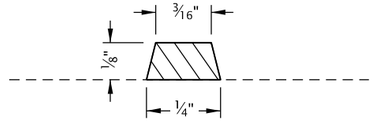
SECTION



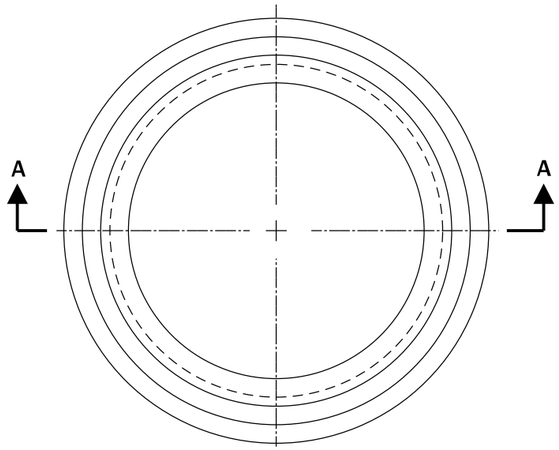
PLAN OF COVER



SECTION A-A



SECTION OF RAISED LETTER



PLAN

RISER RING

RISER RING TABLE

DIM.	RISER RING ADJUSTMENT HEIGHT			
	1½"	2"	2½"	3"
A	1½"	2"	2½"	3"
B	2¼"	2¾"	3¼"	3¾"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See project plans for details not shown.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MONUMENT BOX

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A

SDR DATE 25-JUL-2017

RD115

20-JUL-2020

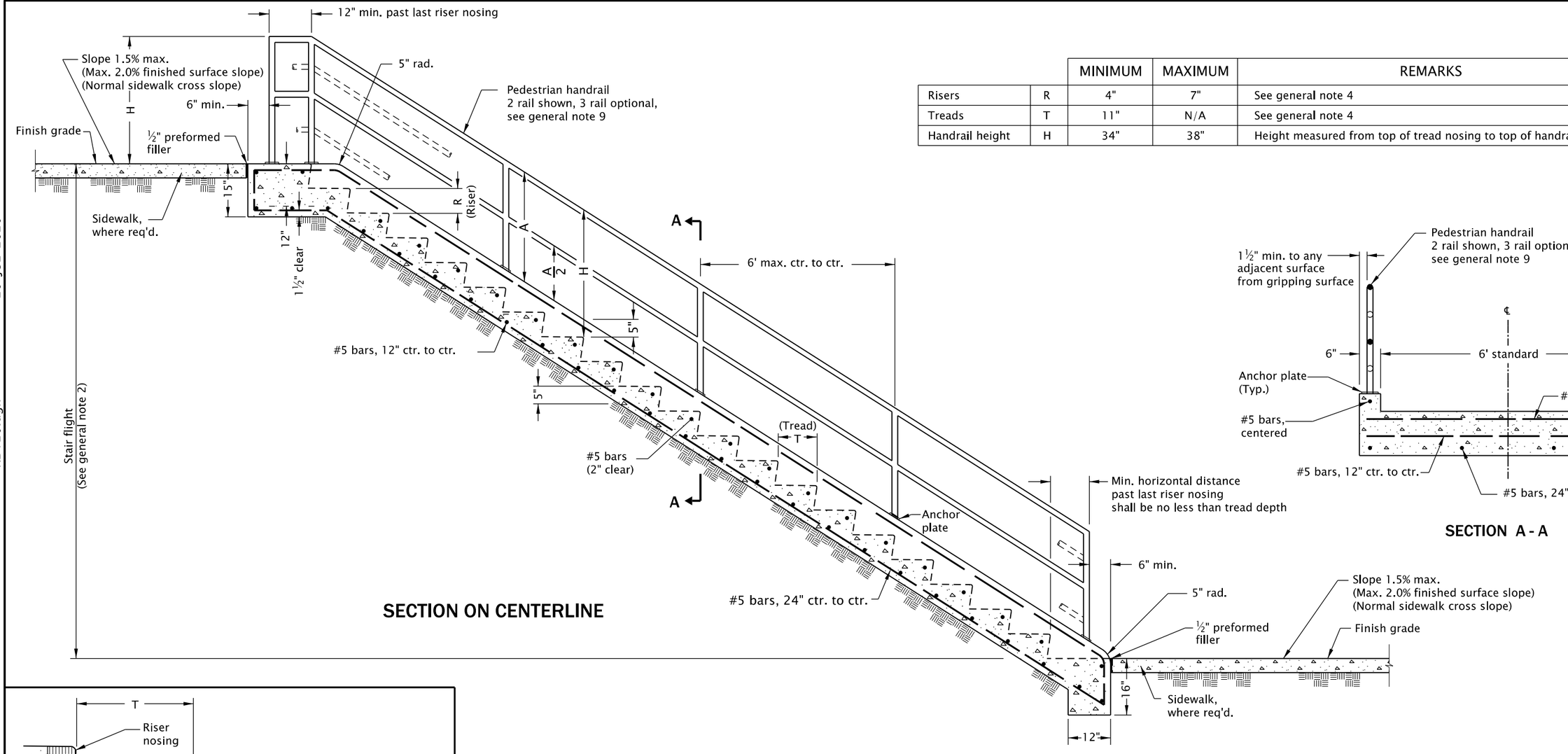
RD115.dgn

Effective Date: June 1, 2024 – November 30, 2024

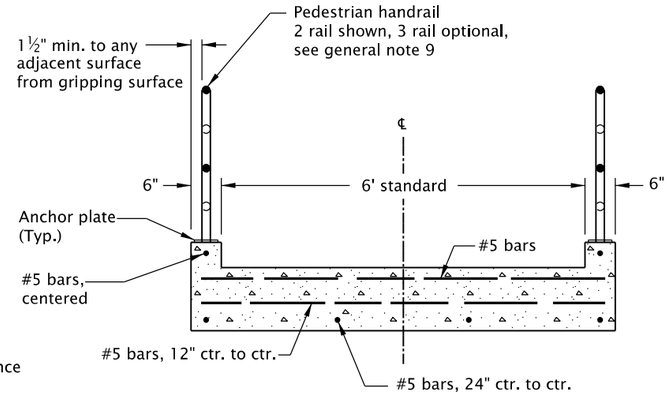
20-JUL-2020

RD120.dgn

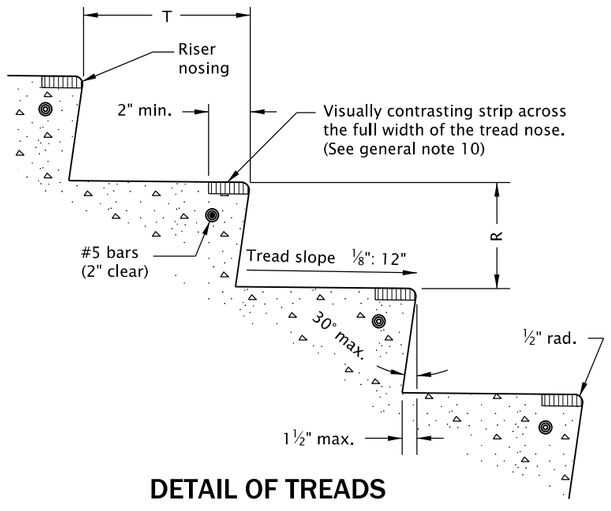
		MINIMUM	MAXIMUM	REMARKS
Risers	R	4"	7"	See general note 4
Treads	T	11"	N/A	See general note 4
Handrail height	H	34"	38"	Height measured from top of tread nosing to top of handrail



SECTION ON CENTERLINE



SECTION A - A



DETAIL OF TREADS

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Details are based on United States Access Board Standards.
2. Maximum vertical rise between finish grade of landings shall be 12'.
3. Number of steps varies. Round edges of steps and all other exposed edges to ½" radius.
4. All risers in a stair flight shall be the same height.
   All treads in a stair flight shall be the same depth.
5. Handrail height (H) to be constant within a stair flight.
6. All concrete shall be commercial grade concrete.
7. All reinforcing steel to be placed a minimum of 2" clear of nearest face of concrete unless otherwise shown or noted.
8. See Std. Dwg. RD720 for sidewalk details.
9. See Std. Dwgs. RD770 & RD771 for pedestrian handrail details.
10. Provide painted contrasting strip (color shall be safety yellow), or approved equal.
11. See project plans for details not shown.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with
the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CONCRETE STAIRWAY

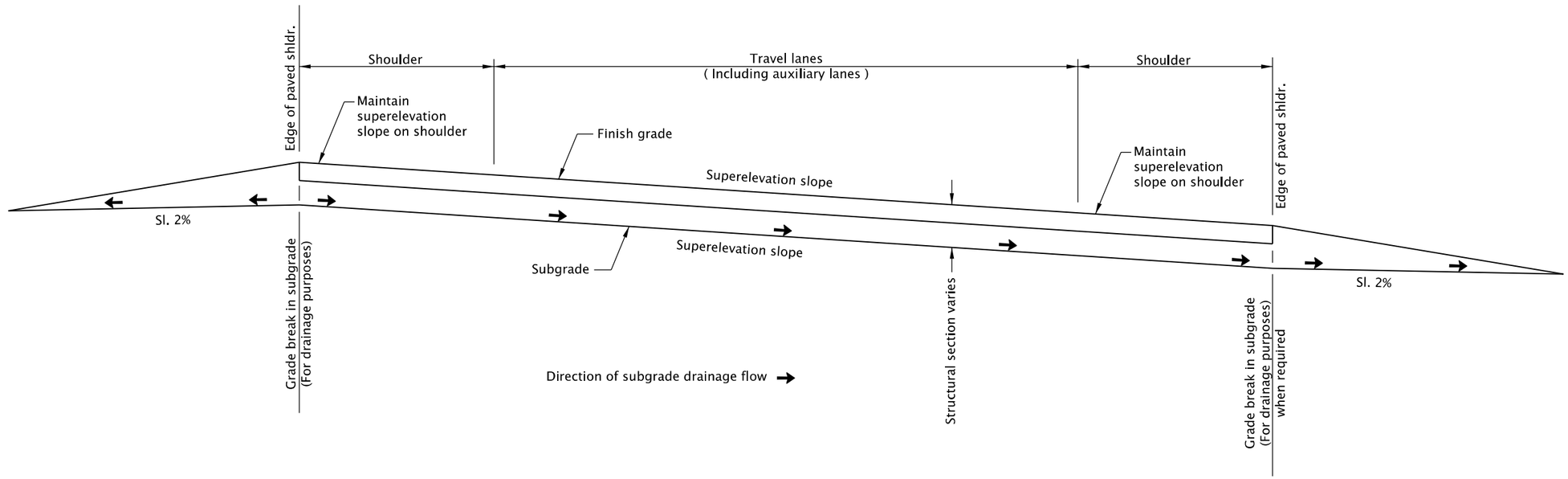
2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 16-JAN-2018 | **RD120**

Effective Date: June 1, 2024 - November 30, 2024

RD140.dgn 20-JUL-2020



GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See project plans for details not shown.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

ROADWAY CROSS SLOPES SUPERELEVATED SECTIONS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 25-JUL-2017 | **RD140**

Effective Date: June 1, 2024 – November 30, 2024

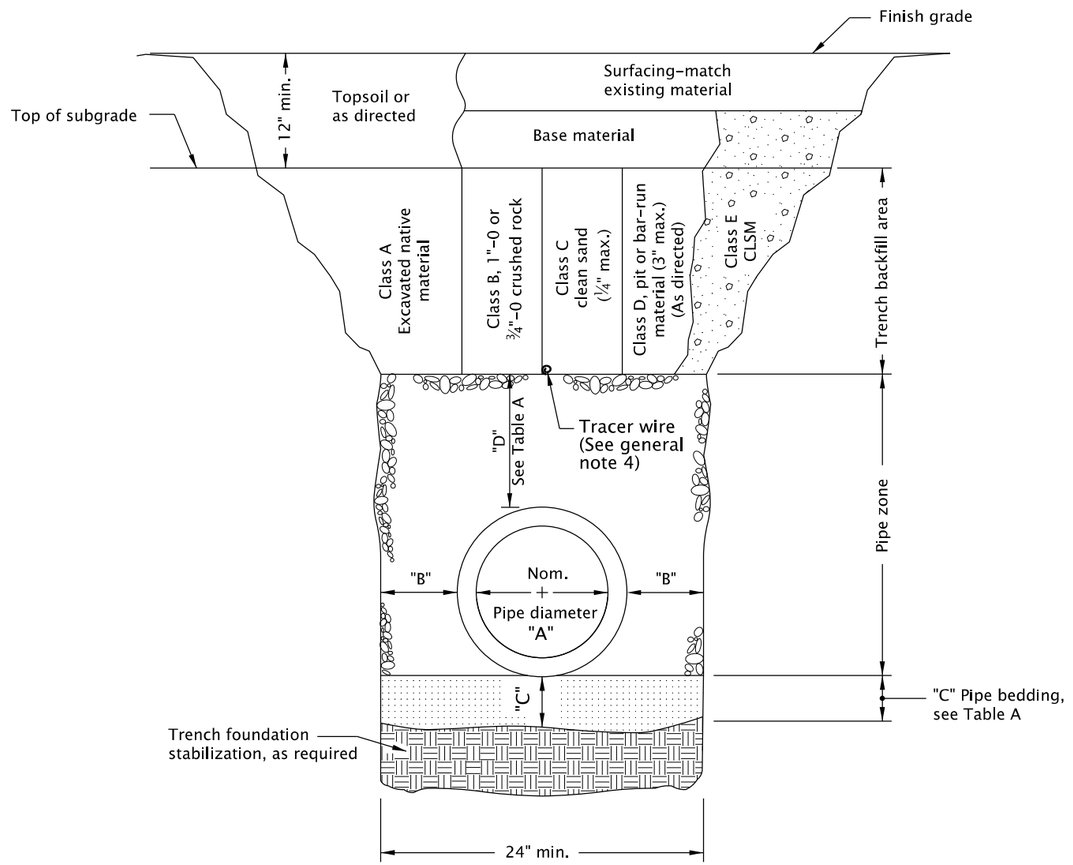
20-JUL-2020

RD300.dgn

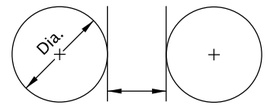
TABLE A

"A" (in)	"B" (in)	"C" (in)	"D" (in)
4	10	4	8
6	10	4	8
8	10	6	10
10	10	6	10
12	12	6	10
15	12	6	10
18	16	6	12
21	16	6	12
24	18	6	12
30	18	6	12
36	24	6	14
42	24	6	14
48	24	6	14
54	24	6	14
60	24	6	14
66	24	6	14
72	24	6	14

For pipes over 72" diameter, see general note 3.



MULTIPLE INSTALLATIONS



DIAMETER	MIN. SPACE BETWEEN PIPES
Up to 48"	24"
48" to 72"	One half (½) dia. of pipe

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Surfacing of paved areas shall comply with street cut Std. Dwg. RD302.
2. For pipe installation in embankment areas where the trench method will not be used and the pipe is ≥ 36" diameter, increase dimension "B" to nominal pipe diameter.
3. Pipes over 72" diameter are structures, and are not applicable to this drawing.
4. See Std. Dwg. RD336 for tracer wire details (When required).

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TRENCH BACKFILL, BEDDING, PIPE ZONE AND MULTIPLE INSTALLATIONS

2024

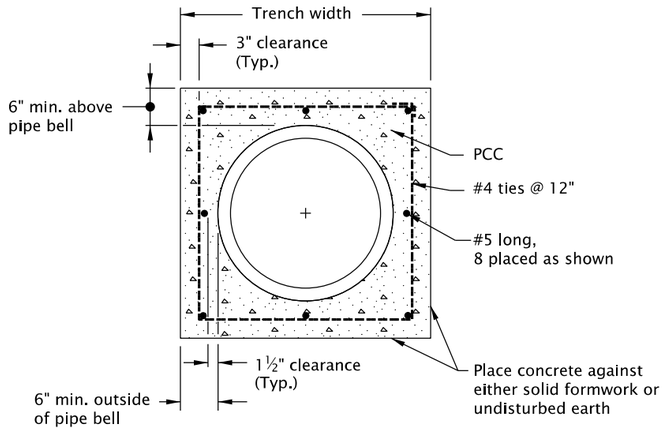
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 14-JUL-2014 | **RD300**

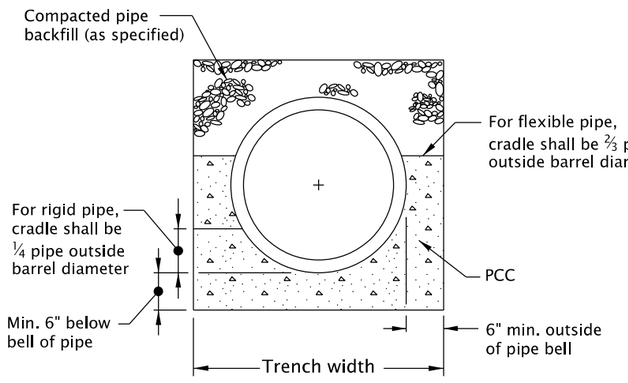
Effective Date: June 1, 2024 – November 30, 2024

20-JUL-2020

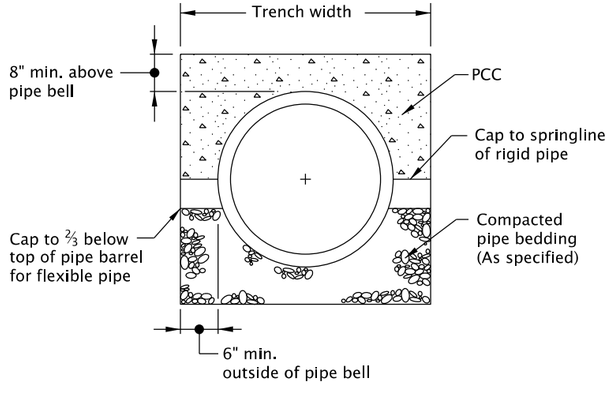
RD306.dgn



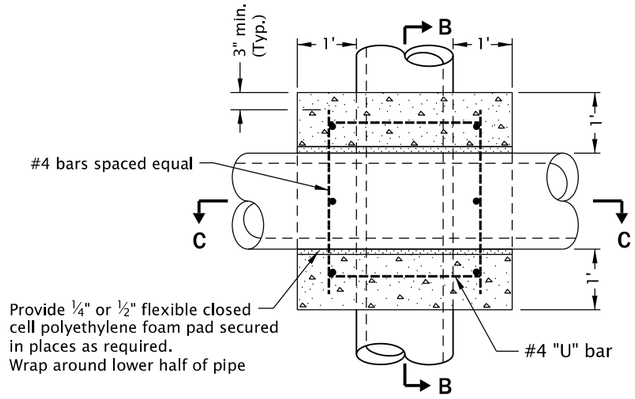
CONCRETE ENCASEMENT DETAIL



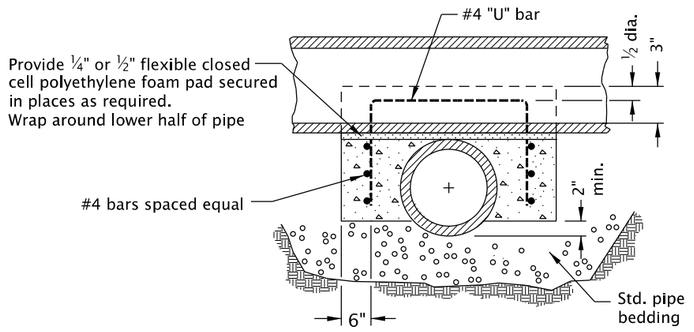
CRADLE DETAIL



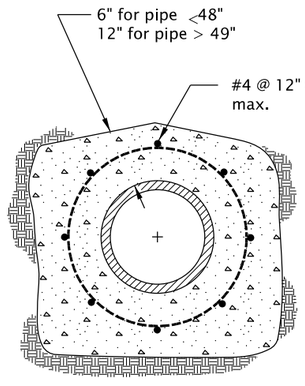
CAP DETAIL



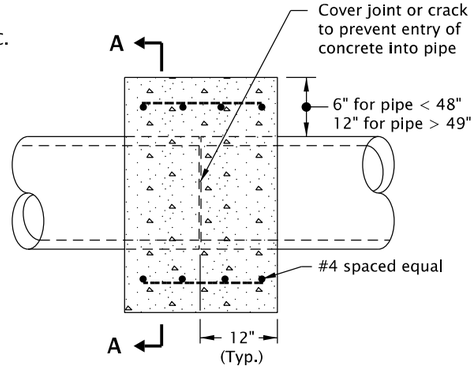
PLAN



SECTION C-C



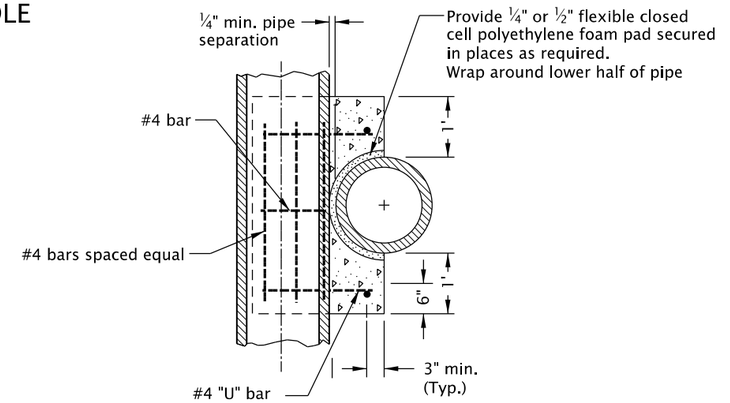
SECTION A-A



PLAN

REINFORCED CONCRETE COLLAR

SADDLE



SECTION B-B

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. End all reinforcing 3" clear of ground, forms or top surface, unless otherwise shown.
3. Trowel finish top surface of saddle, and cradle.
4. Reinforcement shall be # 4 vertical & horizontal bars as shown.
5. See Std. Dwg. RD300 for trench backfill, bedding, etc.
6. See Std. Dwg. RD336 for tracer wire details (When required).
7. Pipe over 72" diameter are structures, and are not applicable to this drawing.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

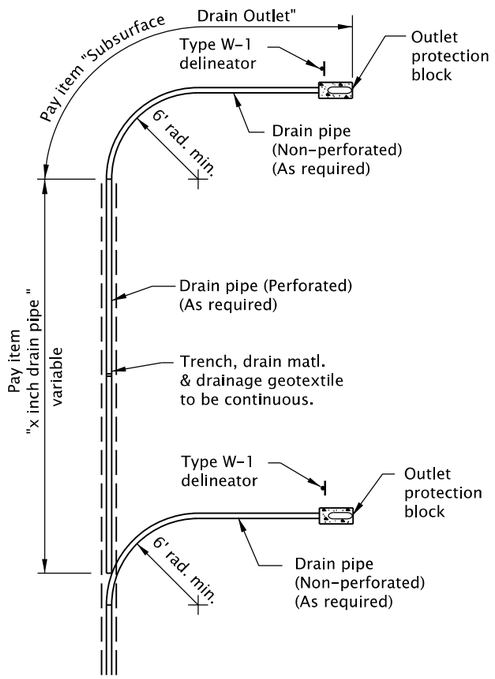
CONCRETE ENCASEMENT, CRADLE, AND CAP DETAILS

2024

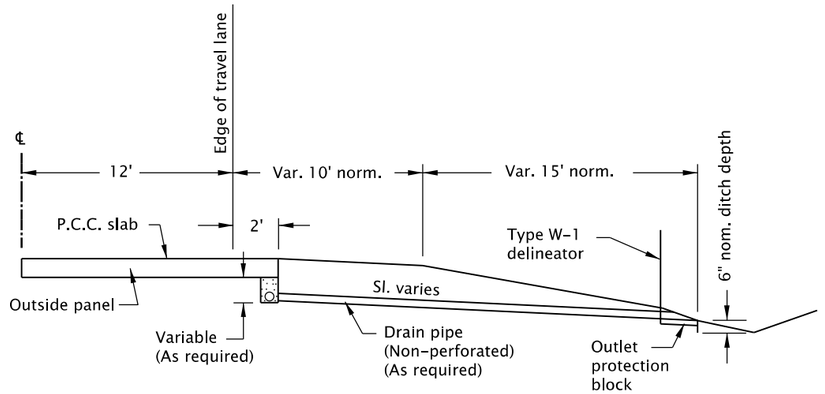
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 14-JUL-2014 | **RD306**

Effective Date: June 1, 2024 – November 30, 2024

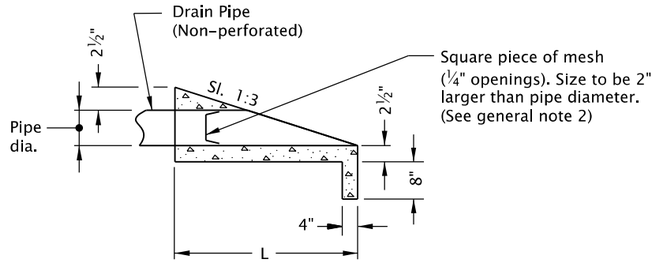


PLAN



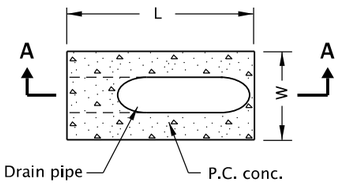
ELEVATION

SUBSURFACE DRAIN OUTLET



SECTION A-A

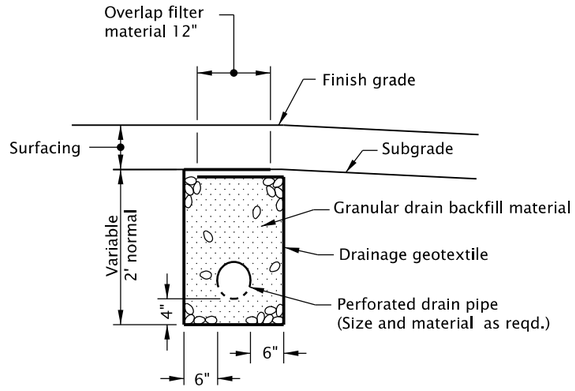
PIPE DIA. (in)	L NOM. (in)	W NOM. (in)
3	24	12
4	24	12
6	33	14
8	42	16



PLAN

OUTLET PROTECTION BLOCK

TYPE 1 SUBSURFACE DRAIN INSTALLATION



SECTION

SUBSURFACE DRAIN DETAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. In guard rail areas extend outlet protection block to back of guard rail post min.
2. Mesh for rodent control to be galvanized wire or approved equal.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SUBSURFACE DRAIN

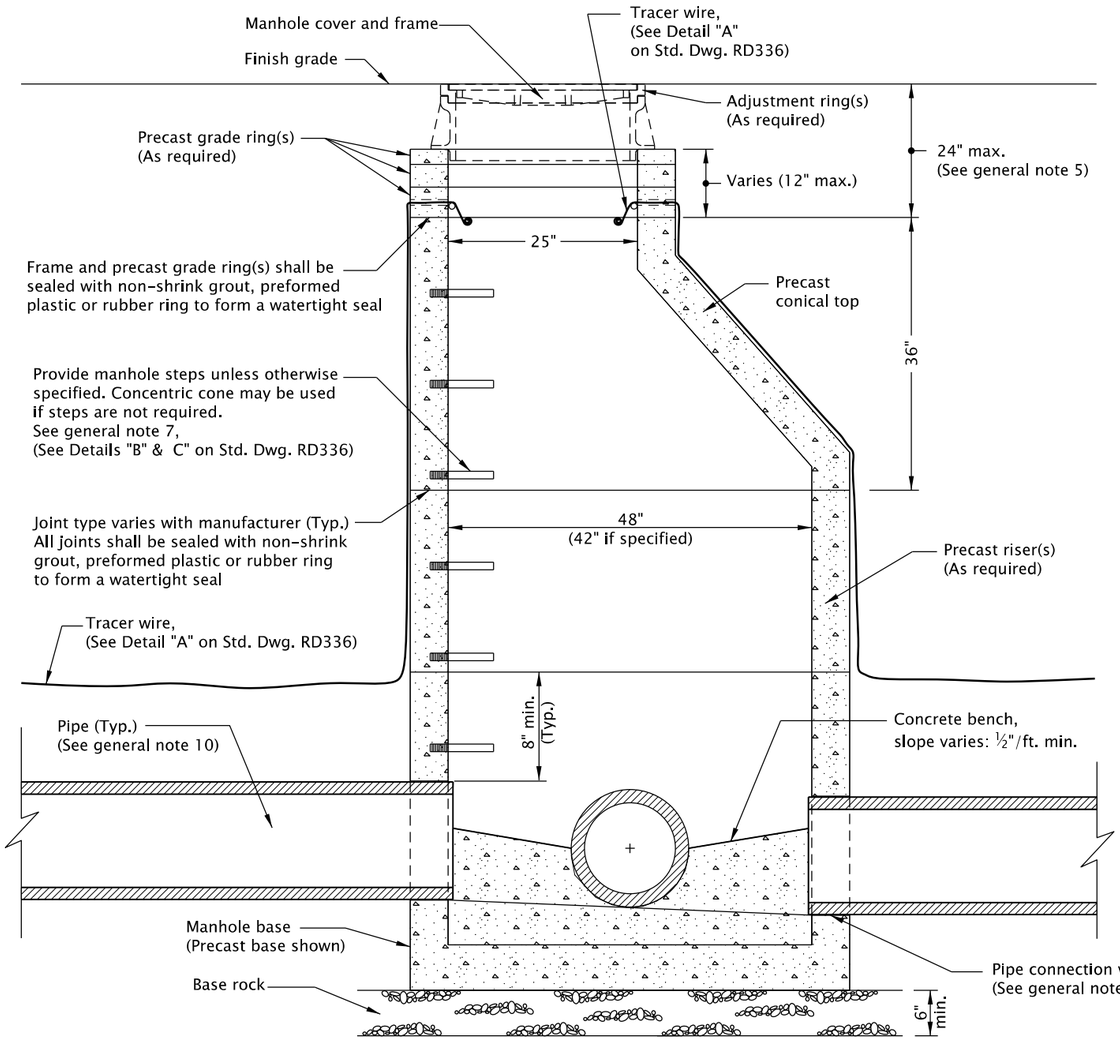
2024

DATE	REVISION DESCRIPTION

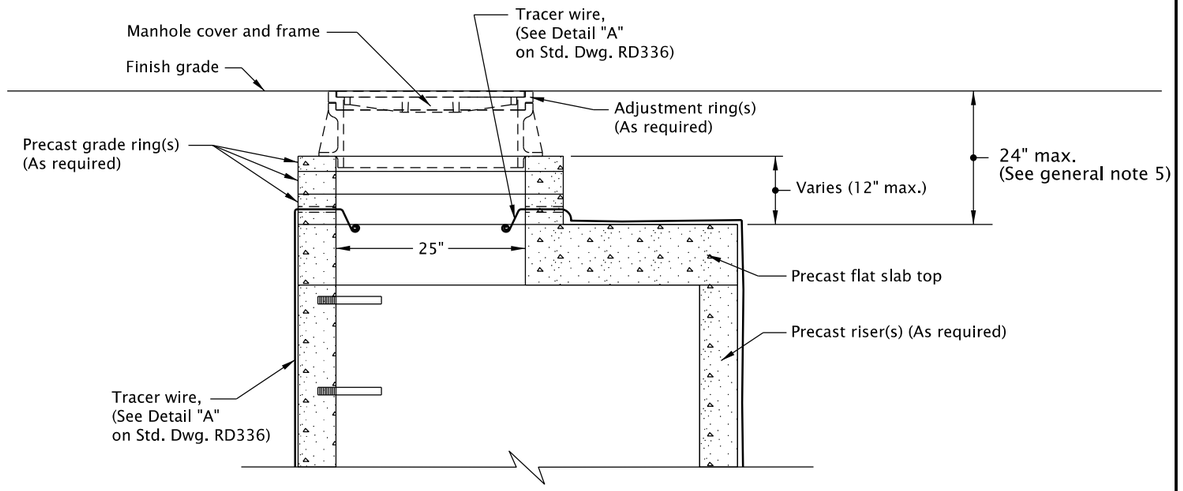
CALC. BOOK NO. N/A | SDR DATE 21-JUL-2015 | **RD312**

Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020
RD335.dgn



MANHOLE WITH PRECAST CONICAL TOP



MANHOLE WITH PRECAST FLAT SLAB TOP

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 48". Use 42" if specified by the Engineer.
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section.
5. Adjust 24" maximum.
6. All connecting pipes shall have a tracer wire, or approved alternate.
7. See Std. Dwg. RD336 for manhole steps.
8. See Std. Dwg. RD336 for details not shown.
9. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD342 for shallow manholes.
12. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

STANDARD STORM SEWER MANHOLE

2024

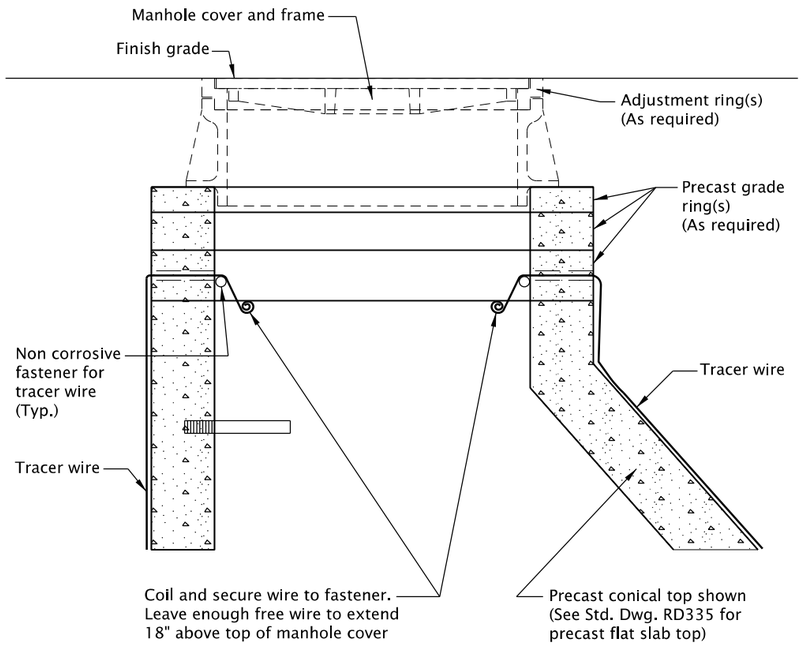
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 21-JUN-2019 | **RD335**

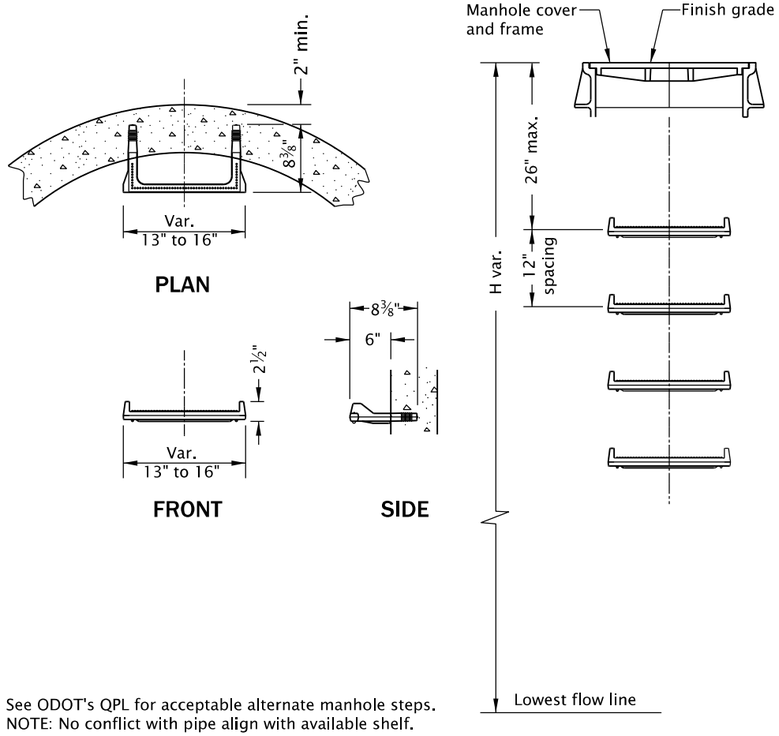
Effective Date: June 1, 2024 – November 30, 2024

20-JUL-2020

RD336.dgn

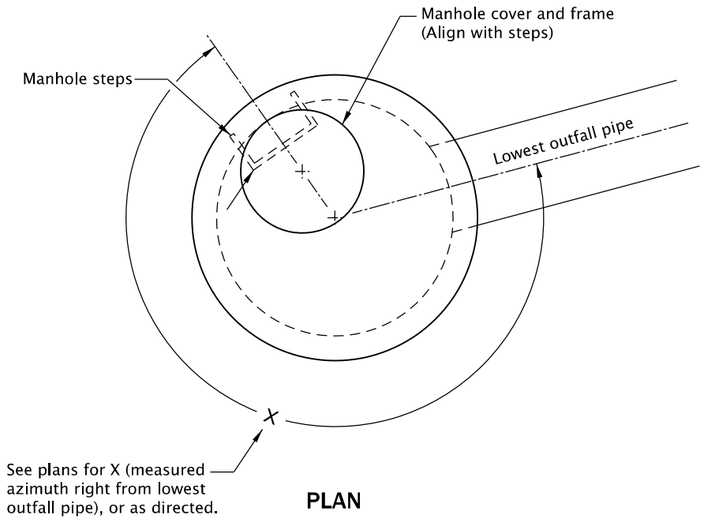


DETAIL "A"
TRACER WIRE
(See general note 6)



See ODOT's QPL for acceptable alternate manhole steps.
NOTE: No conflict with pipe align with available shelf.

DETAIL "B"
MANHOLE STEPS
(See general note 7)



DETAIL "C"
PRECAST CONICAL TOP
OR
PRECAST FLAT SLAB TOP
AND MANHOLE STEPS ORIENTATION
(See general note 7)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 48". Use 42" if specified by the Engineer.
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section.
5. Adjust 24" maximum.
6. All connecting pipes shall have a tracer wire, or approved alternate. Place tracer wire directly over pipe centerline and on top of the pipe zone material.
7. Steps shall conform to requirements of ASTM C478. When H=42" or less omit steps. See Detail "C" for alignment of steps, and manhole cover and frame.
8. See Std. Dwg. RD335 for details not shown.
9. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD342 for shallow manholes.
12. See project plans for details not shown.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

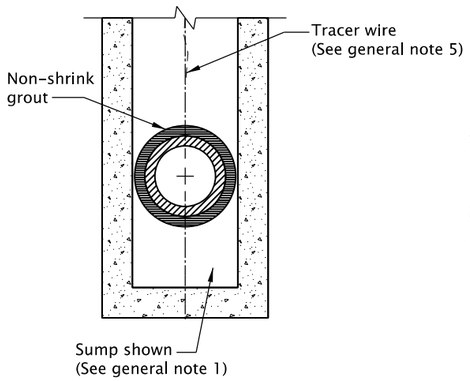
STANDARD MANHOLE DETAILS

2024

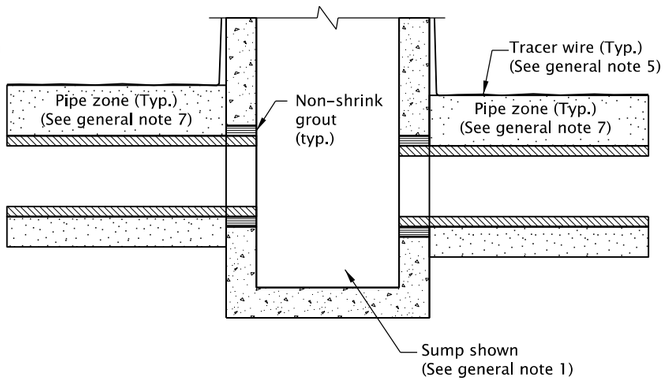
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 16-JAN-2019 | **RD336**

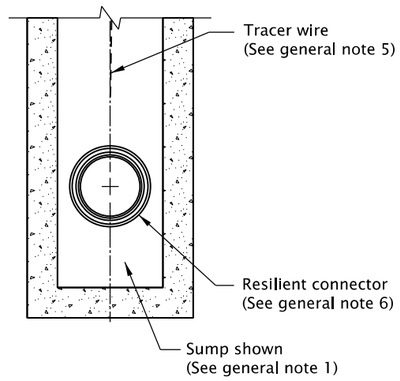
Effective Date: June 1, 2024 – November 30, 2024



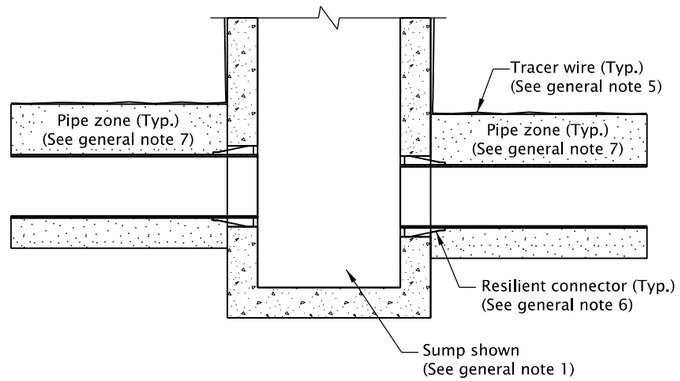
SECTION B-B



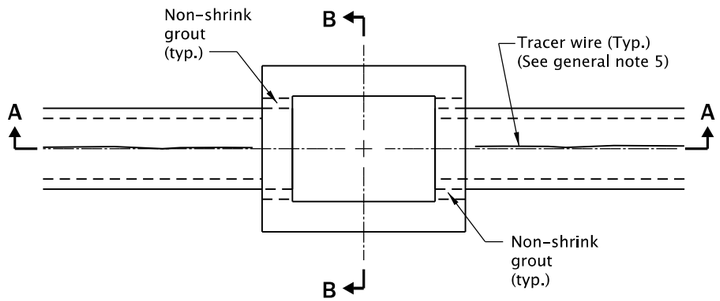
SECTION A-A



SECTION D-D

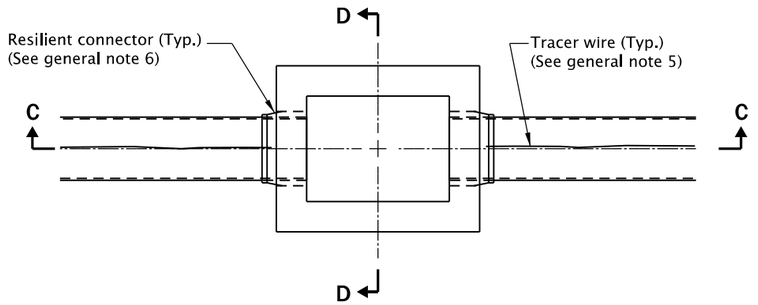


SECTION C-C



PLAN

CONNECTION OF RIGID PIPE TO STRUCTURE



PLAN

CONNECTION OF FLEXIBLE PIPE TO STRUCTURE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See Std. Dwgs. RD364, RD365, and RD366 for inlet details not shown.
2. See appropriate standard drawings or special project details for other similar structures.
3. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
4. Maximum pipe diameter varies with pipe material.
5. All connecting pipes shall have a tracer wire, or approved alternate. See Std. Dwg. RD336 for tracer wire details.
6. When flexible pipe is used, install resilient connectors conforming to requirements of ASTM C923.
7. Pipe zone varies, see Std. Dwg. RD300.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PIPE TO STRUCTURE CONNECTIONS

2024

DATE	REVISION DESCRIPTION
07-2021	REVISED NOTES
04-2022	REVISED NOTES
01-2023	REVISED DETAILS AND NOTES

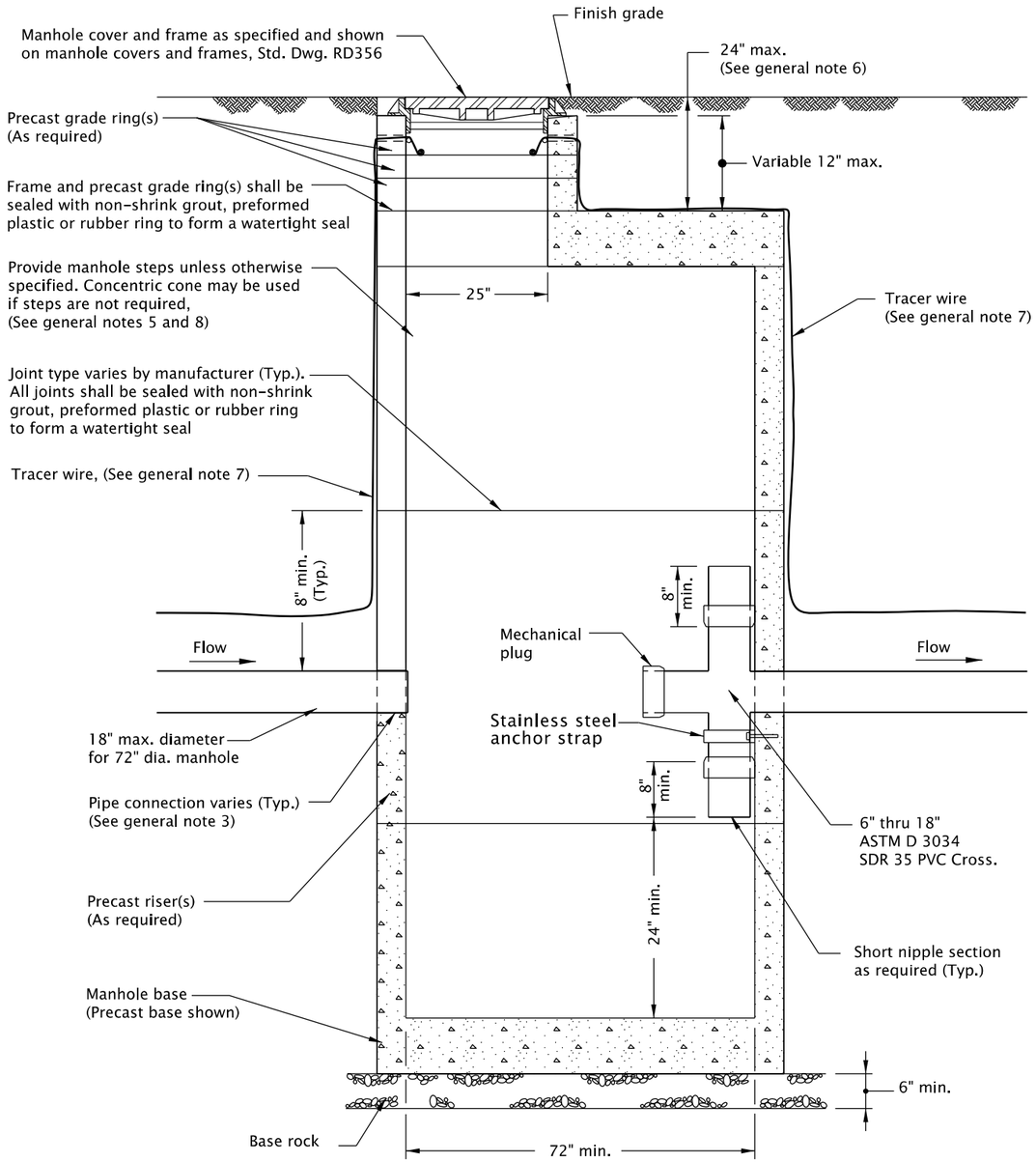
CALC. BOOK NO. N/A | SDR DATE 20-JAN-2023 | **RD339**

Effective Date: June 1, 2024 – November 30, 2024

20-JAN-2023

RD339.dgn

RD340.dgn 20-JUL-2020



GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 72".
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section, for details not shown.
5. See Std. Dwg. RD336 for manhole steps details, and flat slab top orientation.
6. Adjust 24" max.
7. See Std. Dwg. RD336 for tracer wire details.
8. See Std. Dwg. RD336 for manhole steps.
9. Max. pipe diameter varies with pipe material.
10. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

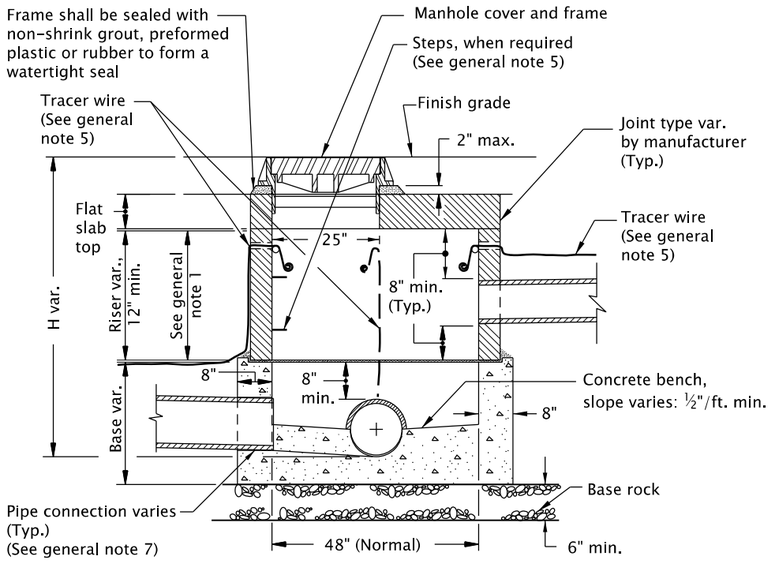
STORM SEWER POLLUTION CONTROL MANHOLE

2024

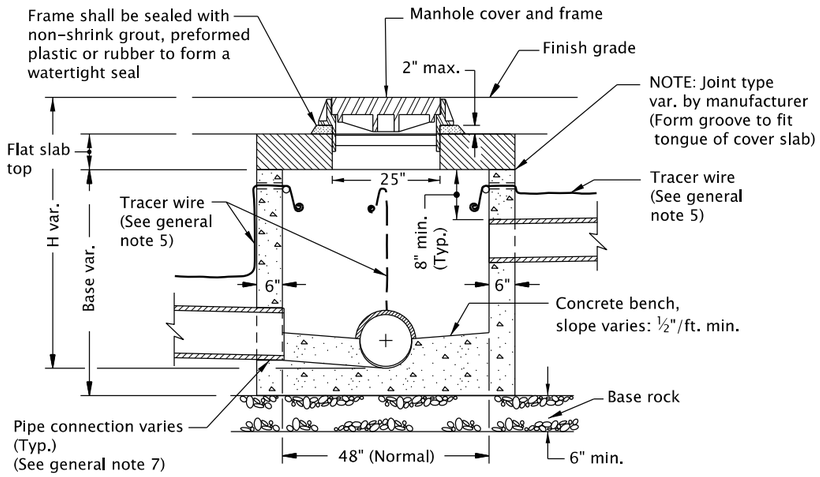
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 16-JAN-2019 | **RD340**

Effective Date: June 1, 2024 – November 30, 2024



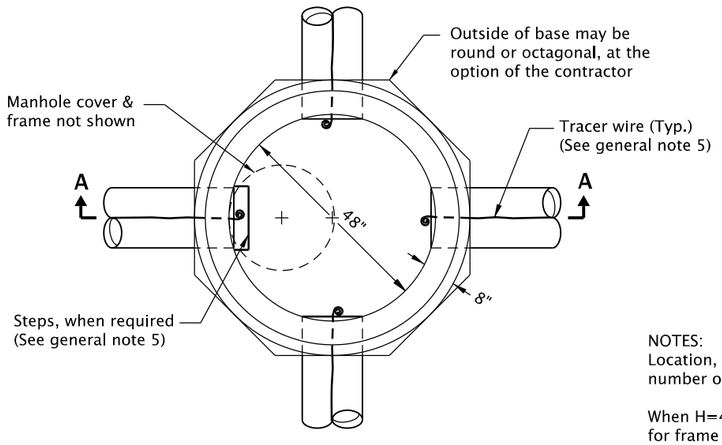
SECTION A-A
(Base, Riser & Flat Slab Top)



SECTION B-B
(Base, Riser & Flat Slab Top)

LEGEND
(See general note 3)

- Cast-in-Place concrete
- Precast concrete
- 1: 2 cement mortar
- Sewer pipe

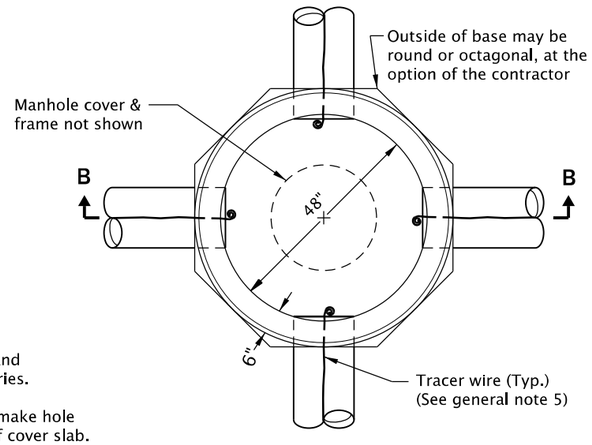


TOP VIEW
(Base, Riser & Flat Slab Top)

NOTES:
Location, elevation, and number of pipe(s) varies.

When H=42" or less make hole for frame in center of cover slab.

When H=42" or less omit steps.



TOP VIEW
(Base & Flat Slab Top)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Minimum length if laterals or connections are inserted: outside diameter of pipe + 17".
2. Use Section B-B when length of riser becomes less than minimum shown.
3. Base may be precast or cast-in-place.
4. All precast products shall conform to the requirements of ASTM C478.
5. See Std. Dwg. RD336 for details not shown.
6. See Std. Dwg. RD344 for manhole base section.
7. See Std. Dwg. RD345 for pipe to manhole connections.
8. See Std. Dwg. RD356 for manhole covers and frames.
9. All concrete shall be commercial grade concrete.
10. Max. pipe diameter varies with pipe material.
11. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SHALLOW MANHOLES

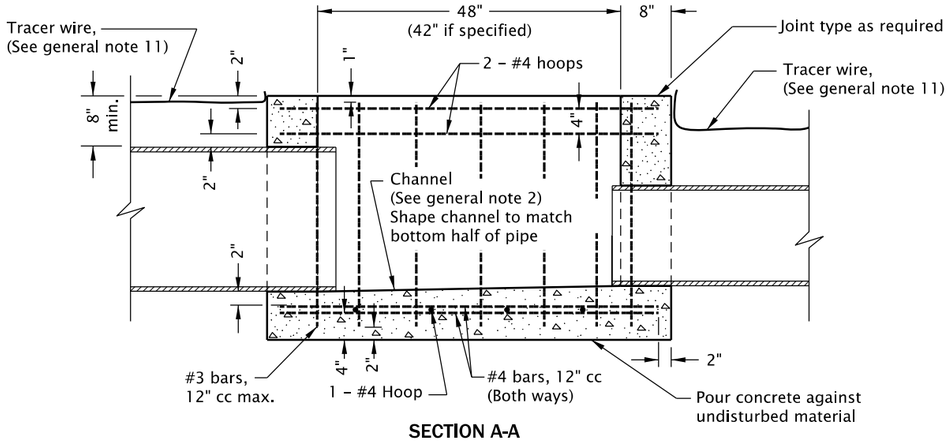
2024

DATE	REVISION DESCRIPTION

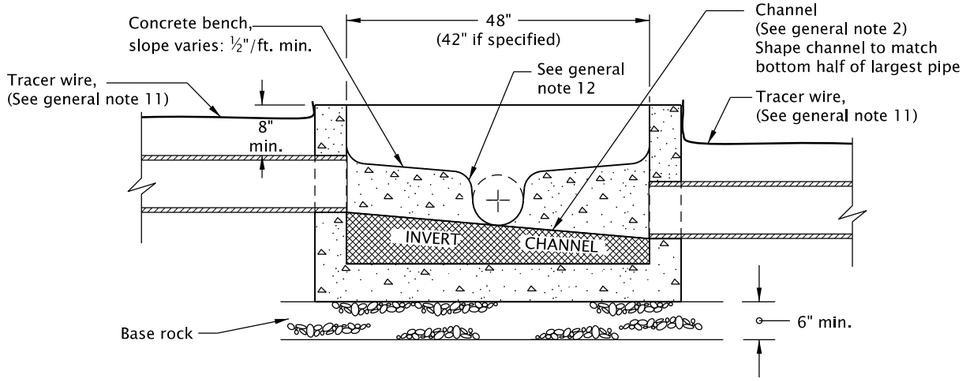
CALC. BOOK NO. N/A | SDR DATE 21-JUL-2015 | **RD342**

Effective Date: June 1, 2024 - November 30, 2024

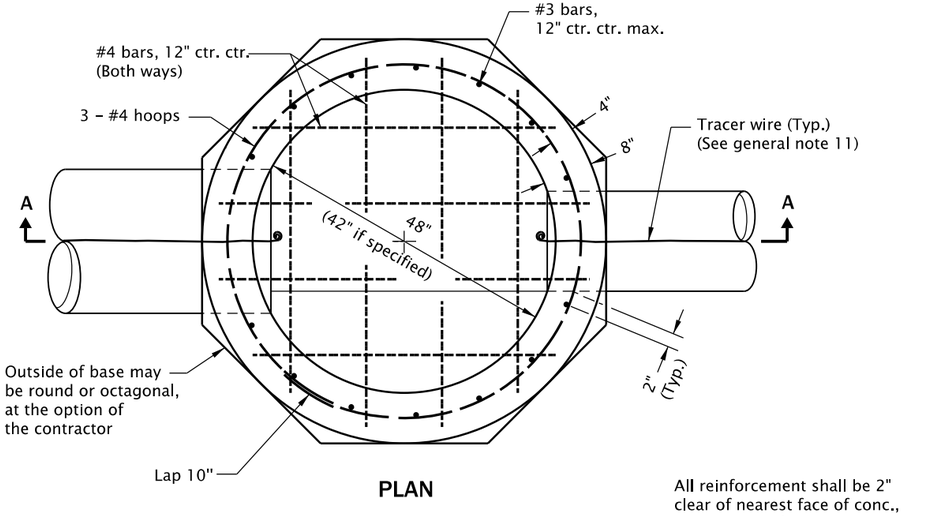
20-JUL-2020
RD342.dgn



SECTION A-A



SECTION B-B

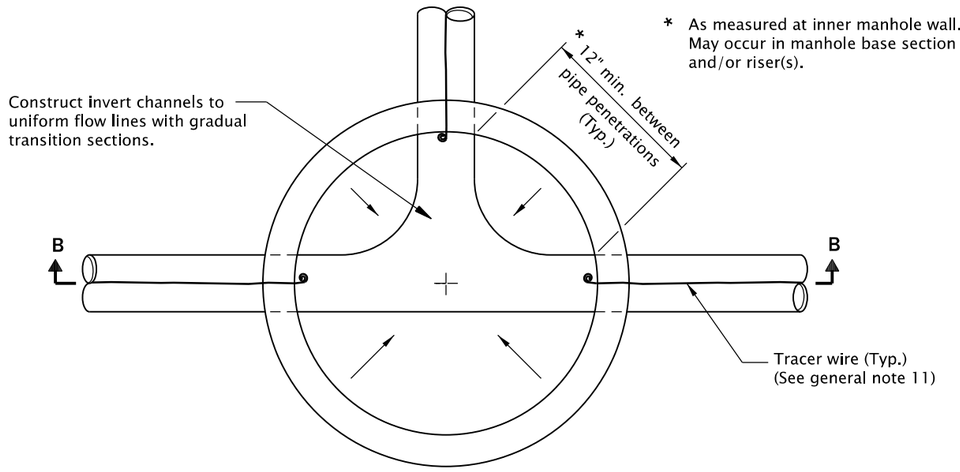


PLAN

All reinforcement shall be 2" clear of nearest face of conc., unless otherwise shown.

CAST IN PLACE MANHOLE BASE

(For invert channel details, see precast option at right)



* As measured at inner manhole wall. May occur in manhole base section and/or riser(s).

PLAN

PRECAST MANHOLE BASE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. Channels shall be constructed to provide smooth slopes and radii to outlet pipe.
3. Bases may be precast or cast in place.
4. Max. pipe diameter varies with pipe material.
5. Use on 42" and 48" diameter manhole.
6. Extend pipe into manhole and grout smooth. Pipe(s) may extend 2" max. beyond the interior manhole wall.
7. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
8. All precast products shall conform to the requirements of ASTM C478.
9. See Std. Dwg. RD345 for pipe to manhole connections.
10. See Std. Dwg. RD336 for manhole steps details.
11. See Std. Dwg. RD336 for tracer wire details.
12. At spring line of pipe, extend channel up to crown line on 12:1 batter.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

STANDARD MANHOLE BASE SECTION

2024

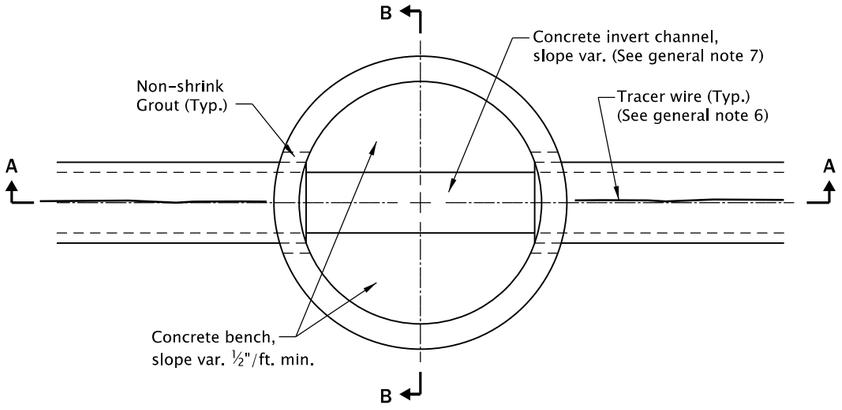
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 14-JUL-2014 | **RD344**

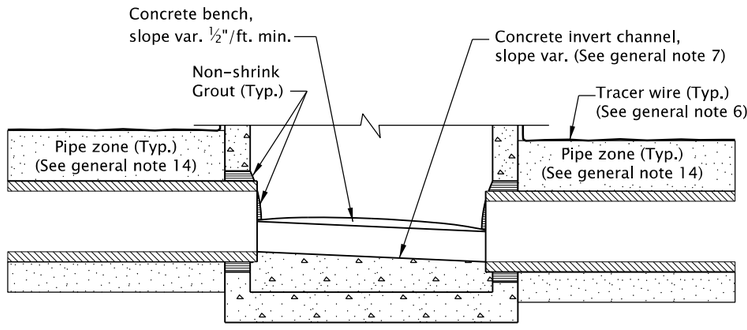
Effective Date: June 1, 2024 – November 30, 2024

20-JUL-2020

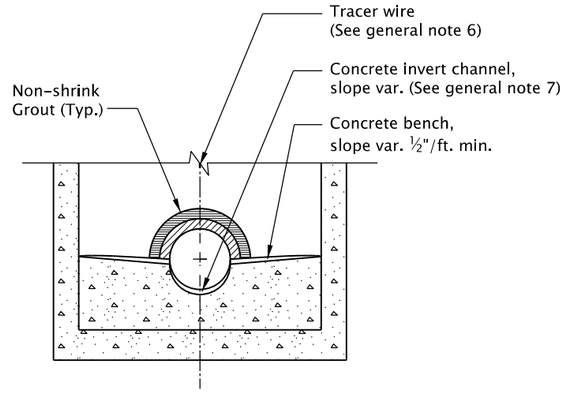
RD344.dgn



PLAN

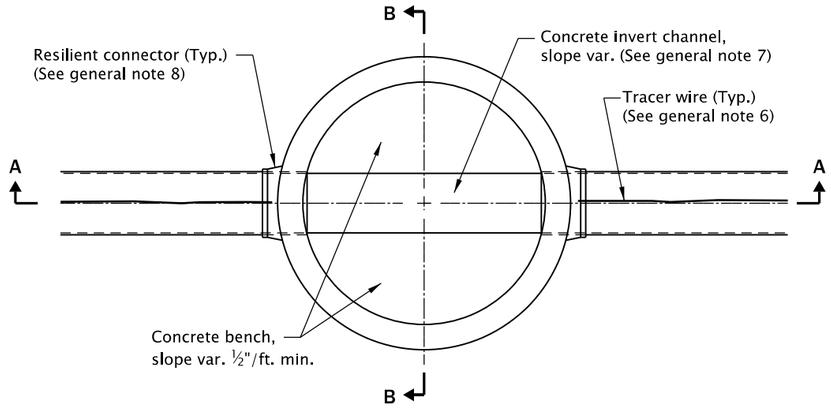


SECTION A-A

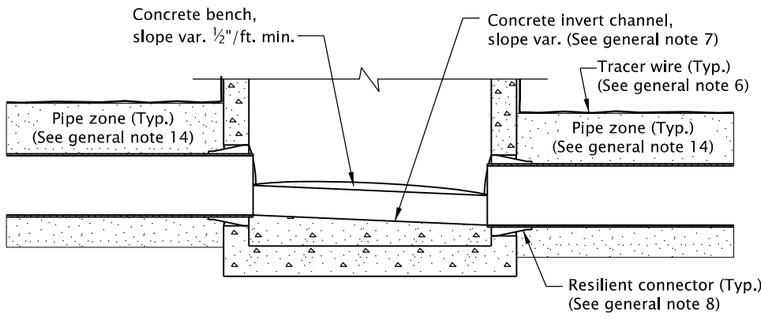


SECTION B-B

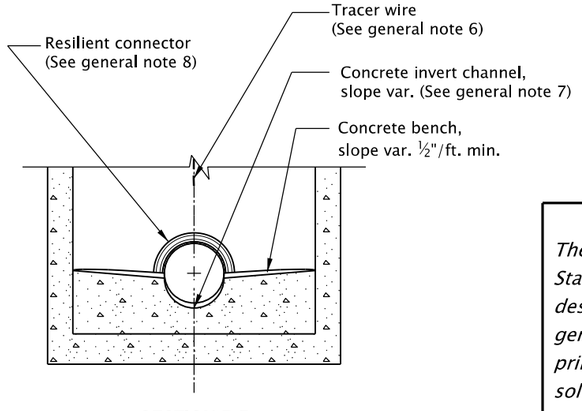
CONNECTION OF RIGID PIPE TO MANHOLE



PLAN



SECTION A-A



SECTION B-B

CONNECTION OF FLEXIBLE PIPE TO MANHOLE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. *All precast sections shall conform to requirements of ASTM C478.*
2. *Manhole base sections may be precast or cast-in-place.*
3. *All concrete shall be commercial grade concrete.*
4. *Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.*
5. *Maximum pipe diameter varies with pipe material.*
6. *All connecting pipes shall have a tracer wire, or approved alternate. See Std. Dwg. RD336 for tracer wire details.*
7. *Invert channels shall be constructed to provide smooth slopes and radii to outlet pipe.*
8. *When flexible pipe is used, install resilient connectors conforming to requirements of ASTM C923.*
9. *See Std. Dwgs. RD335, RD336, and RD338 for details not shown.*
10. *See Std. Dwg. RD336 for manhole steps details.*
11. *See Std. Dwg. RD342 for shallow manholes.*
12. *See Std. Dwg. RD344 for manhole base section.*
13. *See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.*
14. *Pipe zone varies, see Std. Dwg. RD300.*

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PIPE TO MANHOLE CONNECTIONS

2024

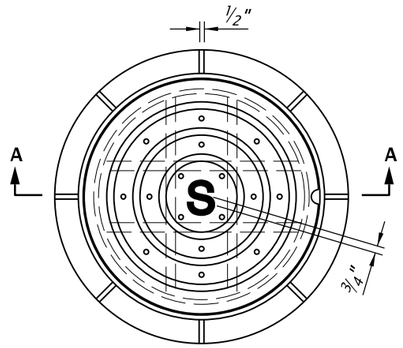
DATE	REVISION DESCRIPTION
01-2023	REVISED DETAILS AND NOTES

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2023 | **RD345**

Effective Date: June 1, 2024 - November 30, 2024

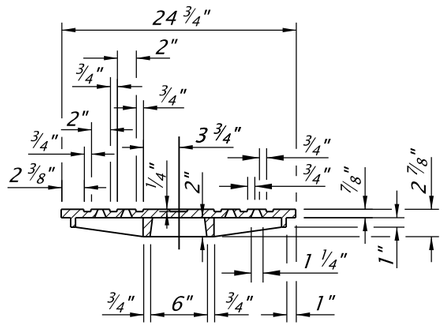
20-JAN-2023

RD345.dgn

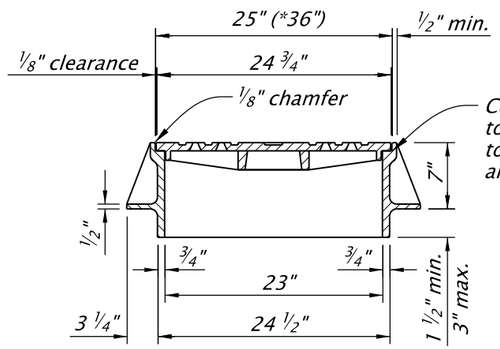


NOTE:
Coat outside of frame with asphalt where frame is to be placed in concrete, pavement, concrete gutter or walk.

PLAN



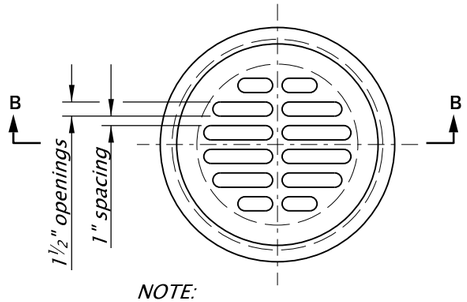
COVER SECTION A-A



**36 inch minimum diameter cover is required for mannholes with depths of 20 feet or greater. See general note 4.*

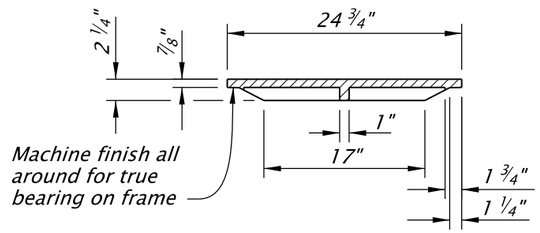
FRAME SECTION A-A

STANDARD MANHOLE COVER AND FRAME



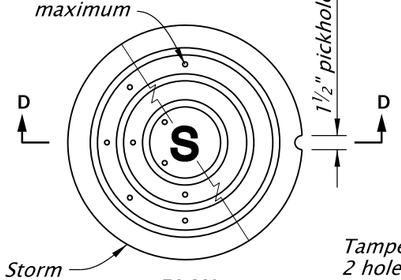
NOTE:
For use with standard manhole frame. See general note 7.

PLAN

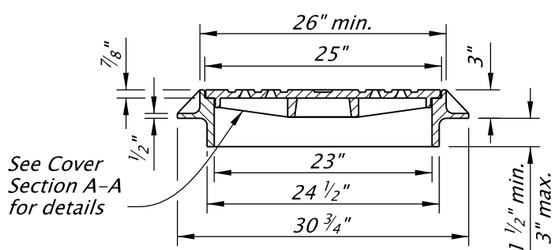


SECTION B-B

STANDARD MANHOLE GRATE



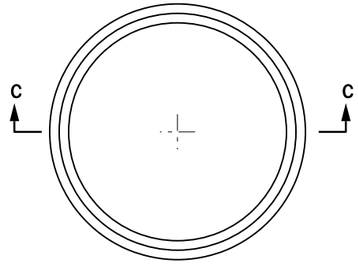
PLAN



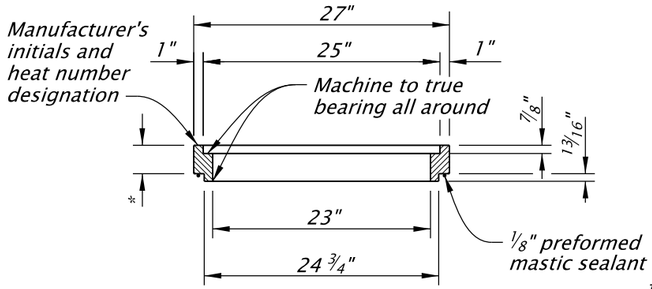
SECTION D-D

CAST IRON SUBURBAN MANHOLE COVER AND FRAME

For use on local streets only, as specified



PLAN

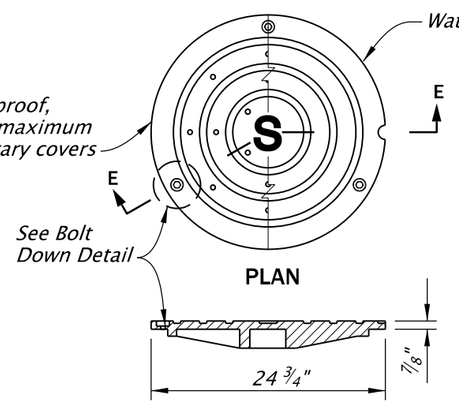


SECTION C-C

** Standard depths 1 1/2", 2", 2 1/2" and 3". Material to be grey cast iron ASTM A48, Class 35B. Tolerance on non-machined surfaces to be ±0.06". See general note 6*

MANHOLE ADJUSTMENT RING

For use with Standard Manhole Frame



PLAN

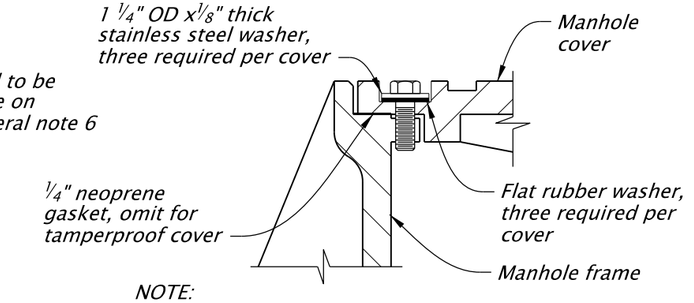
SECTION E-E

CAST IRON TAMPERPROOF AND WATERTIGHT COVER

Frames available in standard or suburban pattern

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. *Tamperproof covers required on sanitary or storm drain manhole where located in pedestrian ways or easement areas. Covers for sanitary manholes shall have two holes maximum.*
2. *Watertight covers required if located where cover may be submerged (no holes).*
3. *Covers and frames shall be stamped with manufacturer's initials, heat number and point of origin.*
4. *See Std. Dwg. RD336 for manhole steps.*
5. *See Std. Dwg. RD360 for manhole frame adjustment.*
6. *See ODOT's QPL for alternate manhole adjustment rings.*
7. *Manhole grate allowed only in locations not subject to bicycle or pedestrian use.*
8. *See ODOT's QPL for alternate bolt-down products.*



NOTE:
Three required, equally spaced, 1/2"x1 1/2" pentagonal or hexagonal head, bronze or stainless steel. Install frame so that one bolt boss is located over the manhole steps. See general note 8

BOLT DOWN DETAIL

For tamperproof and watertight covers

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

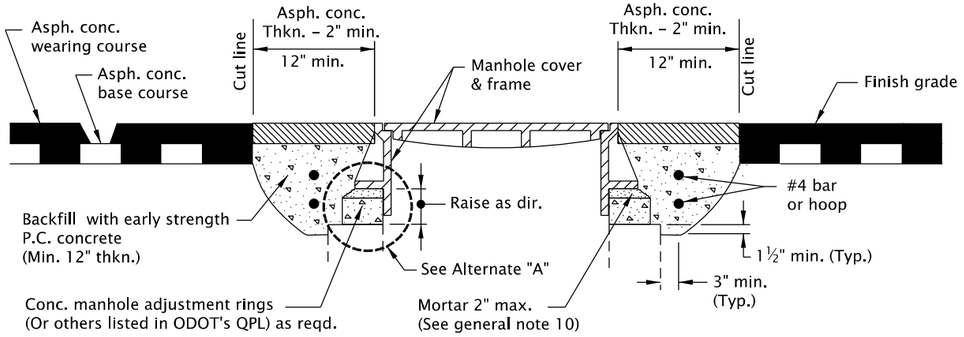
OREGON STANDARD DRAWINGS

MANHOLE COVERS AND FRAMES

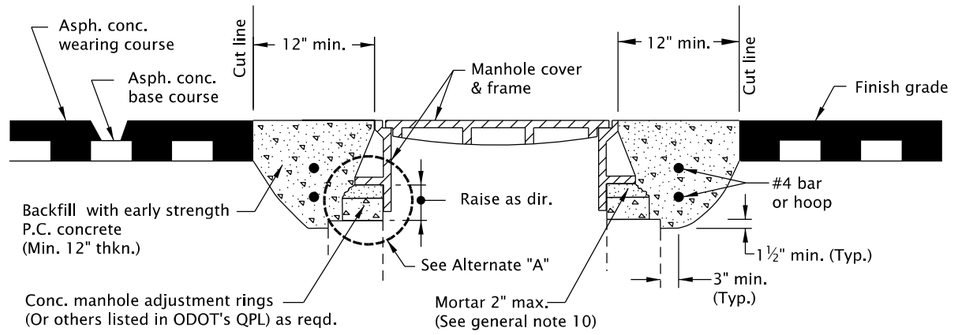
2024

DATE	REVISION DESCRIPTION
07-2022	REVISED DETAILS AND NOTES

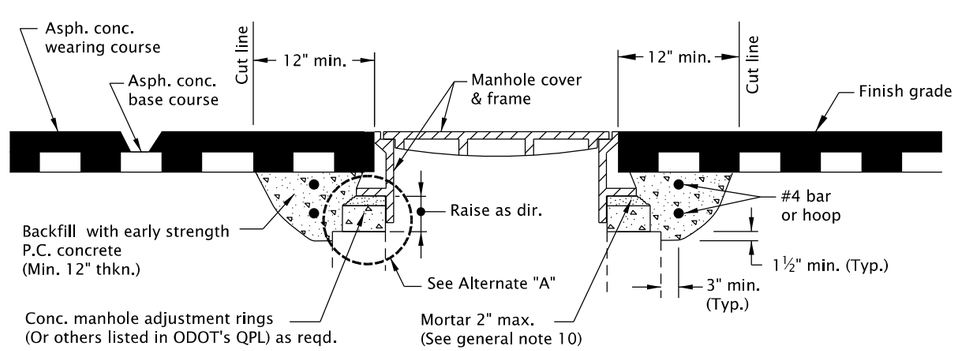
CALC. BOOK NO. N/A | SDR DATE 21-JUN-2019 | **RD356**



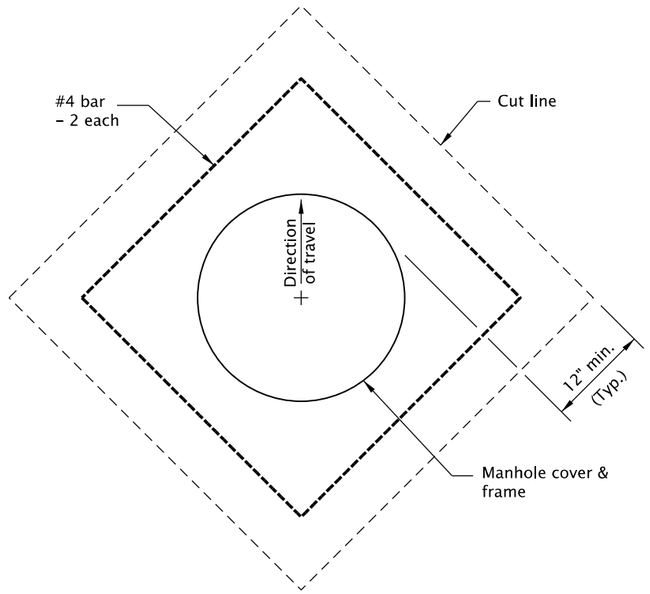
METHOD "A"



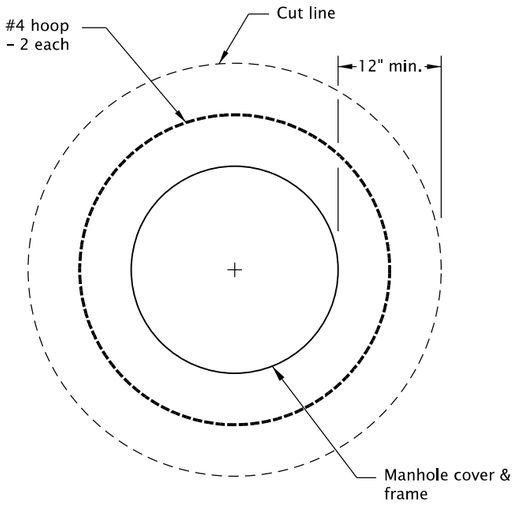
METHOD "B"



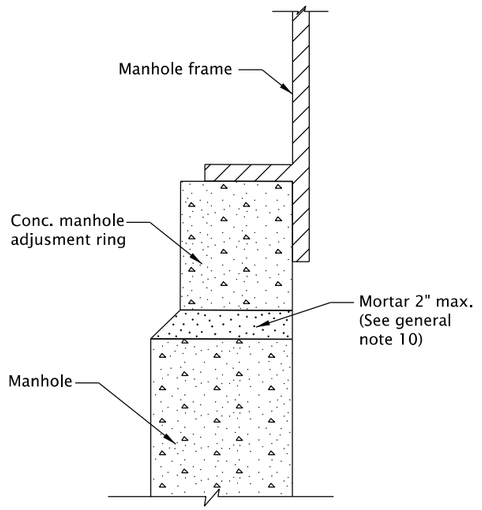
METHOD "C"



PLAN
SQUARE CUT



PLAN
CIRCULAR CUT



ALTERNATE "A"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Cover manhole with building paper and const. asph. conc. base course and wearing courses.
2. Saw cut square or circular excavation around manhole 12" min. from manhole frame.
3. Raise manhole cover and frame to finish grade by installing conc. manhole adjustment rings and leveling mortar, as shown.
4. Backfill with early strength Portland Cement Concrete. All concrete shall be commercial grade concrete.
5. Protect from traffic loading until conc. has cured to 3000 psi.
6. Apply tack coat to edges of existing pavement before installing patch.
7. Finish joint with asphalt seal and sand.
8. See Std. Dwg. RD336 for manhole steps details.
9. See appropriate manhole standard drawings for details not shown.
10. Use epoxy for synthetic grade rings.
11. See Std. Dwg. RD336 for tracer wire details.
12. See Std. Dwg. RD356 for manhole covers and frames.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MANHOLE FRAME ADJUSTMENT

2024

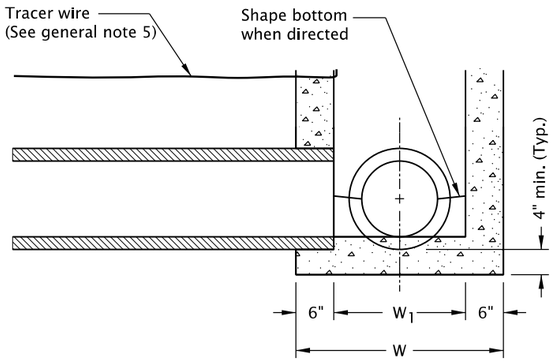
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 21-JUL-2015 | **RD360**

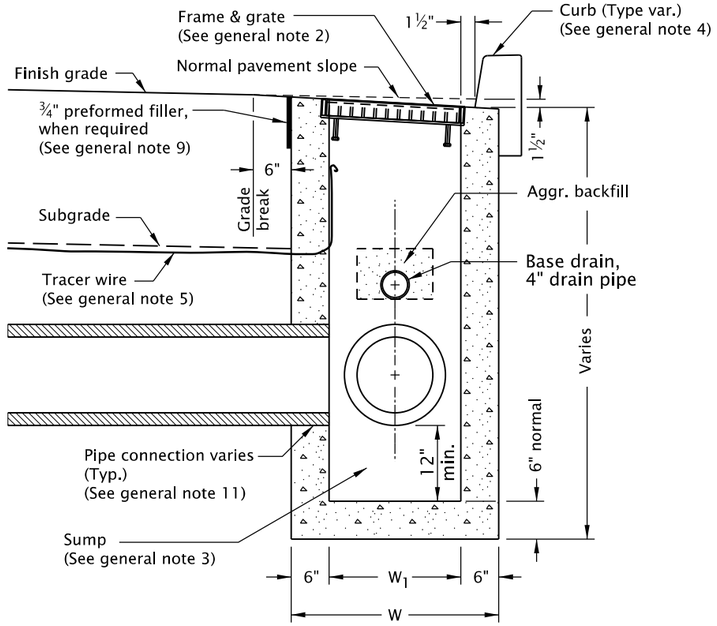
Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020

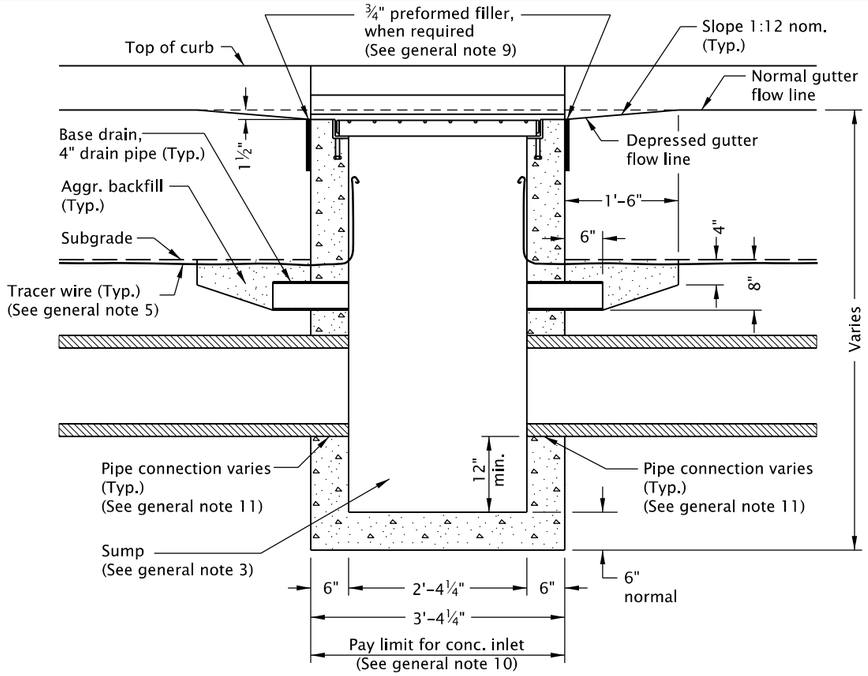
RD360.dgn



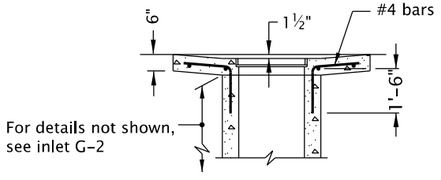
DETAIL A
WITHOUT SUMP



SECTION B - B



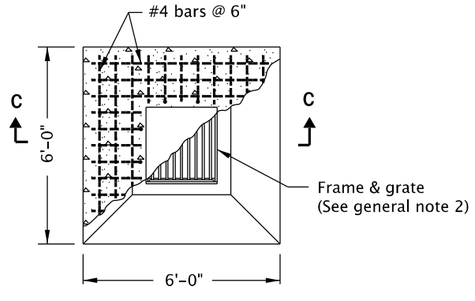
SECTION A - A



SECTION C-C

NOTE:

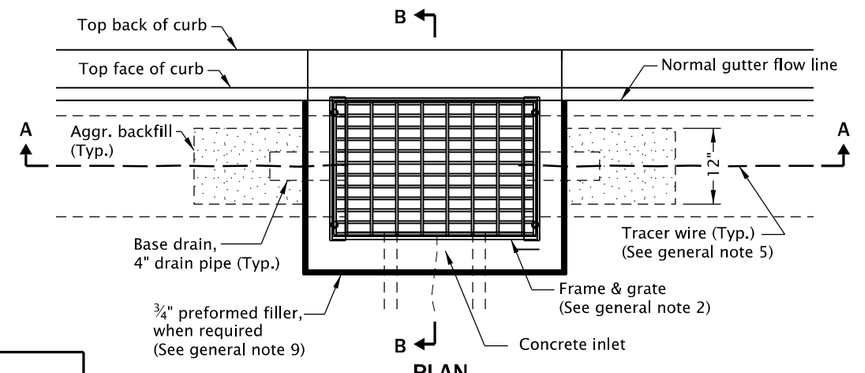
All reinforcement to be placed 2" clear of nearest face of concrete unless shown or noted otherwise



PLAN

TYPE G-2MA

TABLE A		
INLET TYPE	W	W_1
G-1	2'-8⅞"	1'-8⅞"
G-2, G-2M, G-2MA	3'-3⅜"	2'-3⅜"



PLAN

TYPE G-1, G-2, G-2M

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Where precast inlets are used as an alternate to cast-in-place inlets, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided. All precast inlets shall conform to requirements of ASTM C913.
2. Graphics show G-1 inlet with Type 2 grate. See Table A for inlet dimensions.
   Type 1 grate allowed only in locations not subject to bicycle or pedestrian use.
   For frame and grate details, see Std. Dwg. RD365.
3. Provide sump only where shown on plans, and allowed by jurisdiction. See Detail A for inlet without sump.
4. For curb details, see Std. Dwgs. RD700 & RD701.
5. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
6. Max. pipe diameter varies with pipe material.
7. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
8. All concrete shall be commercial grade concrete.
9. ¾" preformed filler (in concrete pavement or gutter only) to extend through thickness of concrete.
10. See Std. Dwg. RD363 for gutter transition section, when curb and gutter are required.
11. See Std. Dwg. RD339 for pipe to structure connections.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CONCRETE INLETS
TYPE G-1, G-2, G-2M, & G-2MA

2024

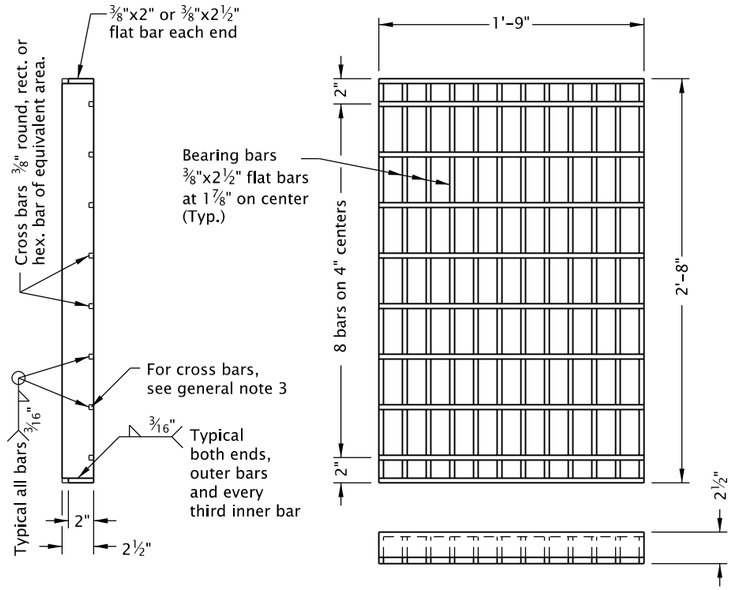
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 21-JUL-2015 | **RD364**

20-JUL-2020

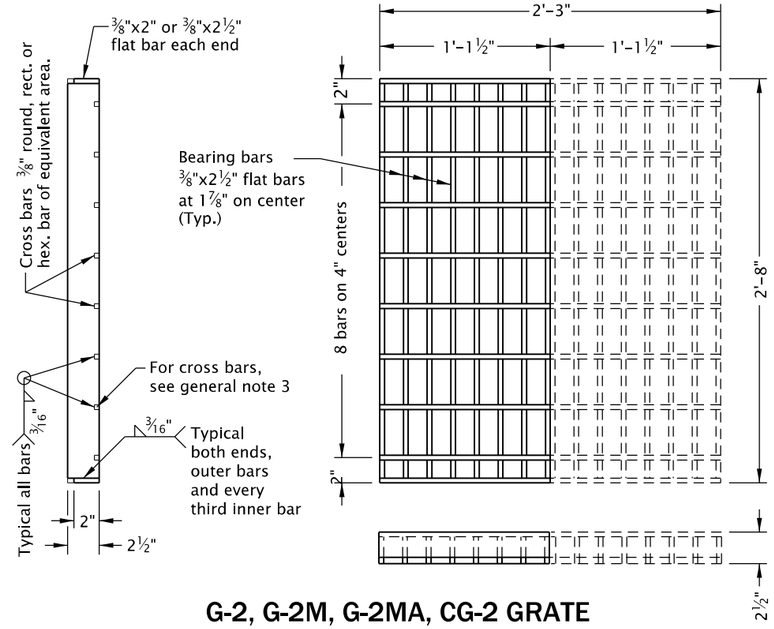
RD364.dgn

Effective Date: June 1, 2024 - November 30, 2024



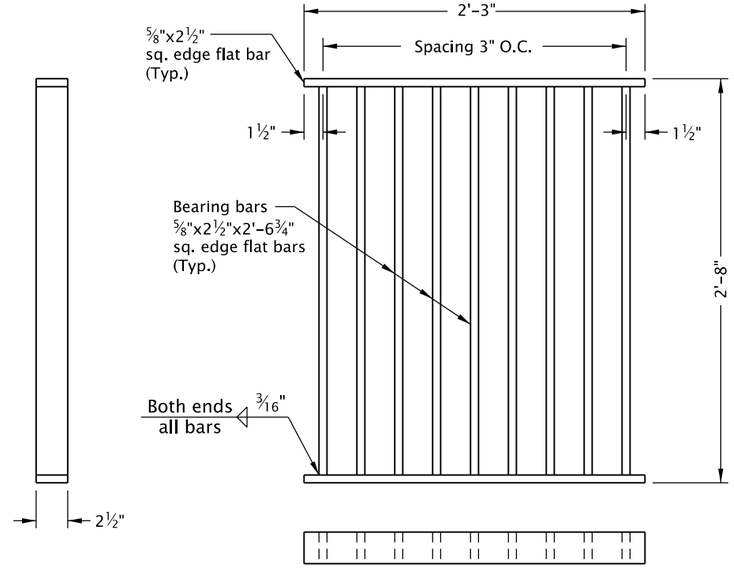
G-1, CG-1 GRATE (TYPE 2)

(Bicycle-safe)



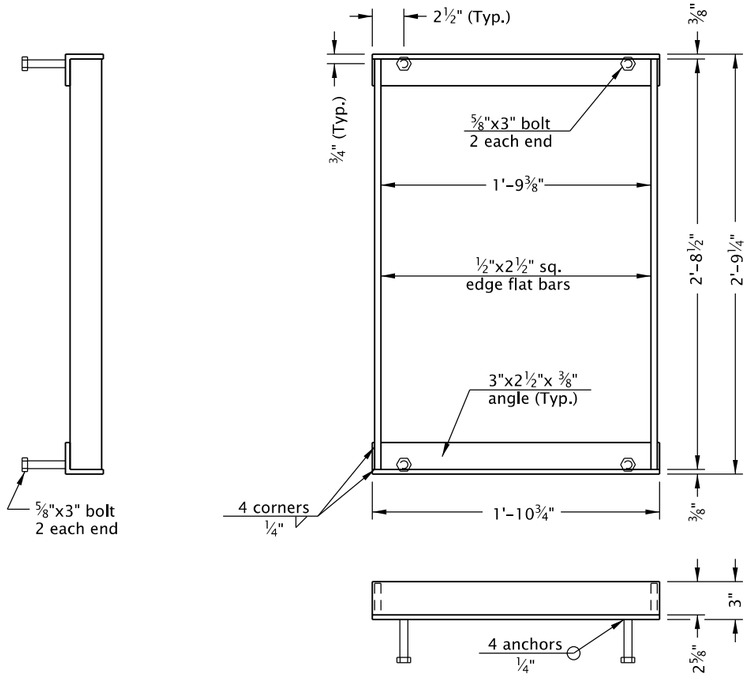
G-2, G-2M, G-2MA, CG-2 GRATE (TYPE 2)

(Bicycle-safe)
(2 grates required per inlet, as shown)

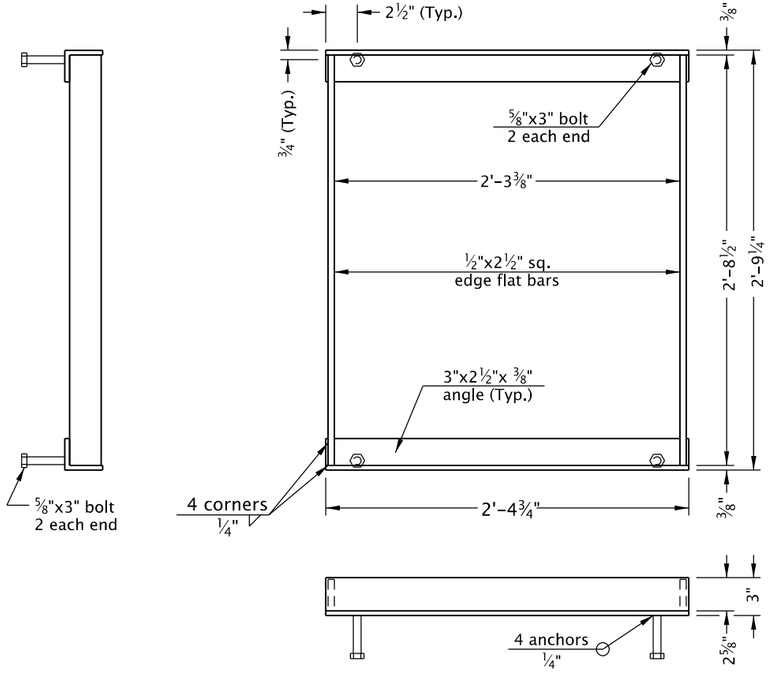


G-2, G-2M, G-2MA, CG-2 GRATE (TYPE 1)

(See general note 2)



G-1, CG-1 FRAME



G-2, G-2M, G-2MA, CG-2 FRAME

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For inlet details, see appropriate inlet standard drawing(s).
2. Type 1 grate allowed only in locations not subject to bicycle or pedestrian use.
3. 3/8" cross bars shall be flush with the top of grate surface and may be fillet welded, resistance welded or electroforged to bearing bars.
4. Hot dip galvanize after fabrication.
5. Cast iron grate and frame are acceptable alternates. See ODOT's QPL.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

FRAMES & GRATES FOR CONCRETE INLETS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. _ _ _ N/A _ _ _ | SDR DATE _ 14-JUL-2014 _ | **RD365**

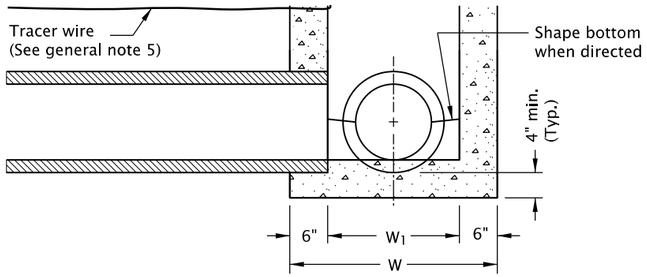
20-JUL-2020

RD365.dgn

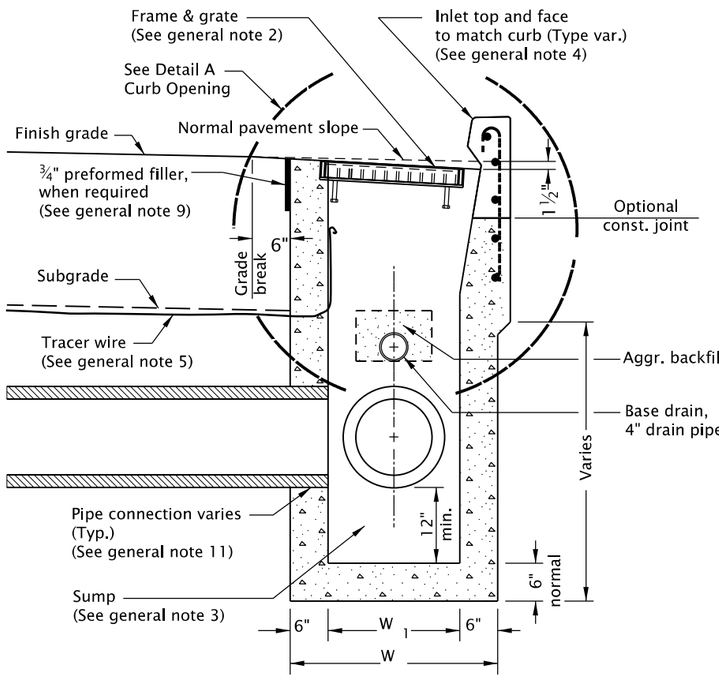
Effective Date: June 1, 2024 – November 30, 2024

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

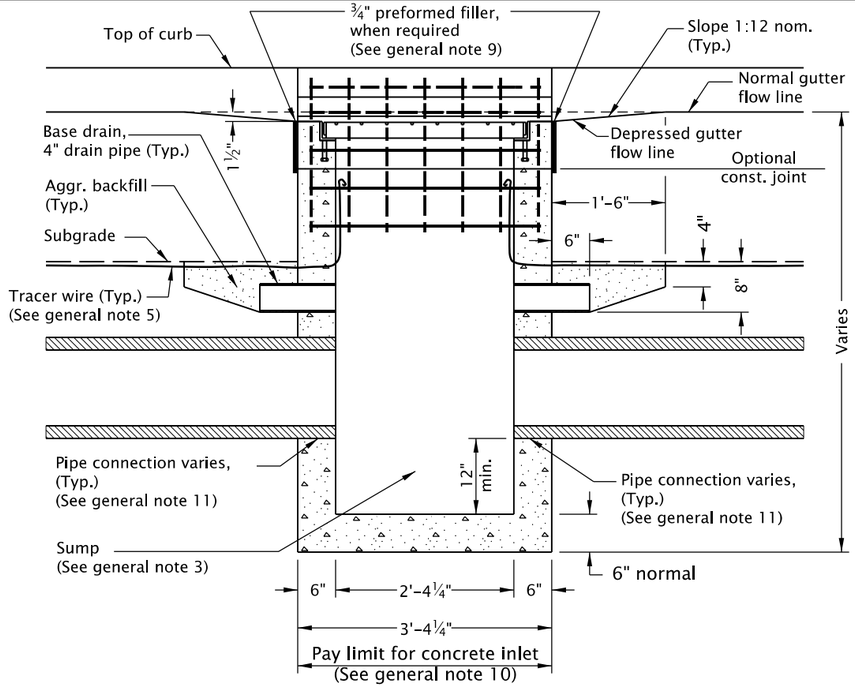
1. Where precast inlets are used as an alternate to cast-in-place inlets, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided. All precast inlets shall conform to requirements of ASTM C913.
2. Graphics show CG-1 inlet with Type 2 grate. See Table A for inlet dimensions. Type 1 grate allowed only in locations not subject to bicycle or pedestrian use. For frame and grate details, see Std. Dwg. RD365.
3. Provide sump only where shown on plans, and allowed by jurisdiction. See Detail B for inlet without sump.
4. For curb details, see Std. Dwgs. RD700 & RD701.
5. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
6. Max. pipe diameter varies with pipe material.
7. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
8. All concrete shall be commercial grade concrete.
9. ¾" preformed filler (in concrete pavement or gutter only) to extend through thickness of concrete.
10. See Std. Dwg. RD363 for gutter transition section, when curb and gutter are required. (Pay limit for inlet is expanded when curb and gutter are monolithic)
11. See Std. Dwg. RD339 for pipe to structure connections.



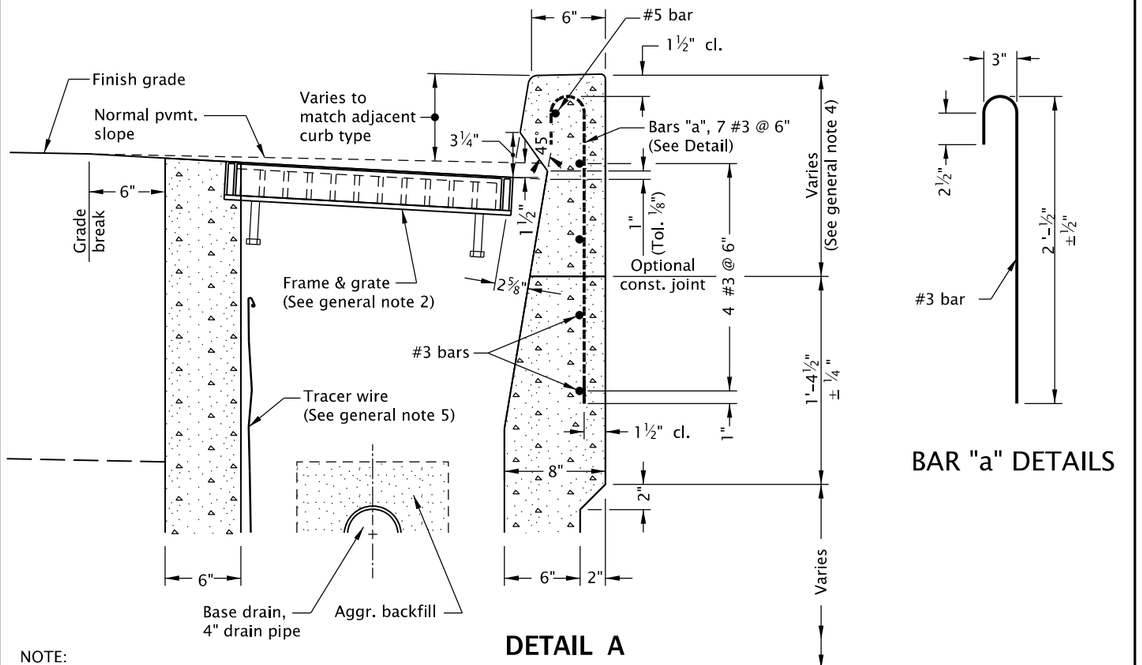
DETAIL B WITH-OUT SUMP



SECTION B - B



SECTION A - A



NOTE:
Use details shown on Std. Dwg. RD367 when curb inlet channels are used.

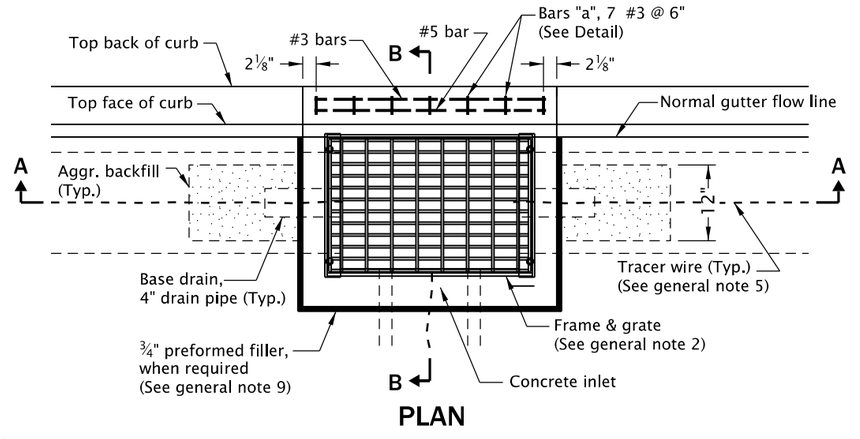
DETAIL A CURB OPENING

BAR "a" DETAILS

TABLE A		
INLET TYPE	W	W_1
CG-1	2'-8⅞"	1'-8⅞"
CG-2	3'-3⅜"	2'-3⅜"

NOTES:

1. #3 "a" bars to be placed during curb construction.
2. All bars to be placed 1½" clear of nearest face of concrete unless shown or noted otherwise.
3. All bars shall be full length.



PLAN

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CONCRETE INLETS TYPE CG-1, CG-2

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 20-JUL-2020 | **RD366**

Effective Date: June 1, 2024 - November 30, 2024

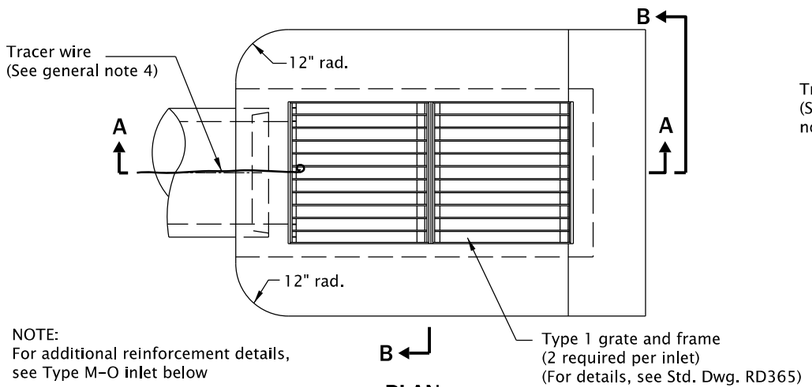
20-JUL-2020

RD366.dgn

20-JUL-2020

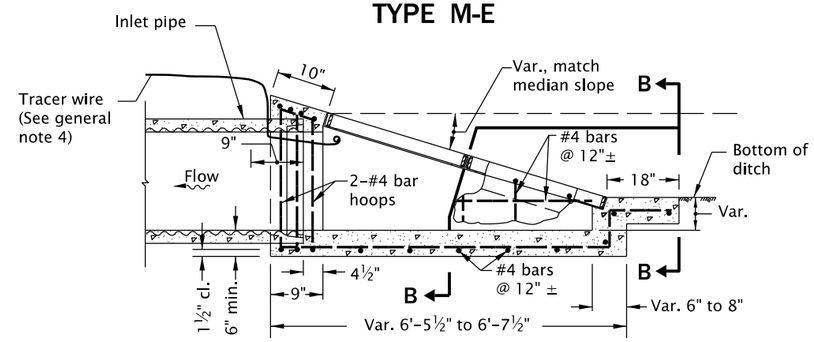
RD368.dgn

TYPE M-E

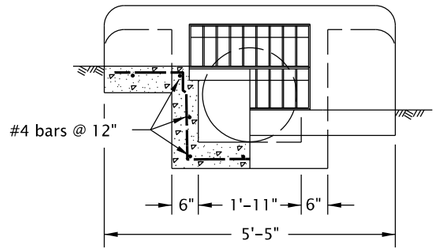


NOTE:
For additional reinforcement details, see Type M-O inlet below

PLAN

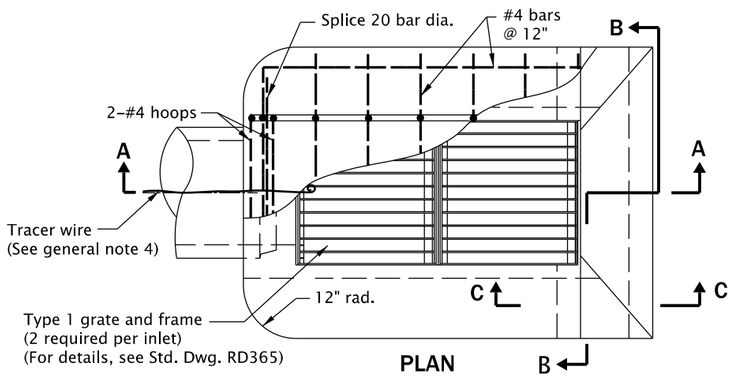


SECTION A-A

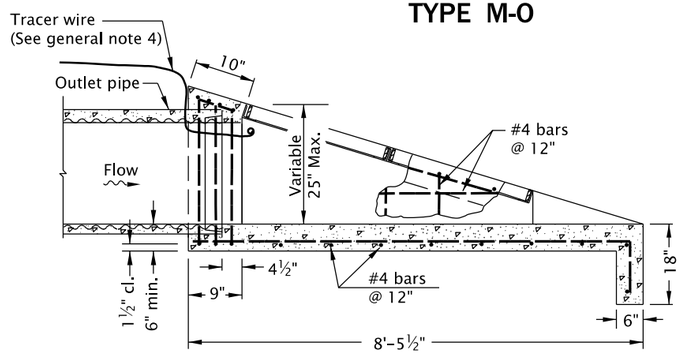


SECTION B-B

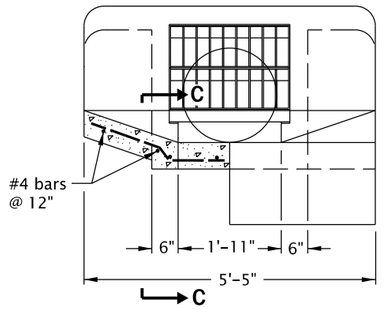
TYPE M-O



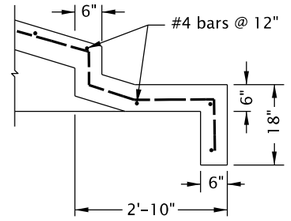
PLAN



SECTION A-A



SECTION B-B

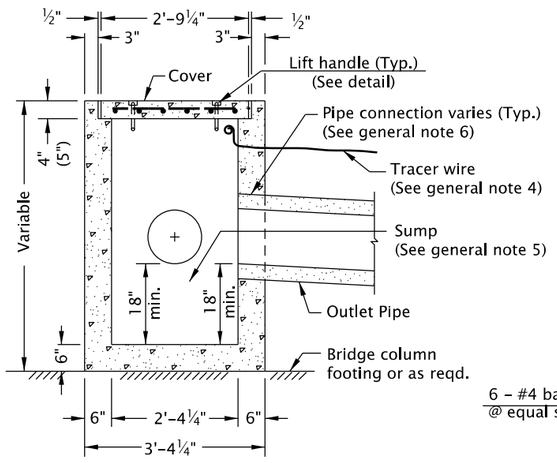


SECTION C-C

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Max. pipe diameter varies with pipe material.
2. All reinforcement to be placed a minimum of 2" clear of nearest face of concrete unless otherwise shown or noted. Reinforcement to be lapped 20 bar diameters at splices.
3. When uncoated metal pipe or arch pipe are used, an asphaltic or similar type protective coating shall be applied to the exterior surface.
4. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
5. Provide sump only where shown on plans, and allowed by jurisdiction. For sump details, see Std. Dwg. RD364.
6. See Std. Dwg. RD339 for pipe to structure connections.
7. All precast inlets shall conform to requirements of ASTM C913.

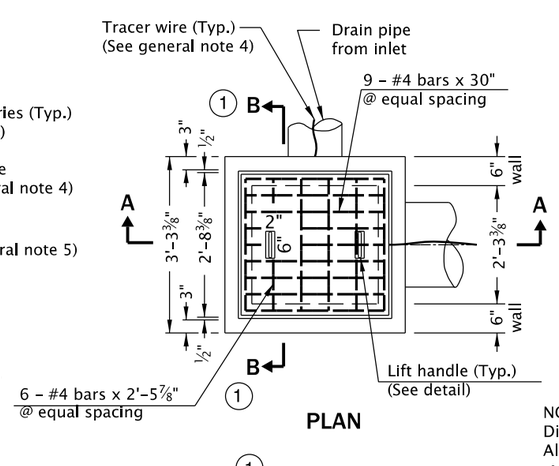
TYPE B



SECTION A-A

* All cover bars for Type B & B-SL inlets to be placed 1½" clear of nearest face of concrete unless shown or noted otherwise.

TYPE B-SL

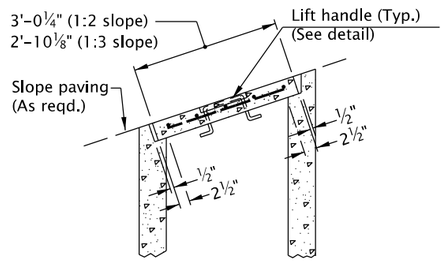


PLAN

1 See Type B-SL

SLOPE INSTALLATION

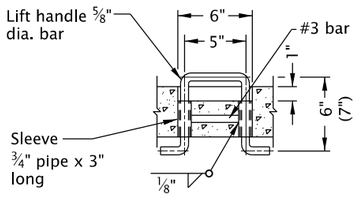
(For details not shown, see Type B)



SECTION B-B

LIFT HANDLE

(Install loose in sleeve)



NOTE: ("TYPE B" MODIFIED INLET)
Dimensions shown in parenthesis are for Type B Modified inlet.
All cover bars for "Type B" Modified inlet are to be placed 1" min. clear of bottom face of concrete and 2½" min. clear of top face of concrete. "Type B" modified inlet to be used if B inlet is under traffic.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

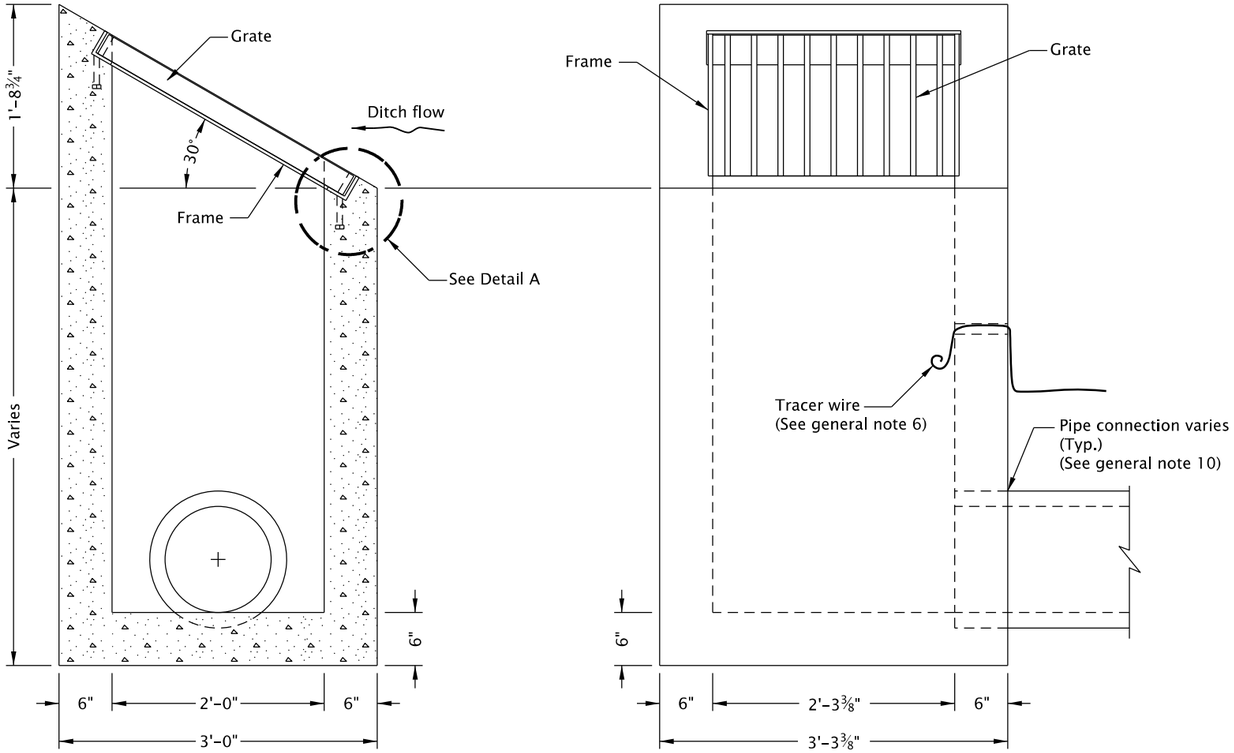
CONCRETE INLETS TYPE M-E, M-O, B AND B-SL

2024

DATE	REVISION DESCRIPTION

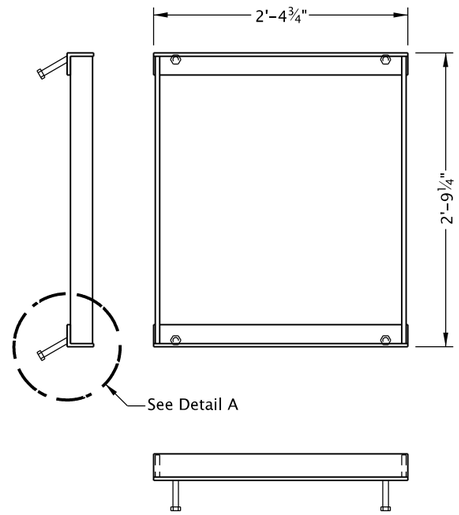
CALC. BOOK NO. N/A | SDR DATE 22-JUL-2016 | **RD368**

Effective Date: June 1, 2024 - November 30, 2024

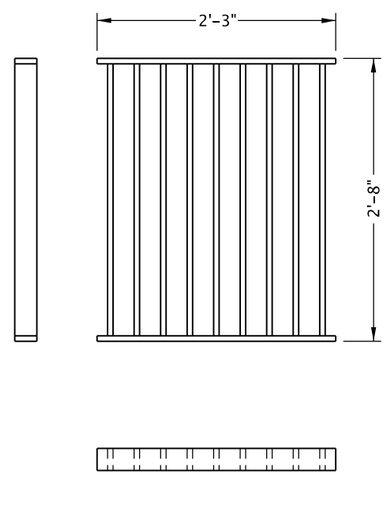


SECTION A - A

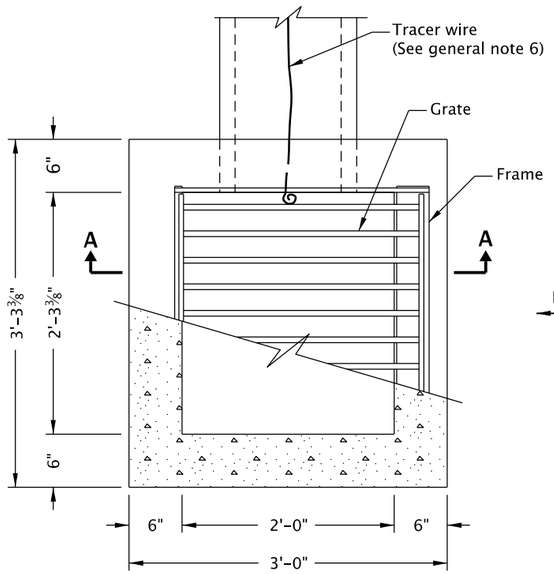
ELEVATION



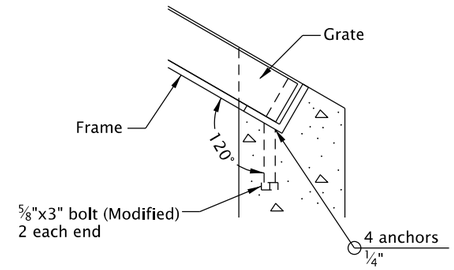
G-2 FRAME
(See general note 2)



G-2 GRATE (TYPE 1)
(See general note 2)



PLAN



DETAIL A
(Anchor bolt modication, see general note 2)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. For frame & grate details not shown, see Std. Dwg. RD365.
   Modify anchor bolt attachment to frame as shown in Detail A.
   G-2 (Type 2) grates may be used if approved by the engineer.
3. Catch basin, frame, and grates shall meet H20 loading.
4. Provide sump only when shown on plans, and allowed by jurisdiction. For sump details, see Std. Dwg. RD364.
5. ⅝" cross bars shall be flush with the grate surface and may be fillet welded, resistance welded or electroforged to bearing bars.
6. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
7. Max. pipe diameter varies with pipe material.
8. Do not use in locations where inlet can be struck by an errant vehicle, or provide shielding of inlet.
9. Inlet base may be cast-in-place or precast. Where precast inlet base is used as an alternate, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided.
   All precast inlets shall conform to requirements of ASTM C913.
10. See Std. Dwg. RD339 for pipe to structure connections.
11. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

DITCH INLET TYPE D

2024

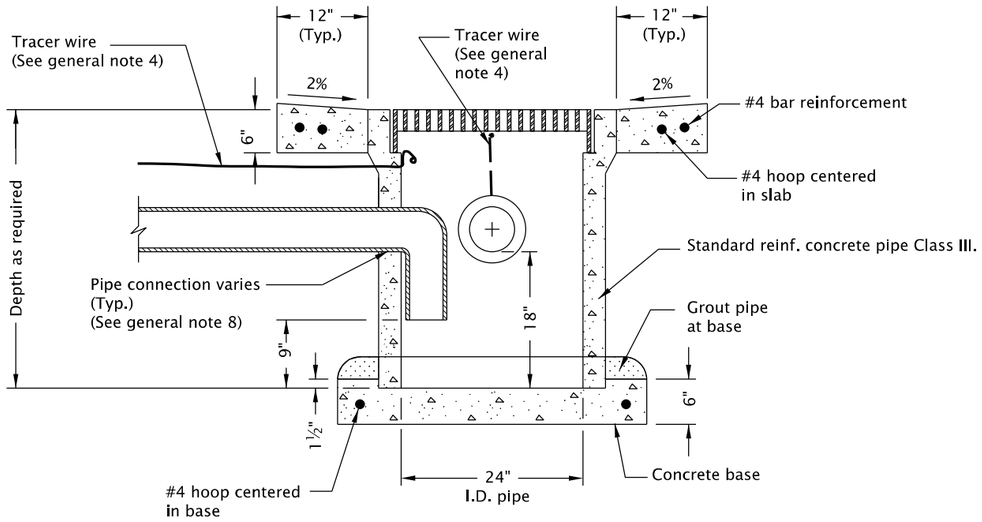
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 21-JUL-2015 | **RD370**

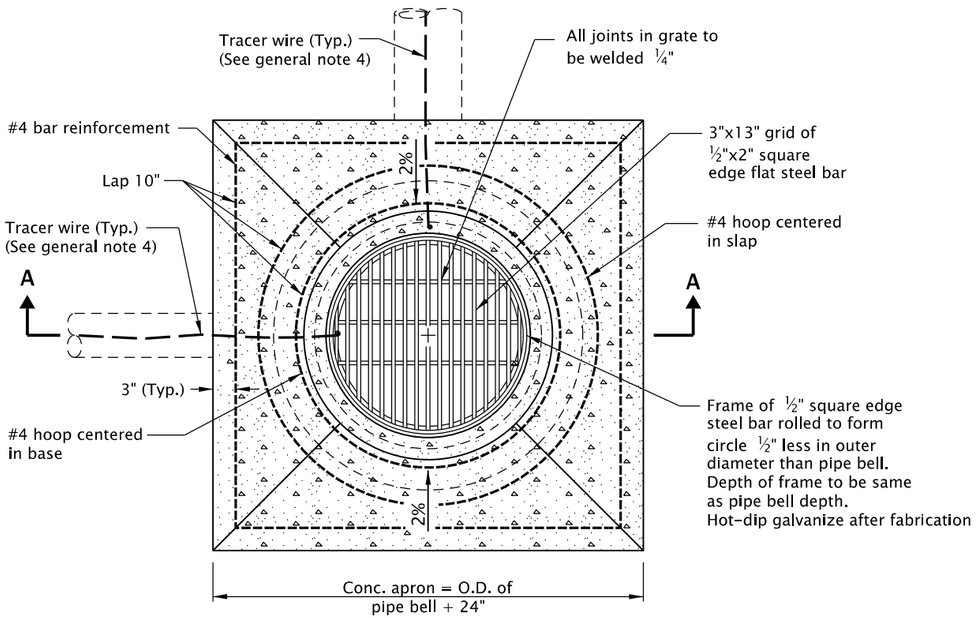
Effective Date: June 1, 2024 – November 30, 2024

20-JUL-2020

RD370.dgn



SECTION A-A



PLAN

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Grates shall be bicycle-safe.
2. Precast concrete inlets may be used when specified or approved. All precast inlets shall conform to requirements of ASTM C913.
3. Anchor vertical leg of inlet pipe if not a glued joint.
4. See Std. Dwg. RD336 for tracer wire details.
5. All reinforcement shall be 2" clear of nearest face of conc., unless otherwise shown.
6. Max. connecting pipe diameter varies with pipe material.
7. All concrete shall be commercial grade concrete.
8. See Std. Dwg. RD339 for pipe to structure connections.
9. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

AREA DRAINAGE BASIN OR FIELD INLET

2024

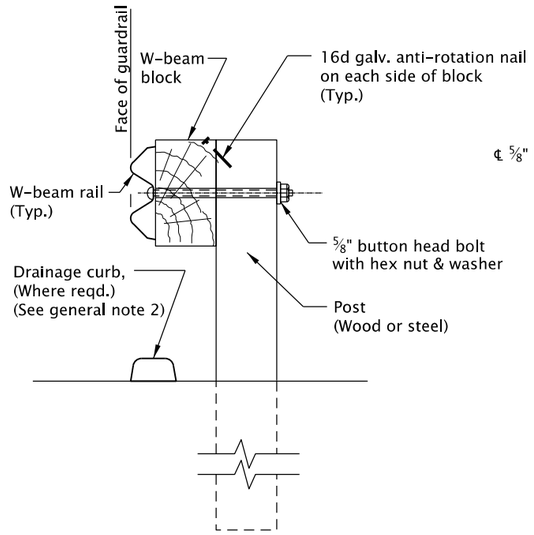
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 14-JUL-2014 | **RD374**

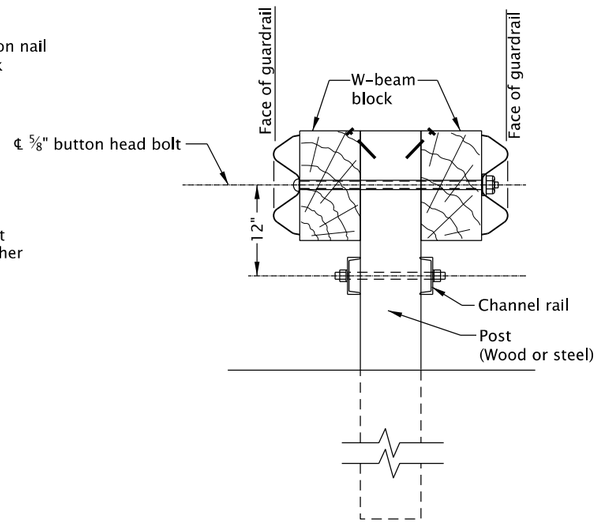
Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020

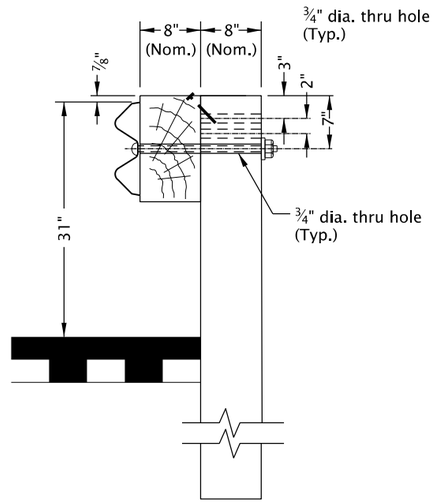
RD374.dgn



TYPES 2A & 3
(For Type 3 use double thickness (2) rail elements)



METAL MEDIAN BARRIER
(DOUBLE SIDED W/ CHANNEL RAIL)
(See general note 3)

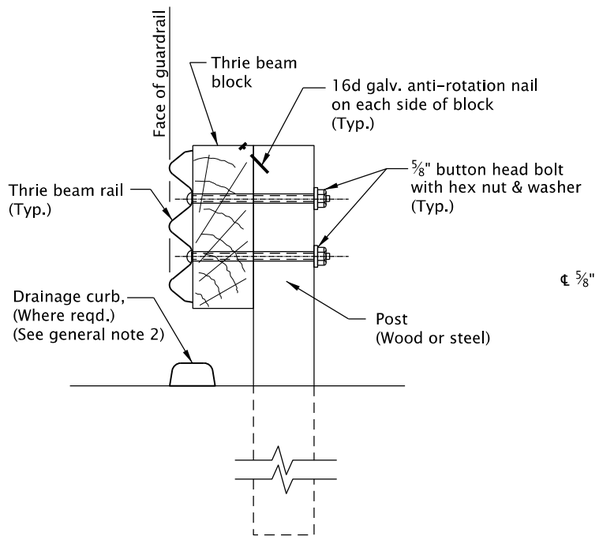


TYPICAL INSTALLATION

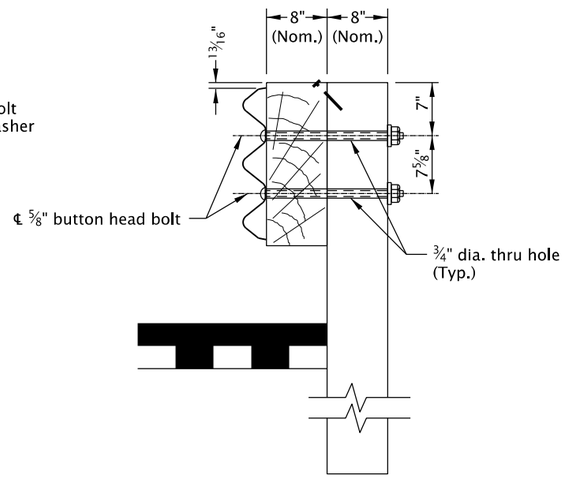
W-BEAM GUARDRAIL

W-BEAM GUARDRAIL ASSEMBLY

NORMAL RAIL ELEMENT DATA			
TYPE	RAIL	EFFECTIVE LENGTHS	GAUGE
2A	W-beam	6.25', 12.5', 25'	10 & 12
3	W-beam	6.25', 12.5', 25'	10 & 12
4	Thrie beam	6.25', 12.5', 25'	10 & 12
4 TRANSITION	Thrie beam	6.25'	10 & 12



TYPE 4 & 4 TRANSITION



INITIAL INSTALLATION

THRIE BEAM GUARDRAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. When required by the plans, Drainage curb alignment same as face of guardrail.
3. Orient post bolts with the button head located on the side nearest the traffic lane.
   The bolt's threaded portion is not permitted to extend beyond limits of ¼" to ½" from the face of the tightened nut; trim the treated portion as needed.
4. Lap guardrail in direction of adjacent traffic.
5. Final paved surfacing to extend to face of post. Rail height measured from final paved surface at face of rail (Typical all types). 1"± tolerance.
6. Wood block shall be toe-nailed to the post with 2 - 16d galvanized nails in top of block to prevent block rotation.
7. Wood blocks shown. Blocks of an approved alternate material may be used.
   See ODOT's QPL.
8. Existing posts shall not be raised.
   Replace posts as necessary to achieve required guardrail height.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MIDWEST GUARDRAIL SYSTEM TYPES

2024

DATE	REVISION DESCRIPTION
07-2021	REVISED DETAILS AND NOTES

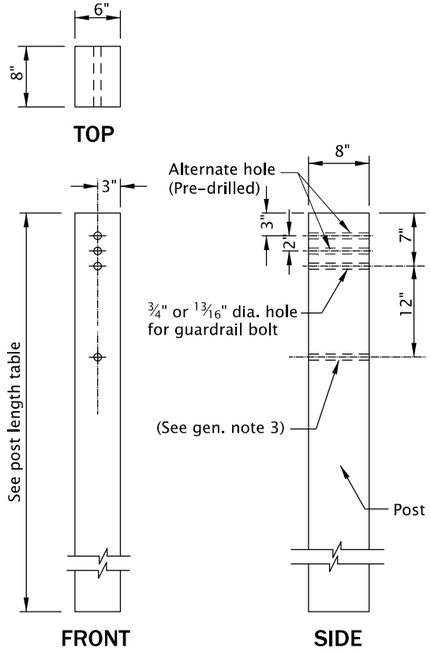
CALC. BOOK NO. N/A | SDR DATE 19-JUL-2021 | **RD402**

Effective Date: June 1, 2024 - November 30, 2024

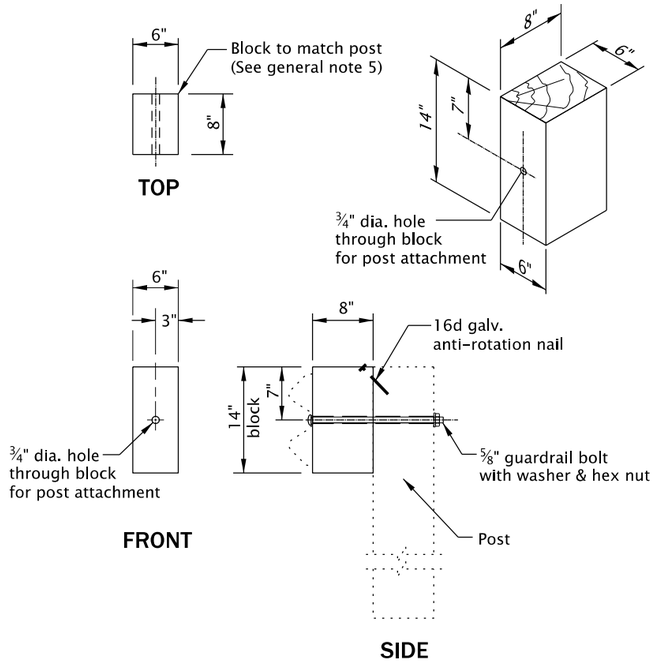
19-JUL-2021

RD402.dgn

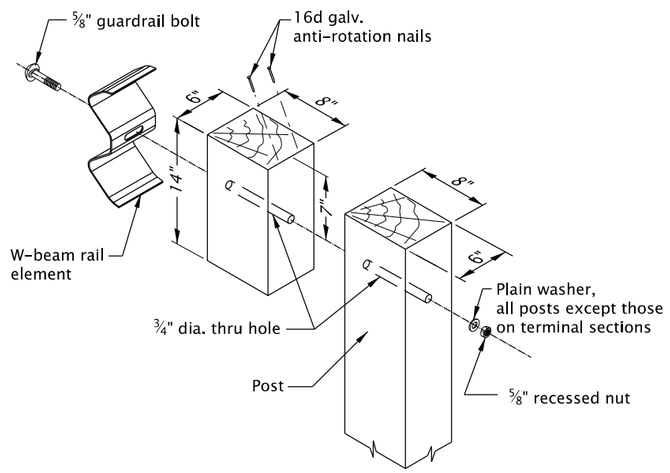
RD403.dgn 19-JUL-2021



W-BEAM WOOD POST
(6x8 post shown)



W-BEAM WOOD BLOCK FOR WOOD POST
(6x8 wood block shown)



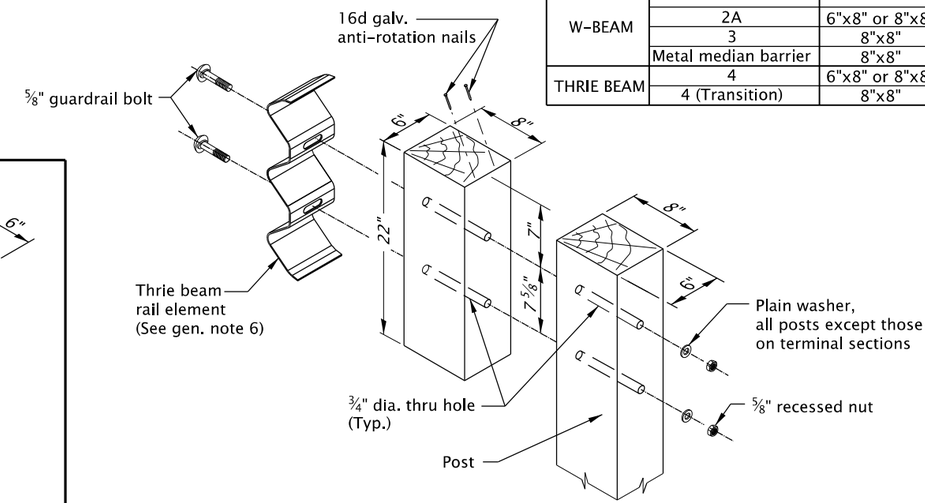
W-BEAM ASSEMBLY DETAIL
(6x8 wood post and 6x8 wood block shown)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

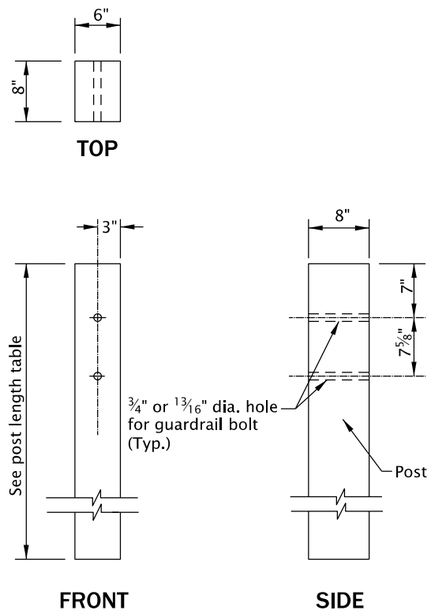
1. See appropriate guardrail standard drawing(s) for details not shown.
2. See Bridge Dwgs. for bridge transition guardrail post and block requirements.
3. Lowest hole(s) required only when channel rail is to be installed. Drill 12" below top ¾" or 13⁄16" hole(s) used.
4. Dimensions shown are for nominal posts and blocks.
5. Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT's QPL.
6. When required by the plans, nested thrie beam wood post shall be 8"x8".
7. Wood block shall be toe-nail to the post with 2 - 16d galvanized nails in top of block to prevent block rotation.

GUARDRAIL WOOD POST TABLE

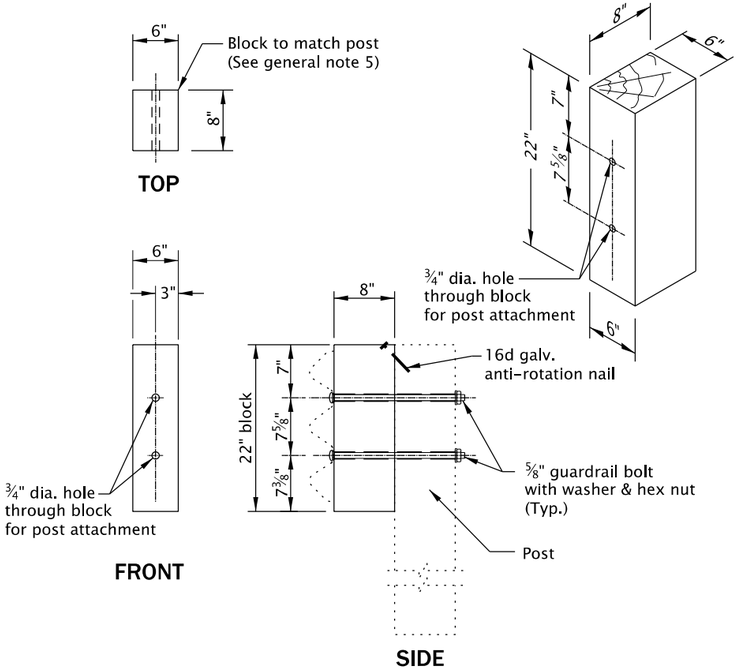
	GUARDRAIL TYPE	POST SIZE	POST LENGTH	POST SPACING
W-BEAM	2A	6"x8" or 8"x8"	6'-0"	6'-3"
	3	8"x8"	6'-0"	3'-1½"
	Metal median barrier	8"x8"	6' 6"	6'-3"
THRIE BEAM	4	6"x8" or 8"x8"	7'-0"	6'-3"
	4 (Transition)	8"x8"	6'-0"	3'-1½"



THRIE BEAM ASSEMBLY DETAIL
(6x8 wood post and 6x8 wood block shown)



THRIE BEAM WOOD POST
(6x8 post shown)



THRIE BEAM WOOD BLOCK FOR WOOD POST
(6x8 wood block shown)

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

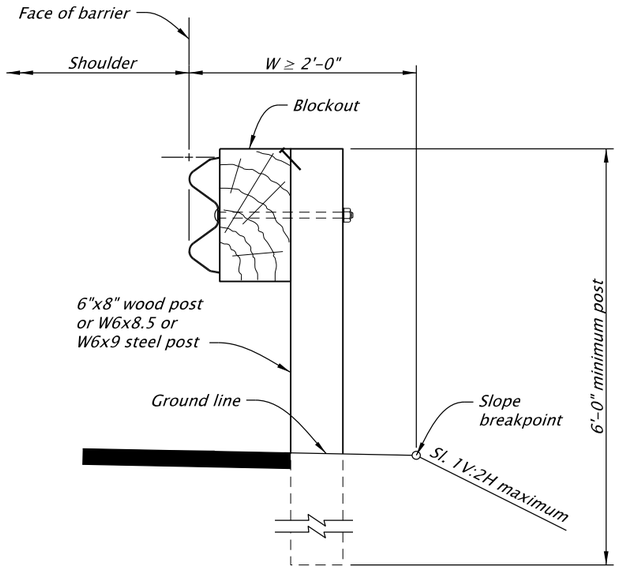
MIDWEST GUARDRAIL SYSTEM WOOD POST AND BLOCK

2024

DATE	REVISION DESCRIPTION
07-2021	REVISED DETAILS AND NOTES

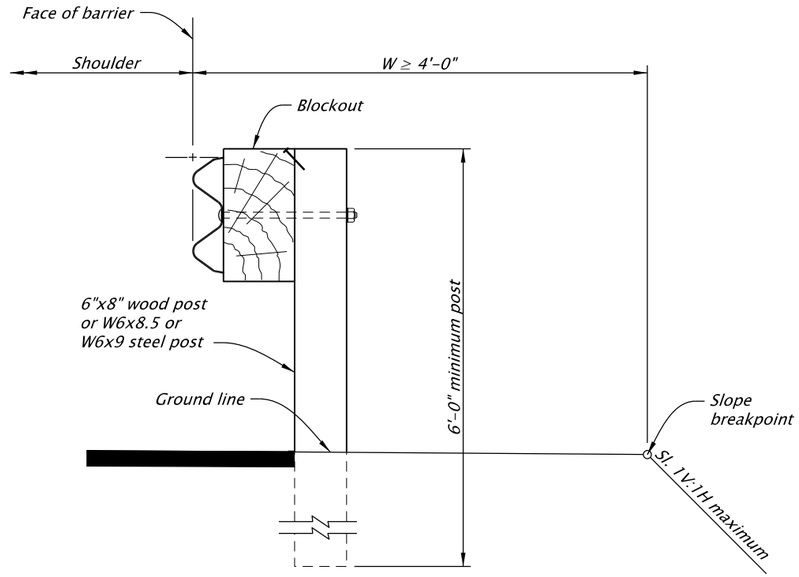
CALC. BOOK NO. N/A | SDR DATE 19-JUL-2021 | **RD403**

Effective Date: June 1, 2024 - November 30, 2024



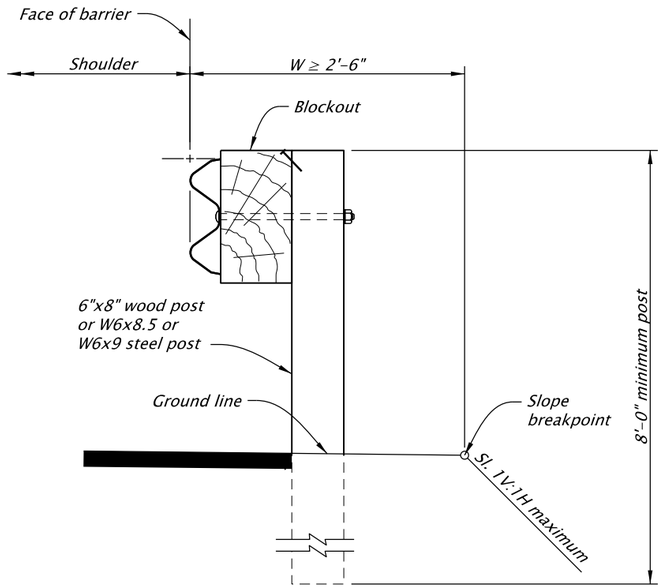
CASE 1

(Wood post shown)



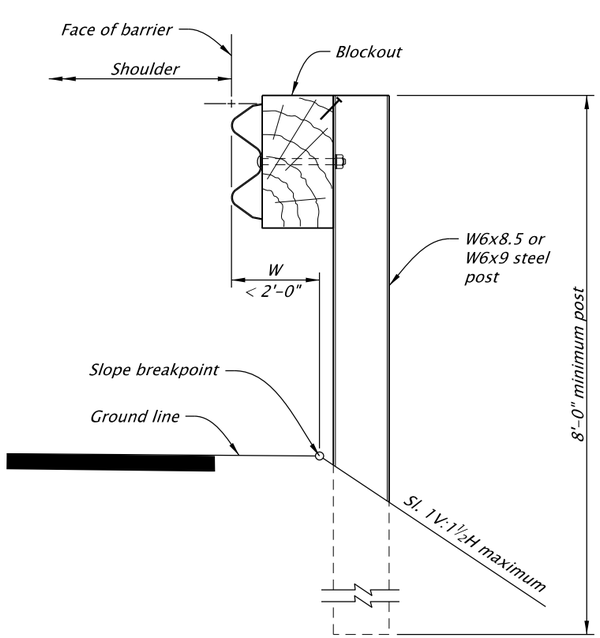
CASE 2

(Wood post shown)
Use when there is a 4'-0" or greater shoulder widening from face of guardrail to the slope breakpoint



CASE 3

(Wood post shown)
Use when there is a 2'-6" or greater shoulder widening from face of guardrail to the slope breakpoint



CASE 4

(Steel post shown)
Do not use in weak soil conditions.
Use when there is less than a 2'-0" shoulder widening from face of guardrail to the slope breakpoint

PLACEMENT OF GUARDRAIL ON SLOPES

NOTE: Cases shown do not apply to terminals, transition sections or anchors.

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. *See appropriate guardrail standard drawing(s) for details not shown.*
2. *Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT's QPL.*
3. *All posts for guardrail run shall be of the same type: wood or steel.*

SLOPE / EMBANKMENT TABLE			
POST LENGTH (ft)	POST TYPE	SLOPE (V:H)	W (ft) (Face of barrier to slope of breakpoint)
6	*Wood/Steel*	*1:2 or flatter*	*2'-0" minimum*
6	*Wood/Steel*	*1:1 or flatter*	*4'-0" minimum*
8	*Wood/Steel*	*1:1 or flatter*	*2'-6" minimum*
8	*Steel*	*1:1½ or flatter*	*Less than 2'-0"*

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PLACEMENT OF GUARDRAILS ON SLOPES

2024

DATE	REVISION DESCRIPTION
07-2021	NEW DRAWING CREATED
12-2021	REVISED DETAILS AND NOTES
12-2022	REVISED NOTE

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2023 | **RD406**

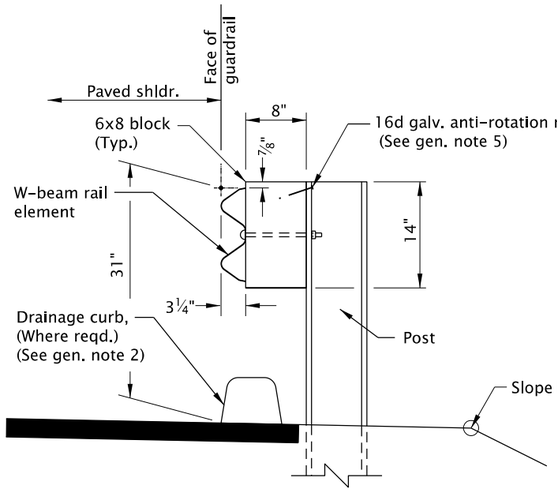
20-JAN-2023

RD406.dgn

Effective Date: June 1, 2024 – November 30, 2024

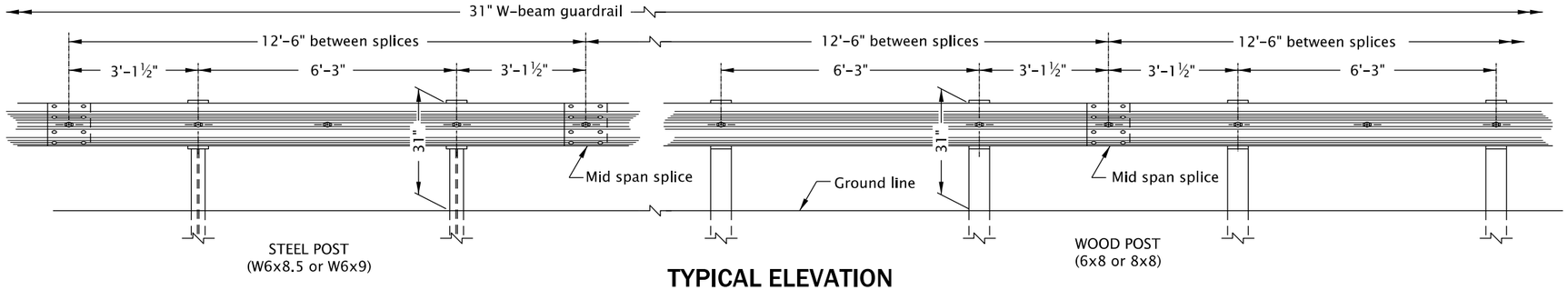
19-JUL-2021

RD407.dgn

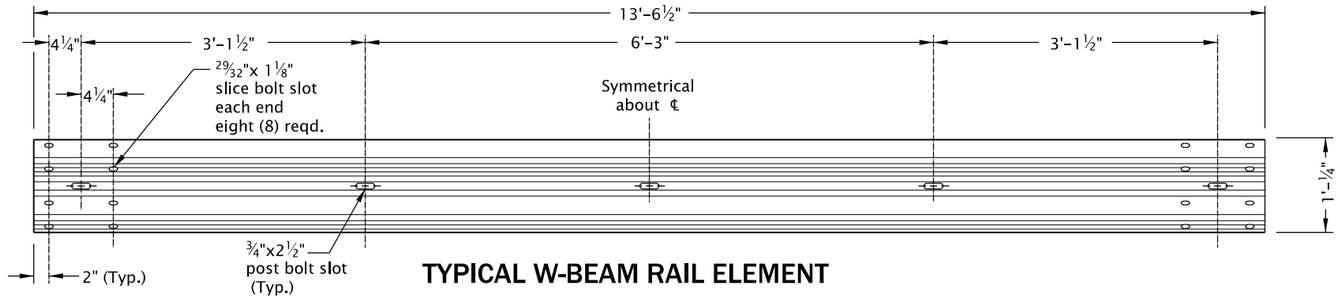


TYPICAL SECTION

(Steel post shown)



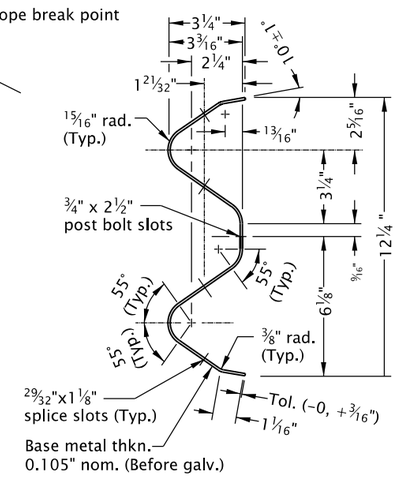
TYPICAL ELEVATION



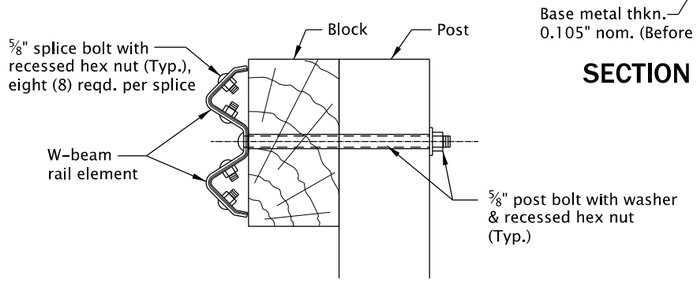
TYPICAL W-BEAM RAIL ELEMENT

NORMAL RAIL ELEMENT DATA

Type	Effective Lengths	Thkn. (Galv.)
2A, 3	6.25', 12.5', 25'	10 ga. & 12 ga.



SECTION THRU RAIL ELEMENT

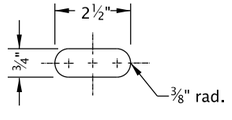


FITTINGS

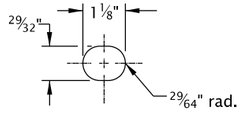
NOTES:

a. When required by the plans, post bolts to extend beyond the tightened nuts within limits of ¼" to ½".

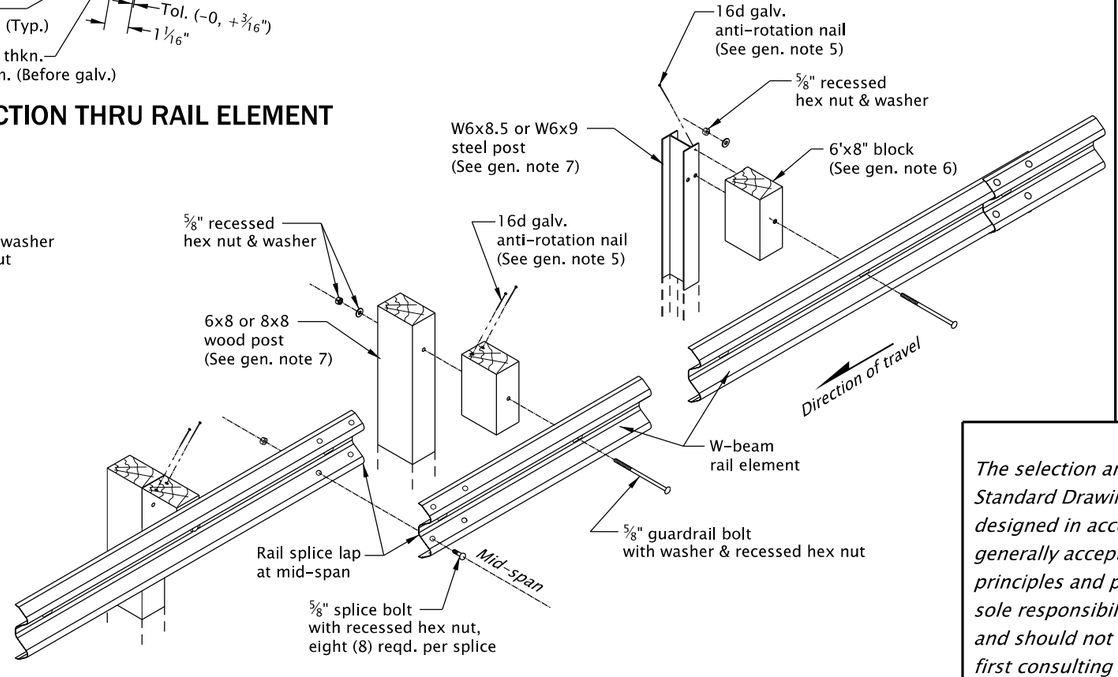
b. All post bolt threads to be set after assembly for wrench removal only.



POST BOLT SLOT



SPLICE BOLT SLOT



W-BEAM ASSEMBLY DETAILS

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. When required by the plans, drainage curb alignment same as face of guardrail.
3. Lap guardrail in direction of adjacent traffic.
4. Final paved surfacing to extend to face of post. Rail height measured from final paved surface at face of rail to top of rail (typ. all types). 1" ± tolerance.
5. Blocks shall be toe-nailed to prevent rotation when wood posts are used (see Std. Dwg. RD403). Blocks shall be rounted or toe-nailed when steel posts are used to prevent rotation (see Std. Dwg. RD404).
6. Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT's QPL.
7. All posts for guardrail run shall be of the same type: wood or steel.
8. For guardrail installed on radii of 150' or less (5' min. radius) use rail elements pre-curved to industry standard. Install "Radius Identification Plate".

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

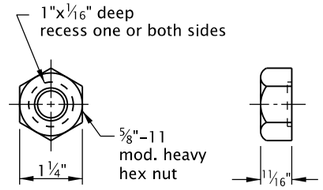
MIDWEST GUARDRAIL SYSTEM W-BEAM

2024

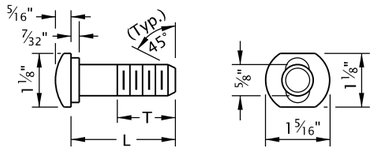
DATE	REVISION DESCRIPTION
07-2021	REVISED DETAILS AND NOTES

CALC. BOOK NO. N/A | SDR DATE ~~19-JUL-2021~~ | **RD407**

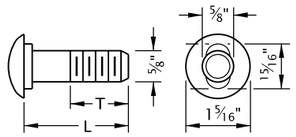
Effective Date: June 1, 2024 - November 30, 2024



5/8" DIA. RECESSED HEX NUT



ALTERNATIVE No. 1

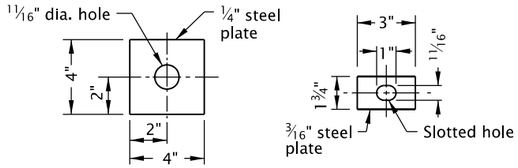


ALTERNATIVE No. 2

BOLT DIMENSION TABLE

Length (L) (in.)	Thread Length (T) (in.)
1 1/4	1 1/8 min.
2	1 3/4 min.
10	4 min.
18	4 min.
25	4 min.

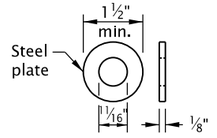
5/8" GUARDRAIL POST/SPICE BOLT (BUTTON HEADED)



SNOW LOAD POST WASHER

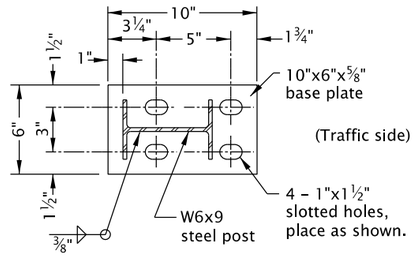
SNOW LOAD RAIL WASHER (b)

Use in area of heavy snow,
as directed by the engineer
(See general note 6)

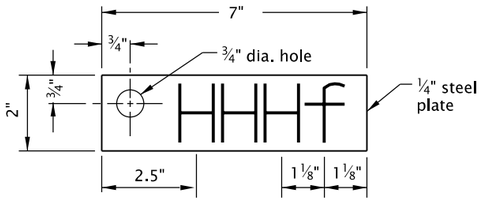


PLAIN WASHER (a)

Use on back of post.

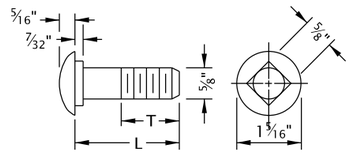


PLAN

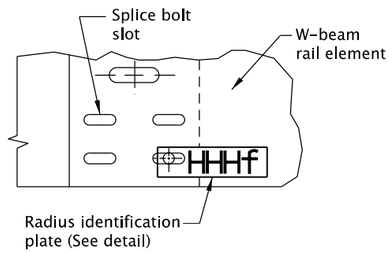


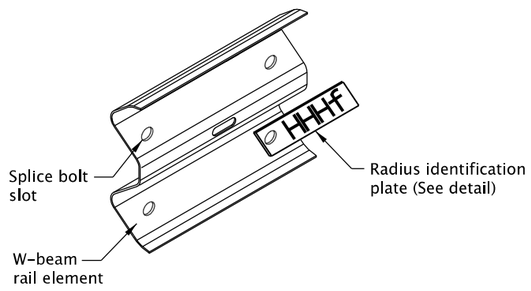
RADIUS IDENTIFICATION PLATE

(See general note 4)



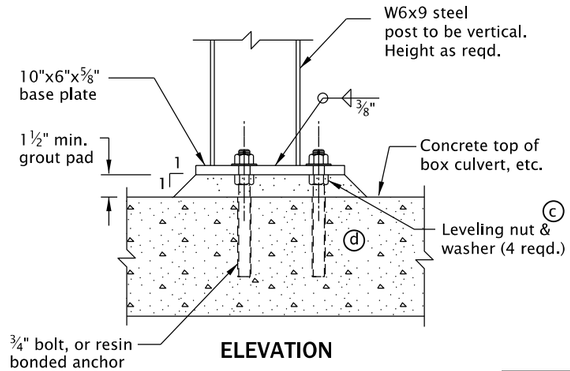
5/8" DIA. CARRIAGE BOLT





RADIUS IDENTIFICATION PLATE MOUNTING DETAIL

(See general note 5)



ELEVATION

BASE PLATE DETAILS

(For additional details, see Std. Dwg. BR266)
(Use when depth of cover is less
than normal for post installation.)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. For details of guardrail connections to structural handrails, see special details or Standard Drawings as called for on plans.
3. All indicated welds shall attain the full strength of the section welded.
4. Radius dimensions, in feet to the nearest 0.5 foot, shall be placed on the plate with a raised weld bead replacing the letters "HHH", shown on the Radius Identification Plate detail. Digits shall be 1½" min. height and ¾" max. width. Plate shall be galvanized after placement of digits.
5. The guardrail radius identification plate is to be mounted on the back side of the rail element with the lowest splice bolt nearest the P.C. of the guardrail radius.
6. When required by the plans, a Snow Load Post Washer shall be used on the backside of the post and a Snow Load Rail Washer shall be placed on rail element face. Snow Load Rail Washers shall not be installed on terminals.

SUPPLEMENTARY NOTES:

(a) Not required if Snow Load Post washer option is used.

(b) Use rectangular Snow Load Rail washer under bolt head and nut on Type C End Piece as shown.

(c) Furnished & installed by structure contractor when shown on structure plans.

(d) 6" min. penetration into concrete slabs other than bridge decks. Cast in place or core and install using approved resin bonding system.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS AND MISC.)

2024

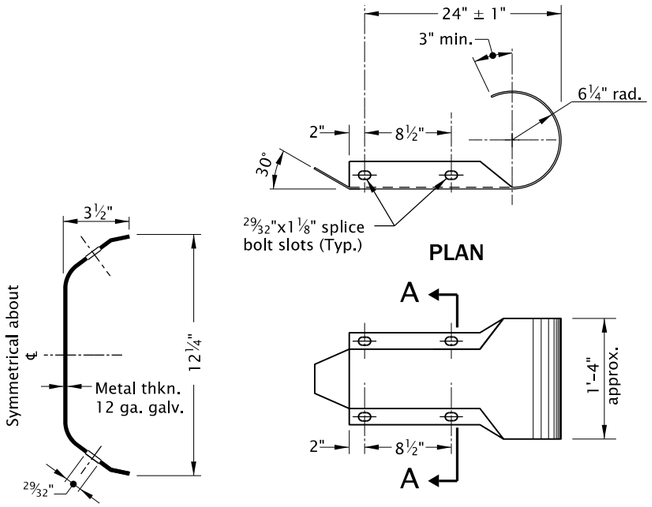
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 13-JAN-2020 | **RD416**

Effective Date: June 1, 2024 - November 30, 2024

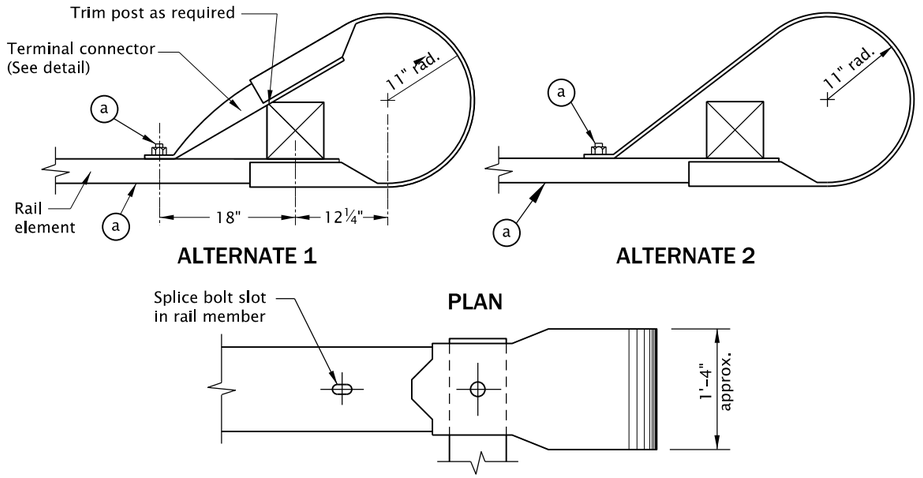
20-JUL-2020

RD417.dgn



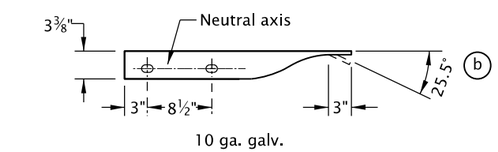
W-BEAM TYPE B END PIECE

ⓐ Use rectangular washer under bolt head and nut on Type C End Piece as shown.

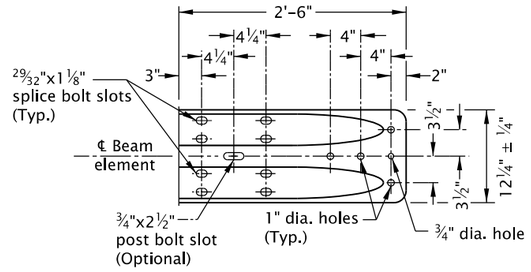


W-BEAM TYPE C END PIECE

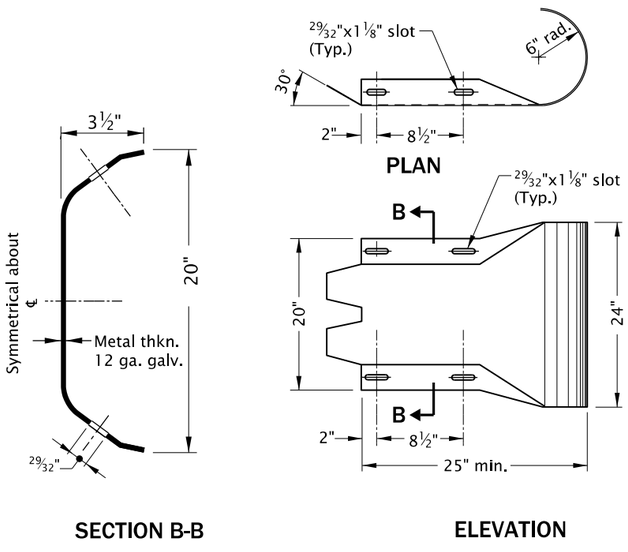
(For details not shown, see Type B End Piece)



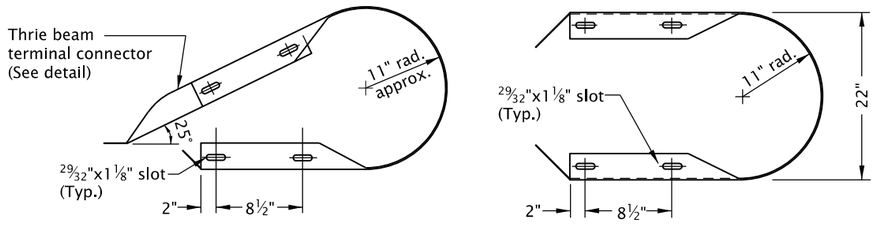
ⓑ 25.5" bend and hole reqd. only for use with alternate Type "C" end piece.

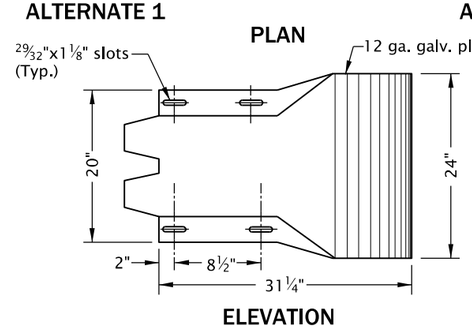


W-BEAM TERMINAL CONNECTOR

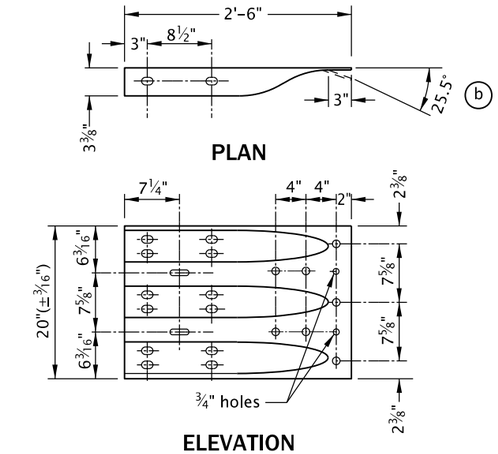


THRIE BEAM TYPE B END PIECE





THRIE BEAM TYPE C END PIECE



THRIE BEAM TERMINAL CONNECTOR

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. For details of guardrail connections to structural handrails, see special details or Standard Drawings as called for on plans.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

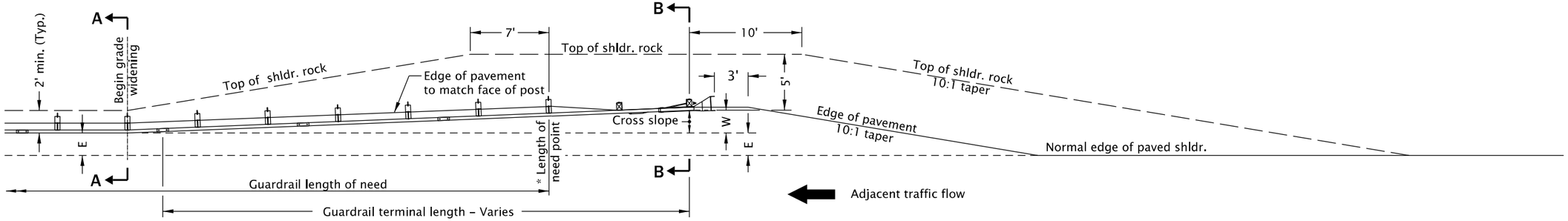
MIDWEST GUARDRAIL SYSTEM END SECTIONS

2024

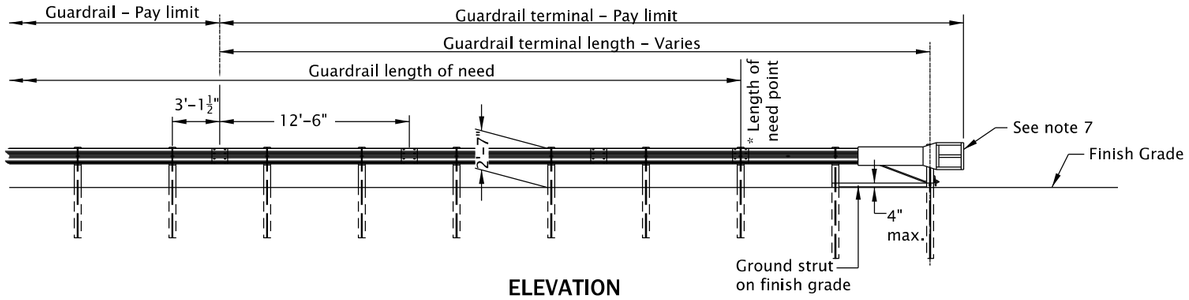
DATE	REVISION DESCRIPTION

CALC BOOK NO. N/A | SDR DATE 13-JAN-2020 | **RD417**

Effective Date: June 1, 2024 – November 30, 2024

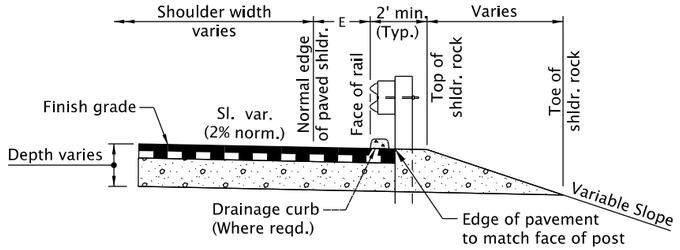


PLAN



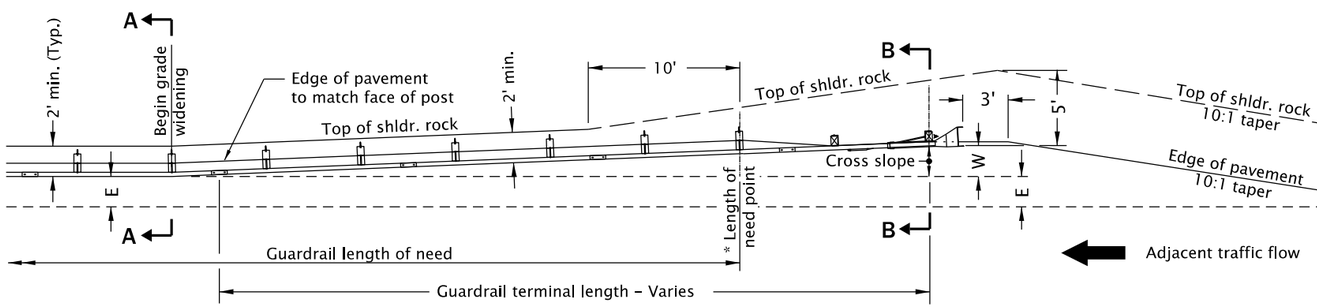
ELEVATION

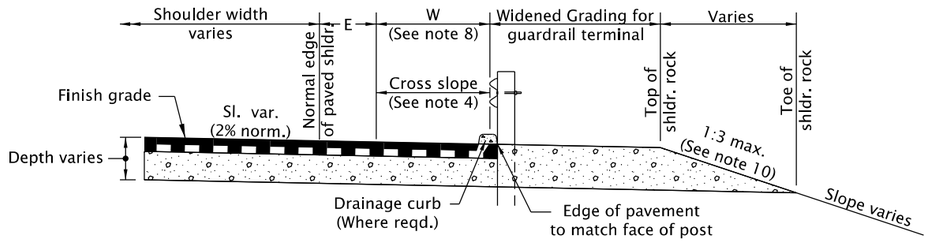
* See note 6 and 9



SECTION A-A

PREFERRED GRADING





SECTION B-B

ALTERNATIVE GRADING

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Use details shown as a general guide since manufacturer's details may vary. Install a guardrail terminal system that meets MASH requirements per manufacturer's recommendations. Ensure that guardrail terminal meets appropriate test level for the project.
2. See appropriate guardrail standard drawing(s) for details not shown. See project plans for details not shown. See Std. Dwg. RD701 for drainage curbs, where required. E=2' or as shown on project plans.
3. Guardrail Non-flared terminal shall be installed with a minimum 1 foot offset ensuring that the end piece is entirely off normal shoulder.
4. Cross slope to match adjacent roadway cross slope (preferred). If required, maximum shoulder slope 10% for guardrail widening. If required, maximum grade break at normal edge of shoulder 8%.
5. On two way two lane highways, both ends of guardrail runs shall be provided with a terminal flared or non-flared. Paving of widened shoulder to the face of posts on both ends of guardrail runs is required.
6. Provide guardrail terminal from ODOT's QPL. Install according to manufacturer's recommendations (post count varies). Provide shop drawings to Engineer.
7. Install a reflectorized object marker on head of every guard rail terminal with "W" 4 feet or less according to manufacturer's recommendations.
8. "W" distance is measured to face of guardrail at end post, exclusive of end piece.
9. Length of need post location varies by manufacturer.
10. 1:4 slope or flatter preferable, 1:3 maximum.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MIDWEST GUARDRAIL SYSTEM GRADING FOR TERMINALS

2024

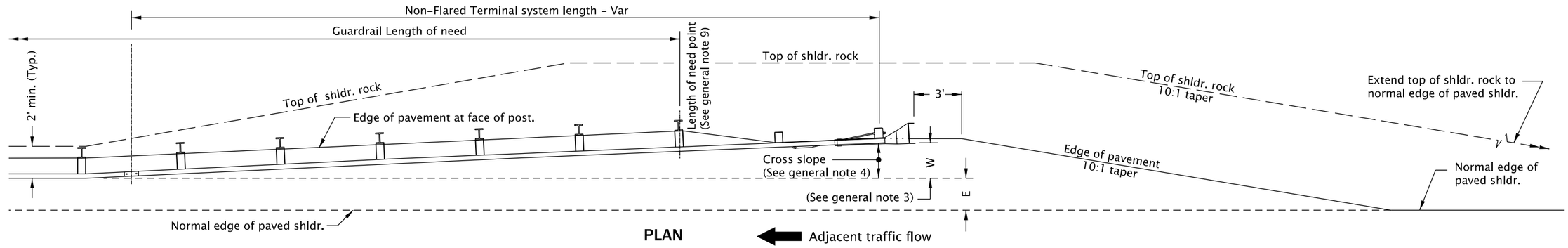
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 19-JUL-2021 | **RD419**

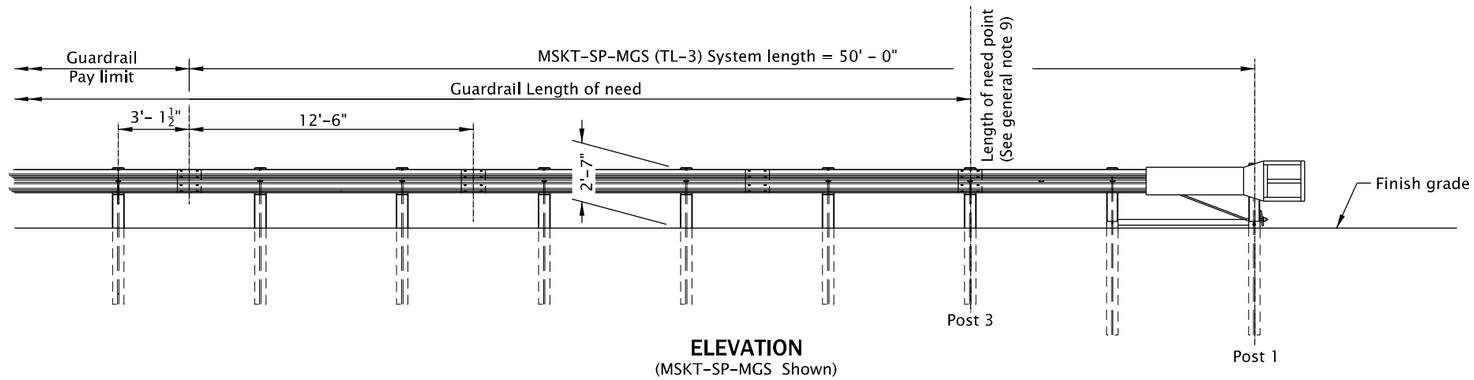
Effective Date: June 1, 2024 – November 30, 2024

19-JUL-2021

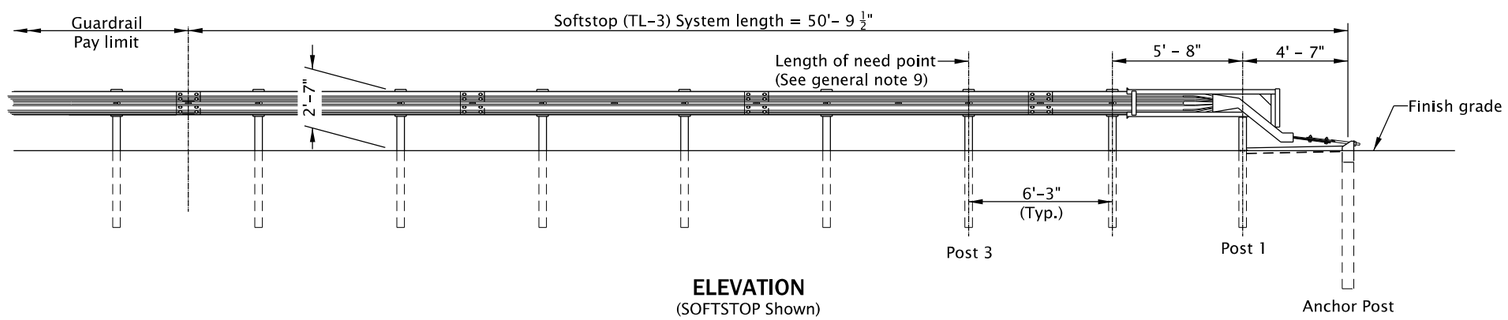
RD419.dgn



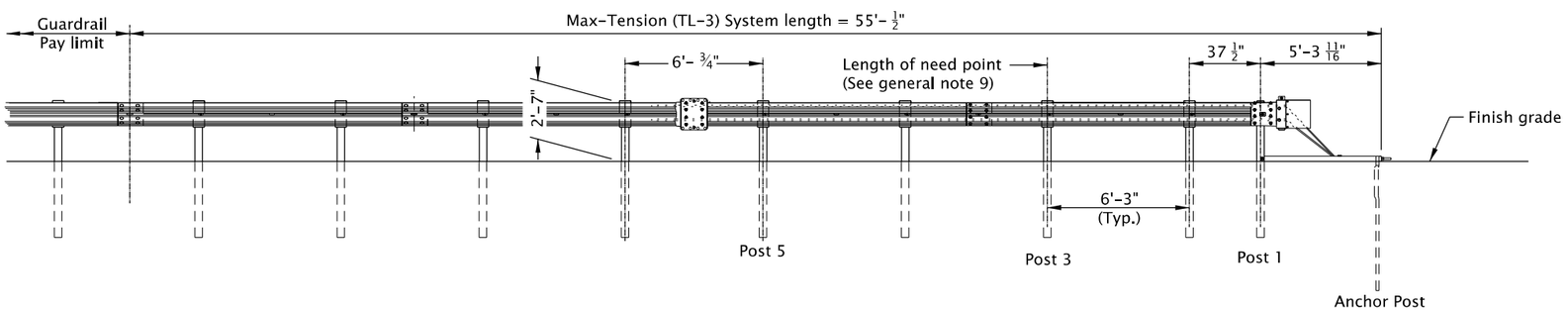
PLAN ← Adjacent traffic flow



ELEVATION
(MSKT-SP-MGS Shown)



ELEVATION
(SOFTSTOP Shown)



ELEVATION
(MAX-TENSION Shown)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Use details shown as a general guide since manufacturer's details may vary. Install a guardrail terminal system that meets MASH requirements per manufacturer's recommendations. Ensure that guardrail terminal meets appropriate test level for the project.
2. See appropriate guardrail standard drawing(s) for details not shown. See project plans for details not shown. See Std. Dwg. RD701 for drainage curbs, where required. E=2' or as shown on project plans.
3. Guardrail Non-flared terminal shall be installed with a min. 1 foot offset ensuring that the end piece is entirely off normal shldr.
4. Cross slope to match adjacent roadway cross slope (preferred). If required, maximum shoulder slope 10% for guardrail widening. If required, maximum grade break at normal edge of shoulder 8%.
5. On two way two lane highways, both ends of guardrail runs shall be provided with a crashworthy terminal flared or non-flared. Paving of widened shldr. to the face of posts on both ends of guardrail runs is required. See Std. Dwgs. RD443 and RD444.
6. Provide guardrail terminal from ODOT's QPL. Install according to manufacturer's recommendations (post count varies). Provide shop drawings to Engineer.
7. Install a reflectorized object marker on head of every guard rail terminal with "W" 4 feet or less according to manufacturer's recommendations.
8. "W" distance is measured to face of guardrail at end post, exclusive of end piece.
9. Length of need post location varies by manufacturer.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

MIDWEST GUARDRAIL SYSTEM NON-FLARED ENERGY-ABSORBING TERMINAL

2024

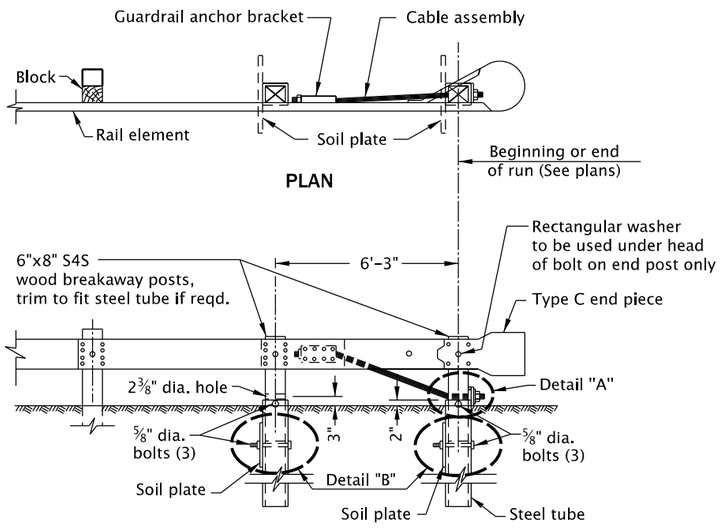
DATE	REVISION DESCRIPTION

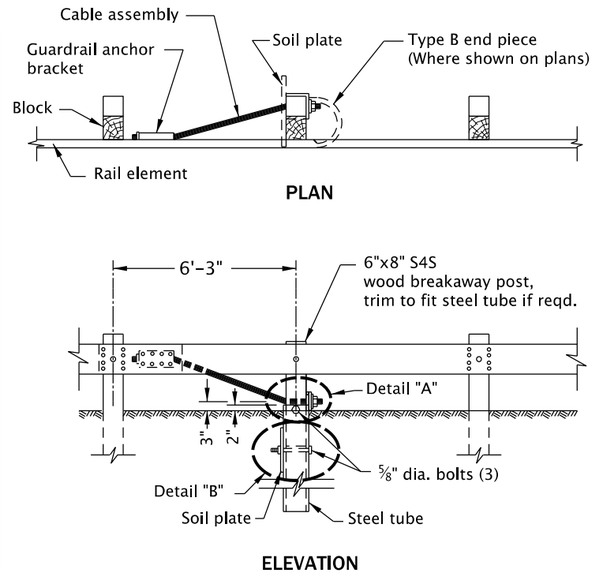
CALC. BOOK NO. N/A | SDR DATE 19-JAN-2024 | **RD420**

19-JAN-2024

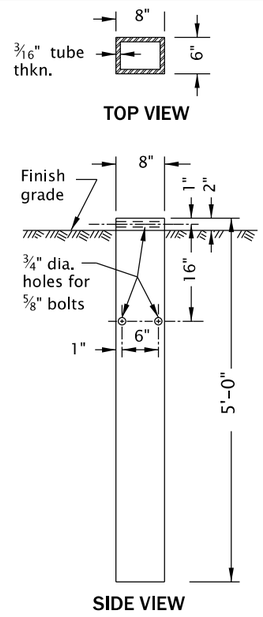
RD420.dgn

Effective Date: June 1, 2024 - November 30, 2024





GUARDRAIL STEEL ANCHORS
(Where shown on plans)



STEEL TUBE

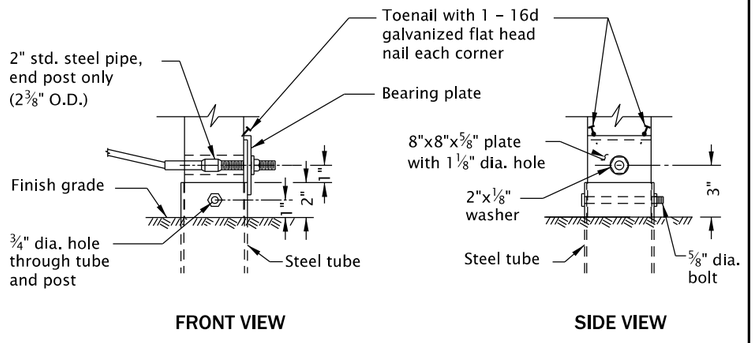
GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. (a.) Cable assembly to be tightened to a taut condition on initial installation.

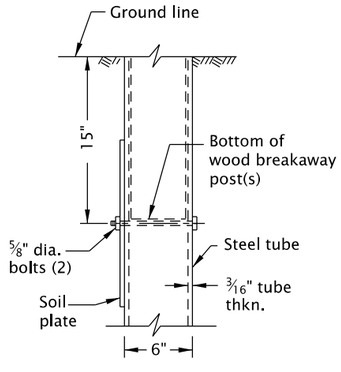
   (b.) Final tension check and tightening of cable assembly as required to be done 30 days following initial installation.

2. See appropriate guardrail standard drawing(s) for details not shown.

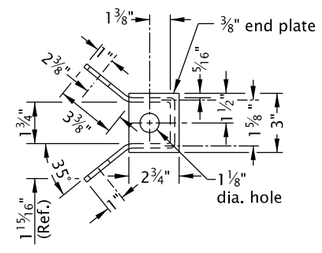
3. See Std. Dwg. RD451 for wood breakaway posts.



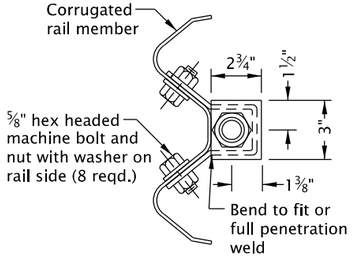
DETAIL "A"



DETAIL "B"

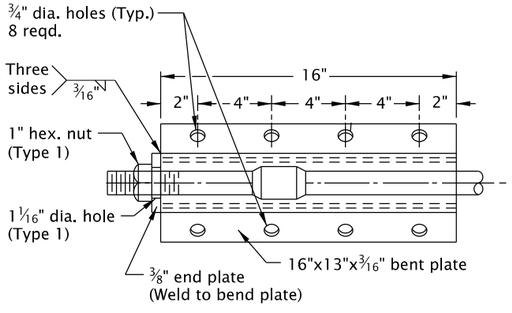


END VIEW
Alternate No. 1



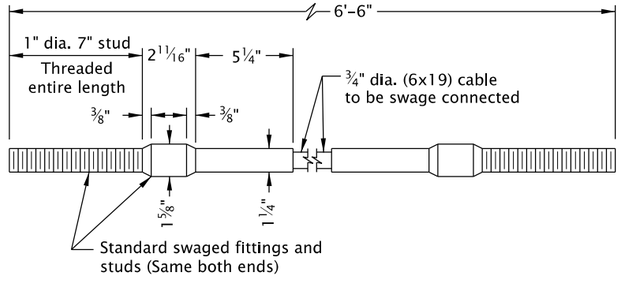
END VIEW
Alternate No. 2

BRACKET

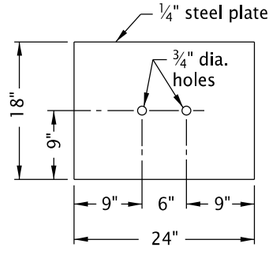


BACK VIEW

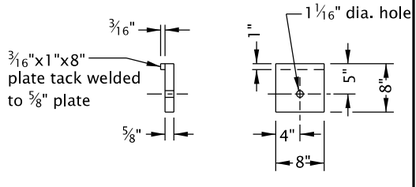
NOTE:
All plate for bracket to be ¼" thick steel, unless otherwise noted.



CABLE ASSEMBLY



SOIL PLATE



BEARING PLATE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

GUARDRAIL ANCHORS (STEEL)

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 13-JAN-2020 | **RD450**

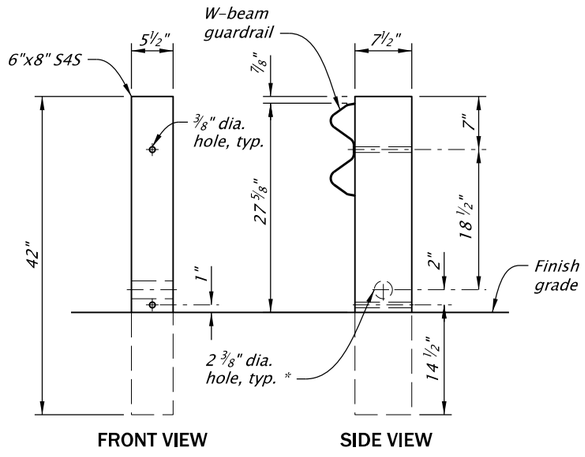
Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020

RD450.dgn

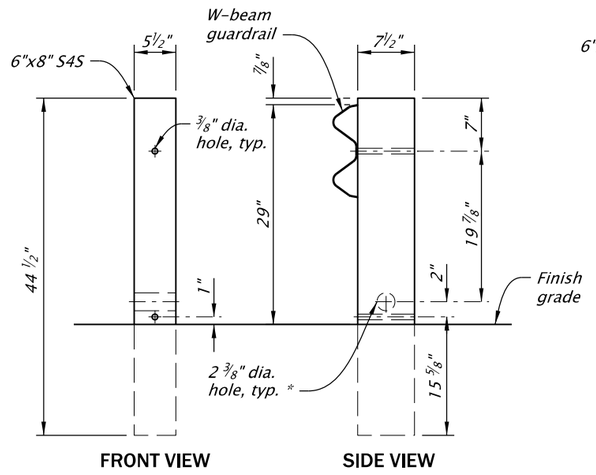
19-JAN-2024

RD451.dgn



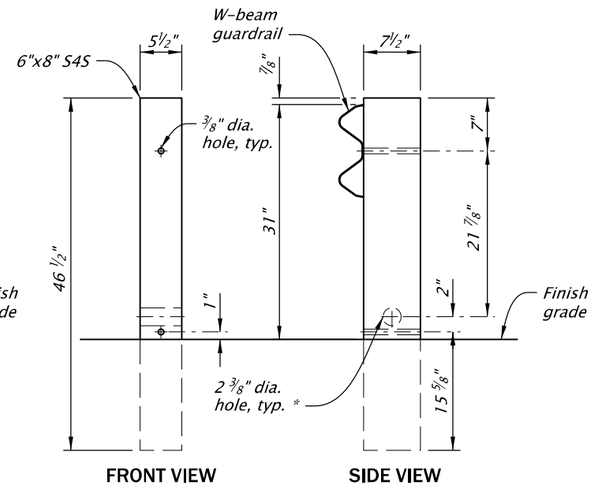
TOP OF RAIL HEIGHT 27⅝"

This detail is retained for maintenance purposes only. Do not use for new construction.



TOP OF RAIL HEIGHT 29"

This detail is retained for maintenance purposes only. Do not use for new construction.



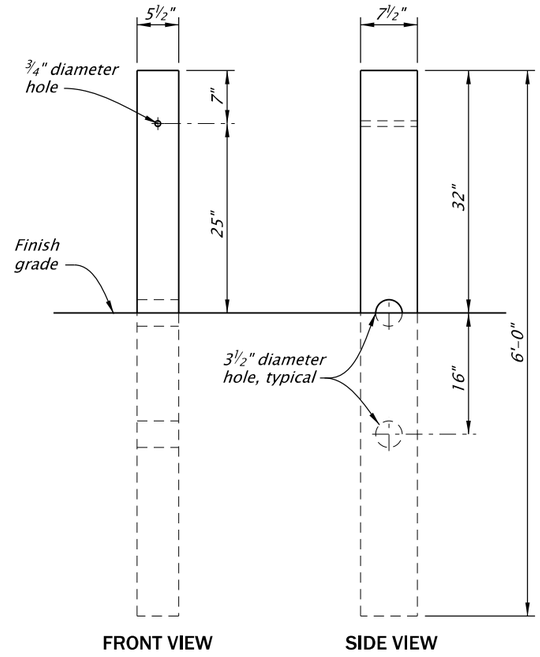
TOP OF RAIL HEIGHT 31"

W-BEAM WOOD BREAKAWAY POSTS

* 2" standard pipe in end post only, 2 ⅜" diameter hole

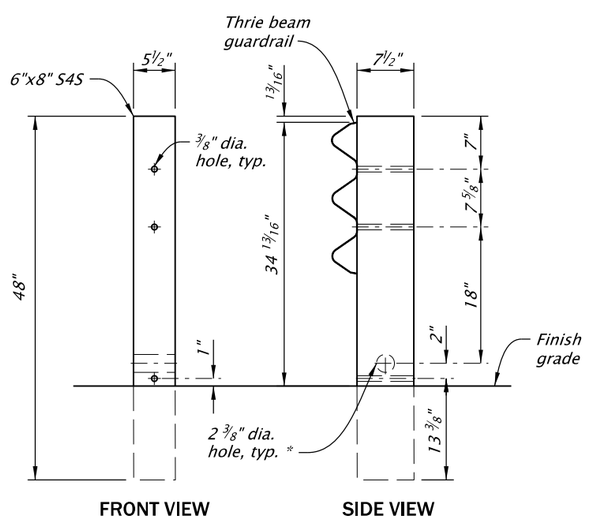
GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. *See appropriate guardrail standard drawing(s) for details not shown.*
2. *Use only 6"x8" S4S wood posts, trim to fit steel tube if required.*

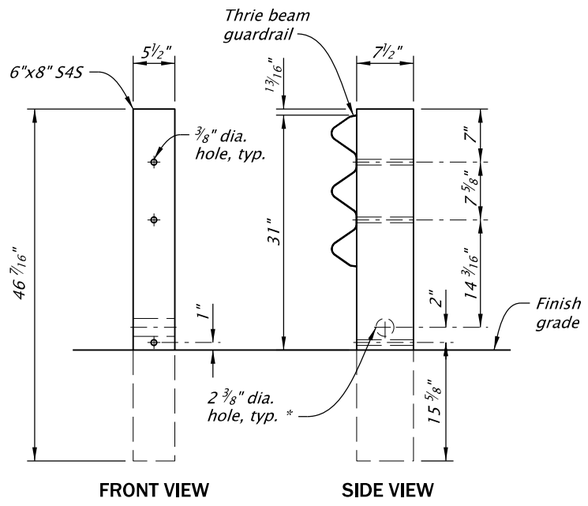


TOP OF RAIL HEIGHT 31"

CONTROLLED RELEASE TERMINAL (CRT) POST



TOP OF RAIL HEIGHT 35" (NOMINAL)



TOP OF RAIL HEIGHT 31"

THRIE BEAM WOOD BREAKAWAY POSTS

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

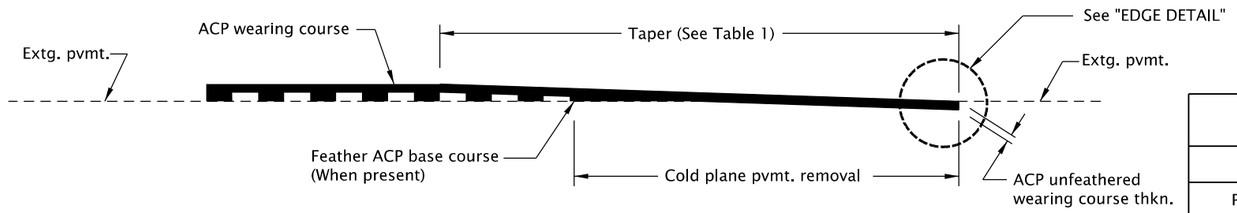
WOOD BREAKAWAY POSTS

2024

DATE	REVISION DESCRIPTION
12-2023	ADDED CRT POST, UPDATED DRAWING CAD STANDARDS

CALC. BOOK NO. N/A | SDR DATE 19-JAN-2024 | **RD451**

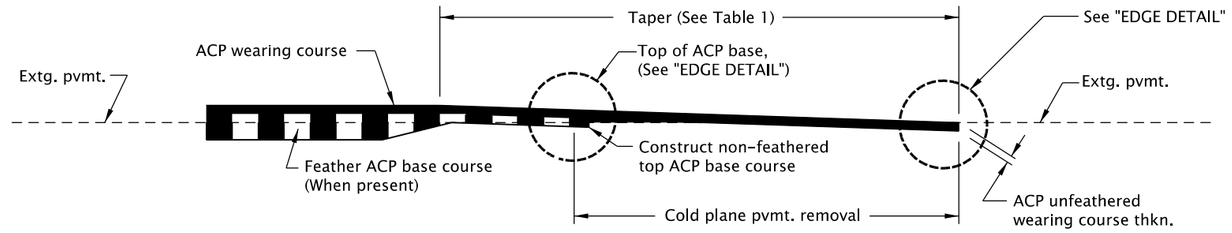
Effective Date: June 1, 2024 - November 30, 2024



METHOD A *

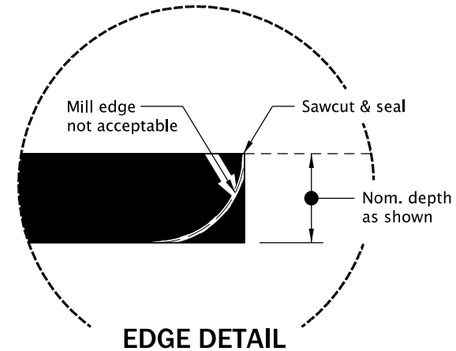
* See project plans for method.

TABLE 1	
TAPER LENGTHS	
Posted Speed	Taper Length
< 45 mph	1" per 50'
≥ 45 mph	1" per 100'

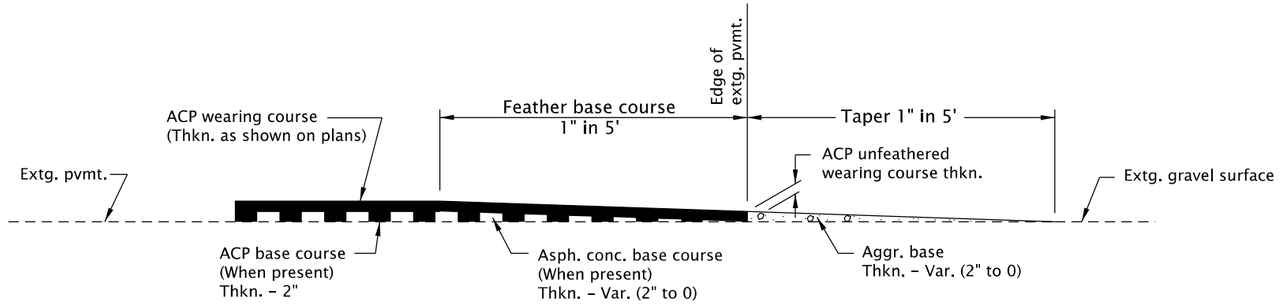


METHOD B *

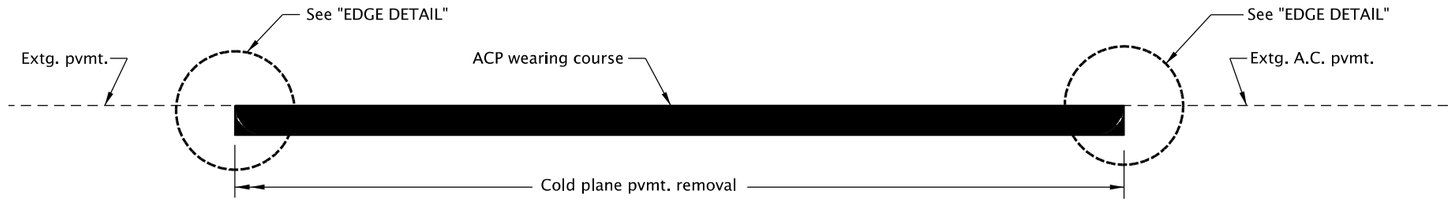
ACP PAVEMENT MATCH AT PROJECT ENDS OR BRIDGE ENDS WHEN NOT OVERLAYING THE BRIDGE



EDGE DETAIL



METHOD OF FEATHERING ACP PAVEMENT AT GRAVEL APPROACHES



METHOD OF MATCHING EXTG. ACP INLAY SURFACING

(Inlay to extg. asphalt conc. pvmt.)

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

ASPHALT CONCRETE PAVEMENT (ACP) DETAILS

2024

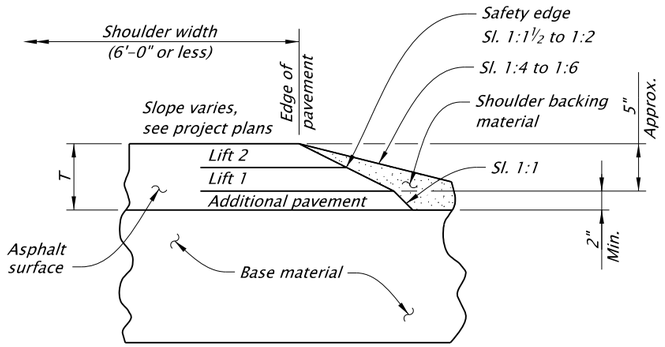
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 25-JUL-2017 | **RD610**

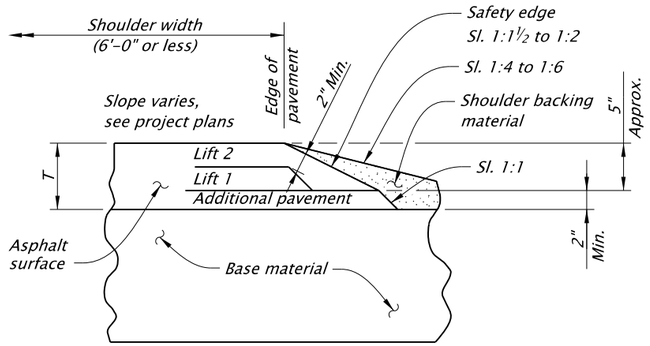
Effective Date: June 1, 2024 – November 30, 2024

20-JUL-2020

RD610.dgn

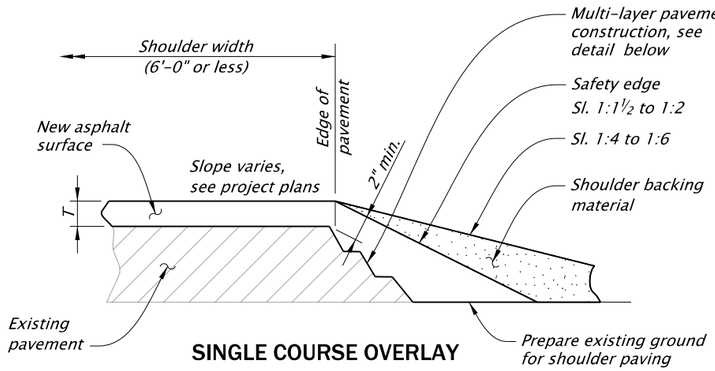


SAFETY EDGE PLACED WITH LIFTS

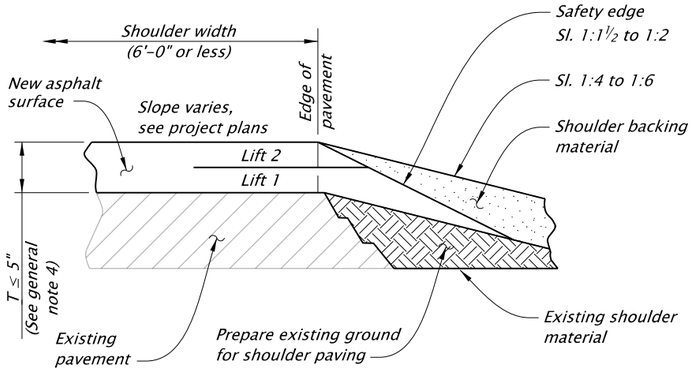


SAFETY EDGE PLACED ONLY WITH FINAL LIFT

SAFETEY EDGE FOR ASPHALT CONCRETE (NEW CONSTRUCTION)

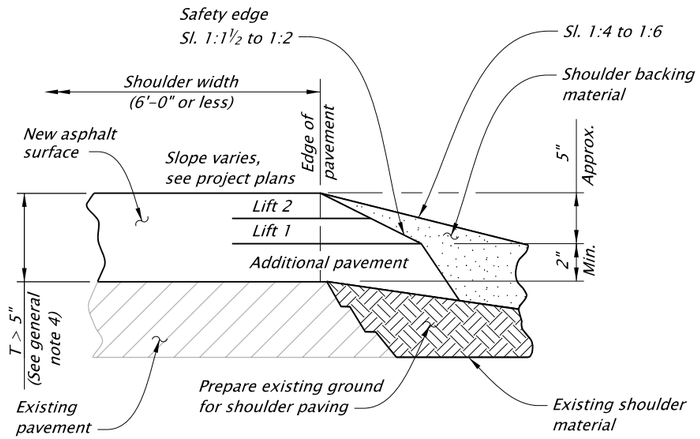


SINGLE COURSE OVERLAY



PAVEMENT THICKNESS (T) 5" OR LESS

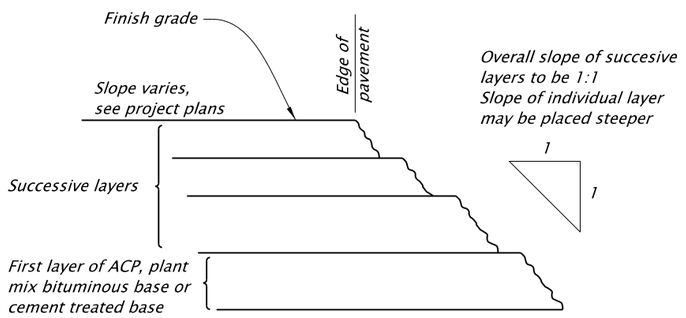
SAFETY EDGE FOR ASPHALT CONCRETE RECONSTRUCTION (INCLUDING MILL, INLAY AND OVERLAY)



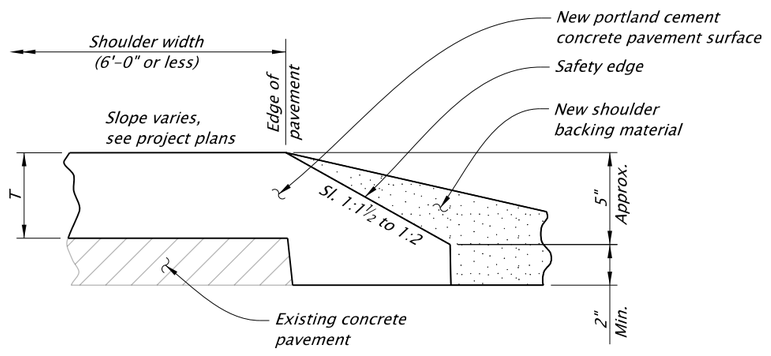
PAVEMENT THICKNESS (T) GREATER THAN 5"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. *Safety edges are required at the outside edges of the paved roadway (edge of travel lane or edge of paved shoulders), where the wearing surface thickness is 2" or greater, except where indicated in the plans.*
2. *Construct the safety edge at a slope of 1:1½ to 1:2 measured from the pavement surface.*
3. *Do not construct safety edge at intersections, paved drives, or other obstructions.*
4. *For total new asphalt depth of "T"≤5", construct the safety edge to the full thickness of the surface and intermediate courses. For total new asphalt depth of "T" > 5", construct the safety edge to a depth of 5" approximately with a 1:1 sloped face below the safety edge.*



MULTI-LAYER PAVEMENT CONSTRUCTION



SAFETY EDGE FOR PORTLAND CEMENT CONCRETE PAVEMENT OVERLAY

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SURFACE EDGE DETAILS

2024

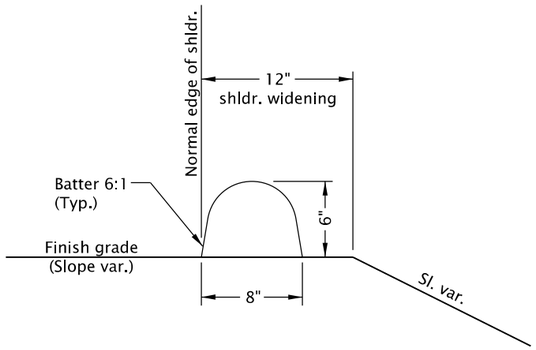
DATE	REVISION DESCRIPTION
07-2021	TITLE CHANGED, REVISED DETAILS AND NOTES

CALC. BOOK NO. N/A | SDR DATE 19-JUL-2021 | **RD615**

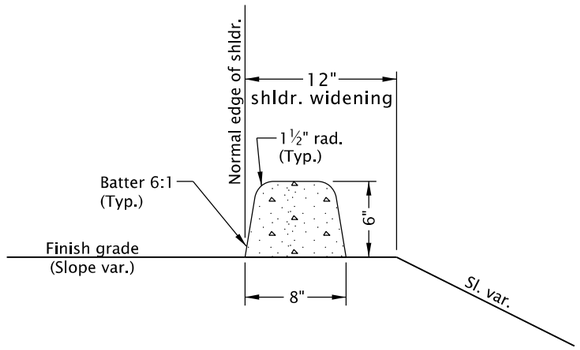
Effective Date: June 1, 2024 - November 30, 2024

19-JUL-2021

RD615.dgn



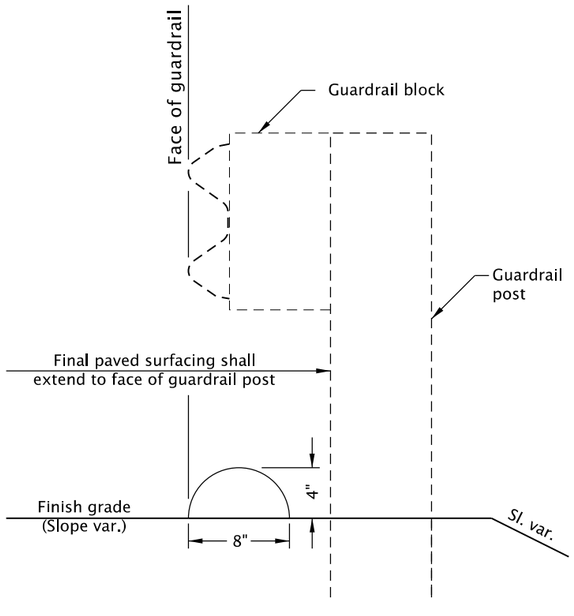
ASPHALT CONCRETE



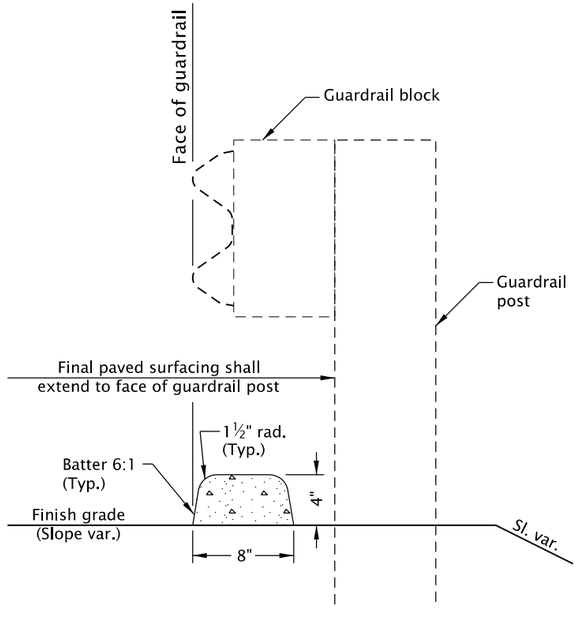
PORTLAND CEMENT CONCRETE

DRAINAGE CURBS

(See general note 4)



ASPHALT CONCRETE



PORTLAND CEMENT CONCRETE

DRAINAGE CURBS UNDER GUARDRAIL

(See general note 4)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For PCC drainage curbs, construct curb expansion joints at 200' maximum spacing, and at points of tangency.
2. For PCC drainage curbs, construct curb contraction joints at 15' maximum spacing.
3. Dimensions are nominal, vary to conform with curb machine approved by the engineer.
4. When bonding to dense graded ACP, apply epoxy cement between surfaces.
5. When drainage curb is required, curb alignment shall be the same as face of guardrail, as shown above. When a run of drainage curb, or any part thereof, is placed under guardrail, curb height shall be 4".
6. For other curb types, see Std. Dwg. RD700.
7. For guardrail details not shown, see Std. Dwg. RD400.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

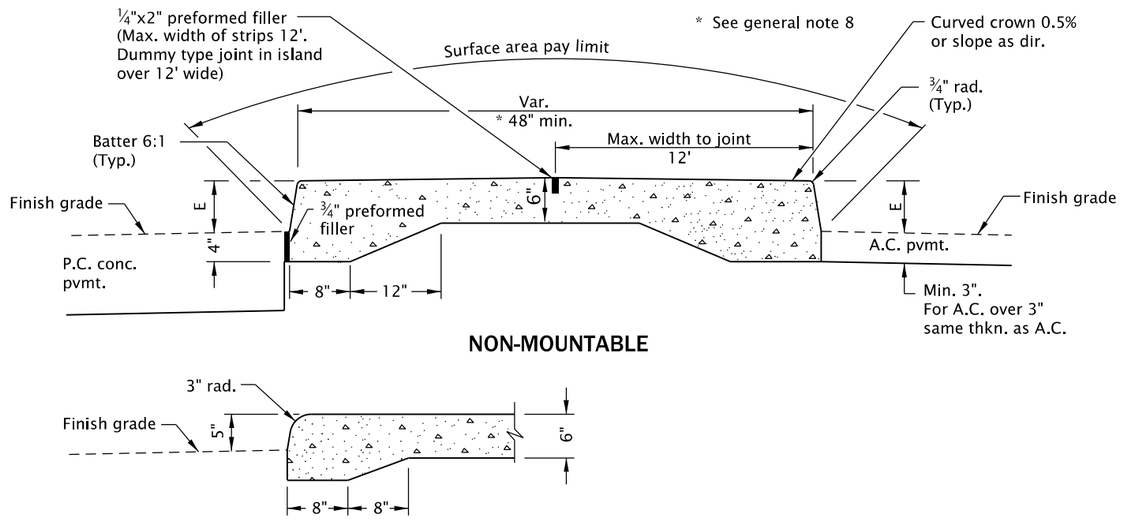
OREGON STANDARD DRAWINGS

DRAINAGE CURBS

2024

DATE	REVISION DESCRIPTION

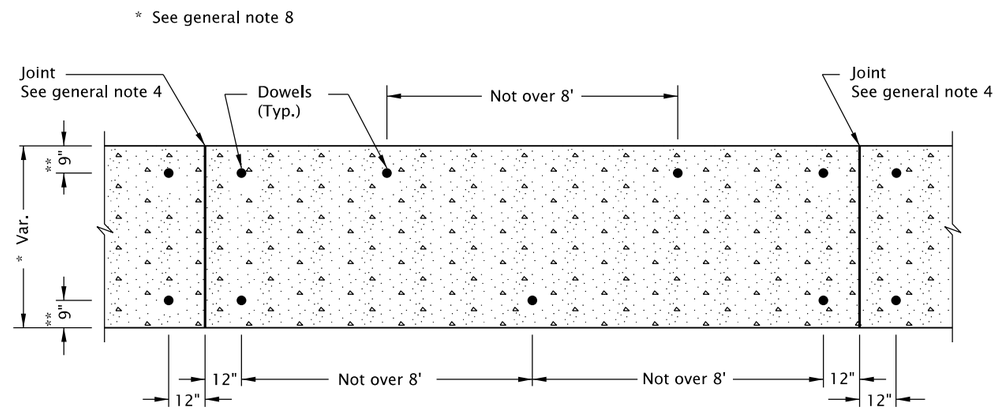
CALC. BOOK NO. N/A | SDR DATE 20-JUL-2020 | **RD701**



NON-MOUNTABLE

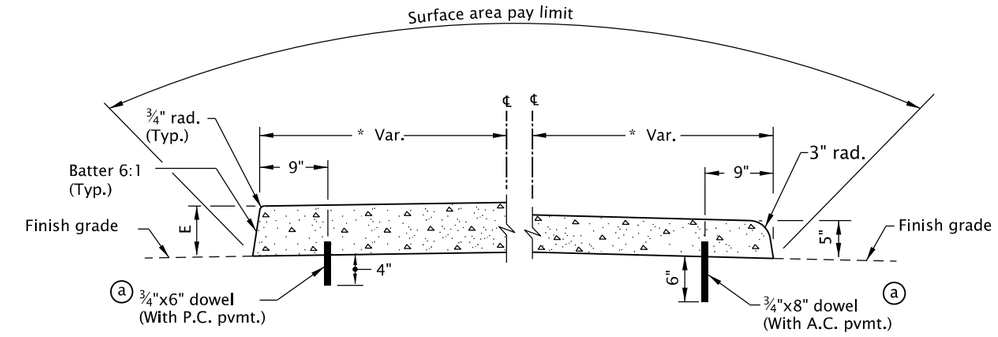
MOUNTABLE
(For surfacing details not shown, see above)

TYPE A



DOWEL PLAN
FOR TYPE C OR TYPE CA ISLANDS & TRANSITIONS
(ON SURFACE OF NEW OR EXISTING PAVEMENT)

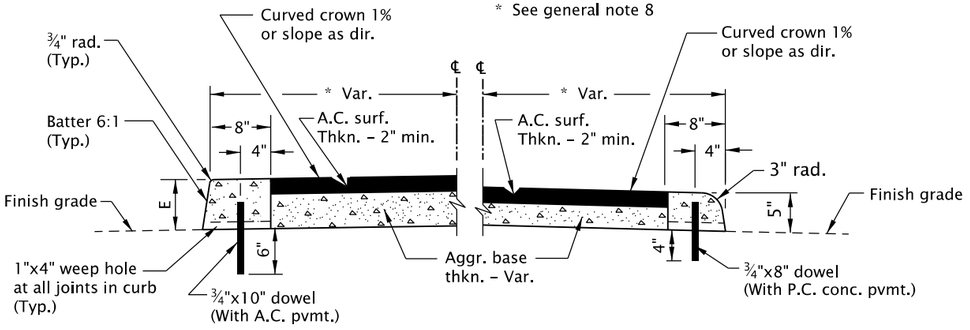
** Also see below for type CA island requirement.



NON-MOUNTABLE **MOUNTABLE**

ⓐ No dowels reqd. for Type C islands 5' wide or wider

TYPE C



NON-MOUNTABLE **MOUNTABLE**

TYPE CA

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Curb exposure "E" = 7" normal. Vary as shown on plans or as directed.
2. Standard batter is shown. Vary as shown on typical section or as directed.
3. Transverse joints in conc. islands to match joints in conc. pvmt. and to be of same type (Omit dowels in expansion joints).
4. Set joint spacing 200' max. for expansion and 15' max. for contraction.
5. Place preformed filler along one side of conc. islands in conc. pvmt. and around all curved ends.
6. Dowels shall be ¾" dia. with length as shown.
   In new conc. pvmt. set dowels before conc. hardens.
   In extg. conc. pvmt. drill holes 1½" dia. and grout dowels in.
   In A.C. pvmt. drive dowels.
7. For transitions to traffic separators, see Std. Dwg. RD706.
8. Minimum island width is 48". For accessible route islands, see Std. Dwg. RD710.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

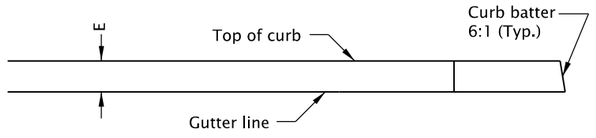
ISLANDS

2024

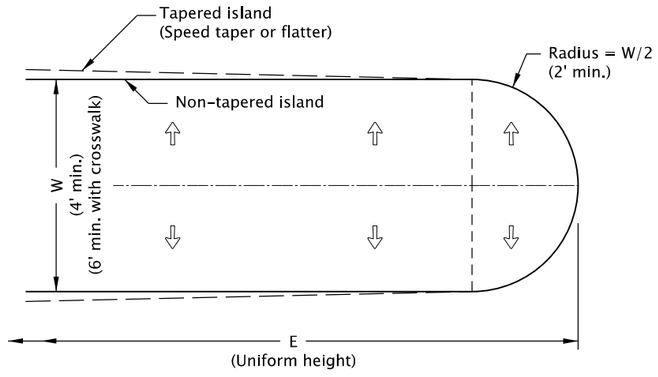
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 16-JUL-2018 | **RD705**

Effective Date: June 1, 2024 – November 30, 2024

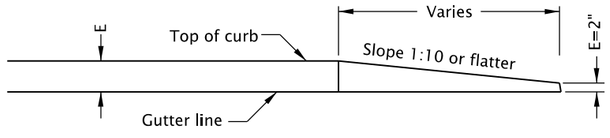


ELEVATION

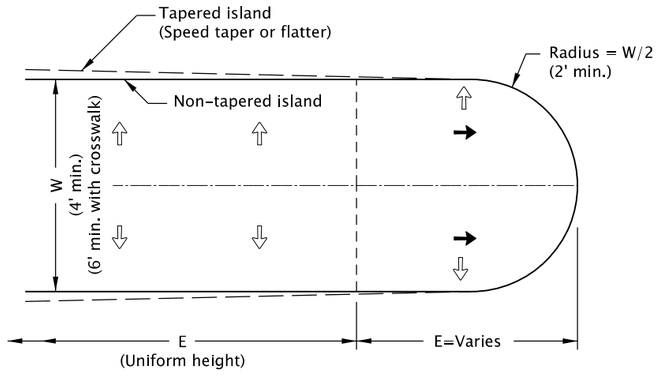


PLAN

OPTION "A"

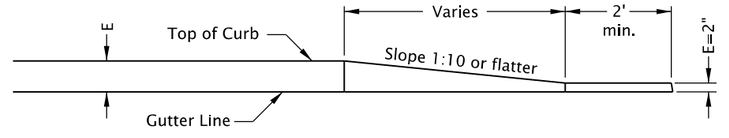


ELEVATION

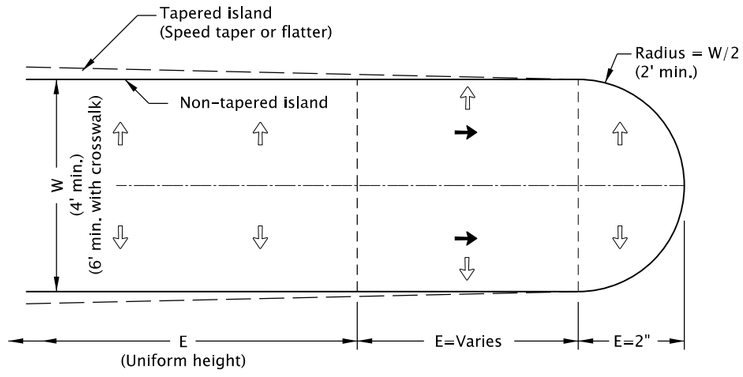


PLAN

OPTION "B"



ELEVATION



PLAN

OPTION "C"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Curb type and median width as shown on plans or as directed.
2. Curb exposure "E" = 7" normal. Vary as shown on plans or as directed.
3. Standard batter is shown. Vary as shown on typical section or as directed.
4. See Std. Dwgs. RD700, RD701, RD705, RD706 & RD710 for additional details.
5. Site conditions normally require a project specific design, which considers roadway conditions (sheet flow limits, cross slope, superelevation, profile, pavement type, lane and shoulder widths, etc.).
6. See Std. Dwg. RD710 for accessible route islands.

⇨ Slope (2.0% normal)

➔ Slope (varies)

E Curb exposure

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

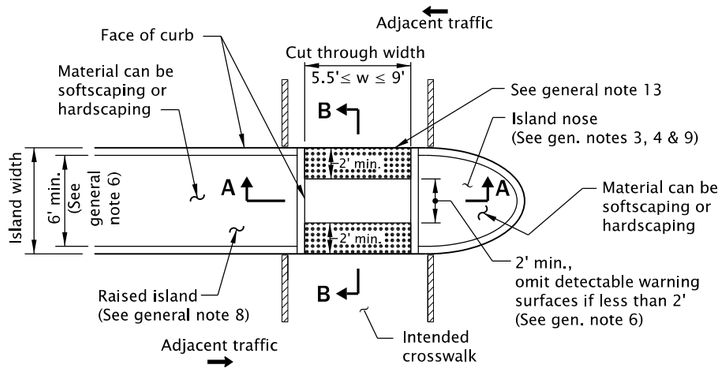
ISLAND NOSE TREATMENTS

2024

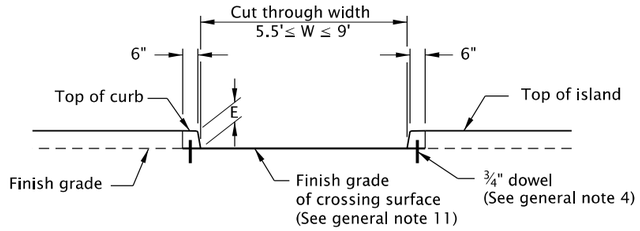
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 22-JUL-2016 | **RD707**

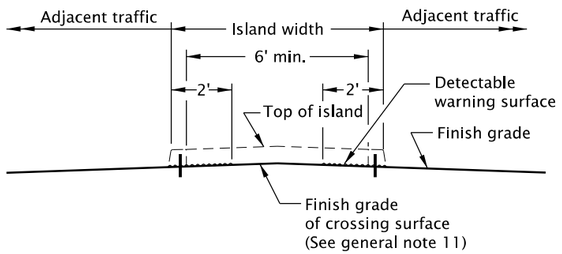
Effective Date: June 1, 2024 - November 30, 2024



PLAN



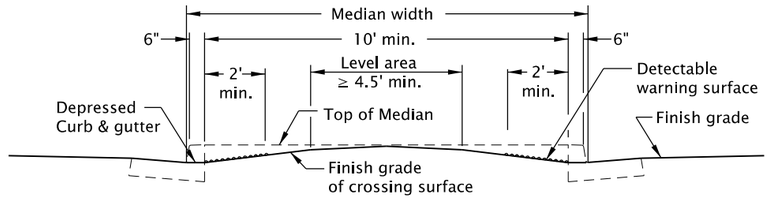
SECTION A-A



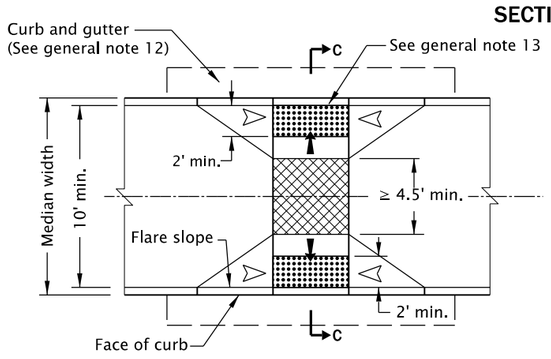
SECTION B-B

MEDIAN ISLAND CROSSING (CUT THROUGH)

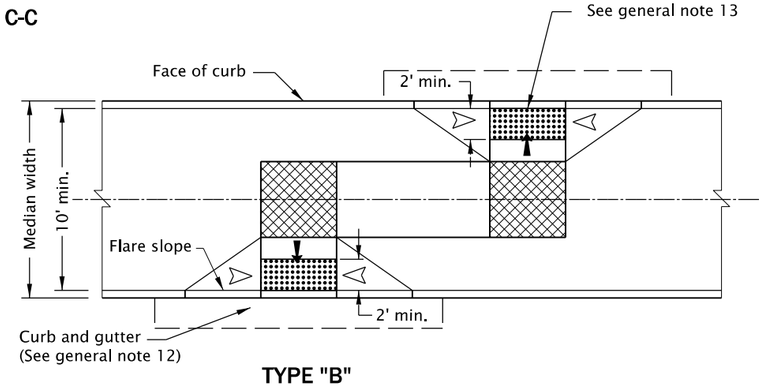
(A.C. pavement shown)



SECTION C-C



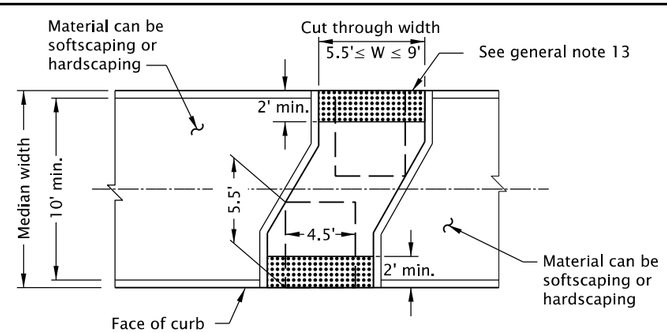
TYPE "A"



TYPE "B"

MEDIAN RAISED CROSSING

(P.C. conc. surface shown)



MEDIAN CUT-THROUGH CROSSING

(Asph. conc. surface shown)

LEGEND:

- Marked or intended crossing location
- Level area (Turning space/landing) Unobstructed 4.5' x 4.5' With obstruction 4.5' x 5.5' (Longer dimension in direction of pedestrian street crossing). For the purposes of this application, a max. 2.0% finished surface slope (for drainage) is considered level.
- Detectable warning surface
- Cross slope 1.5% max. (Max. 2.0% finished surface slope)
- Running slope 7.5% max. (Max. 8.3% finished surface slope)
- Flare slope (Max. 10.0% finished surface slope)
- Zero curb exposure
- Clear space 4.5' x 5.5' (Longer dimension in direction of pedestrian street crossing)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Accessible route islands are based on applicable ODOT Standards.
2. Place detectable warning surface at the back of curb for a minimum depth of 2 feet at curb ramp that is adjacent to traffic. For details not shown, see Std. Dwgs. RD902 through RD908.
3. The minimum area of islands that contain signal poles, pedestals, etc., shall be 75 square feet. Square feet to be measured to outer perimeter of entire island.
4. For cut through islands, dowel each island segment to the pavement with a minimum of two ¾" diameter dowels. Dowel the nose section of the raised median island with a minimum of two ¾" diameter dowels. Place dowels as directed. See Std. Dwg RD705.
5. Align curb ramps for lowered or partially lowered island and cut through island with the crosswalk.
6. Detectable warning surfaces shall be separated by a 2-foot minimum length of walkway without detectable warnings. Where no curb, the detectable warning surface shall be placed at the edge of roadway.
7. Grade breaks at the top and bottom of curb ramp runs shall be perpendicular to the direction of the ramp run. Grade breaks shall not be permitted on the surface of ramp runs and turning spaces. Surface slopes that meet at grade breaks shall be flush.
8. Curb type and island width as shown on plans or as directed. Type A or Type CA islands are acceptable alternates, see Std. Dwg. RD705.
9. See project plans for details not shown. See Std. Dwg. RD707 for island nose treatment. See Std. Dwg. RD705 for expansion and contraction joint spacing. See Std. Dwgs. RD700, RD701, RD705 & RD706 for additional details. See TM Standard Drawings for signal pole, pedestrian pedestal, crosswalk markings, and related details.
10. Details intended for pedestrian route only. For multi-use path, see project plans for specific details.
11. When crossing surface grade is ≤ 5%, a level area is not required.
12. On or along state highways, curb and gutter is required at curb ramps.
13. Raised islands in crossings shall have accessible curb ramps at all crossings or all crossings shall be cut through with the street.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

ACCESSIBLE ROUTE ISLANDS

2024

DATE	REVISION DESCRIPTION
07-2021	REVISED DETAILS AND NOTES
11-2021	REVISED NOTES

CALC. BOOK NO. N/A | SDR DATE 14-JAN-2022 | **RD710**

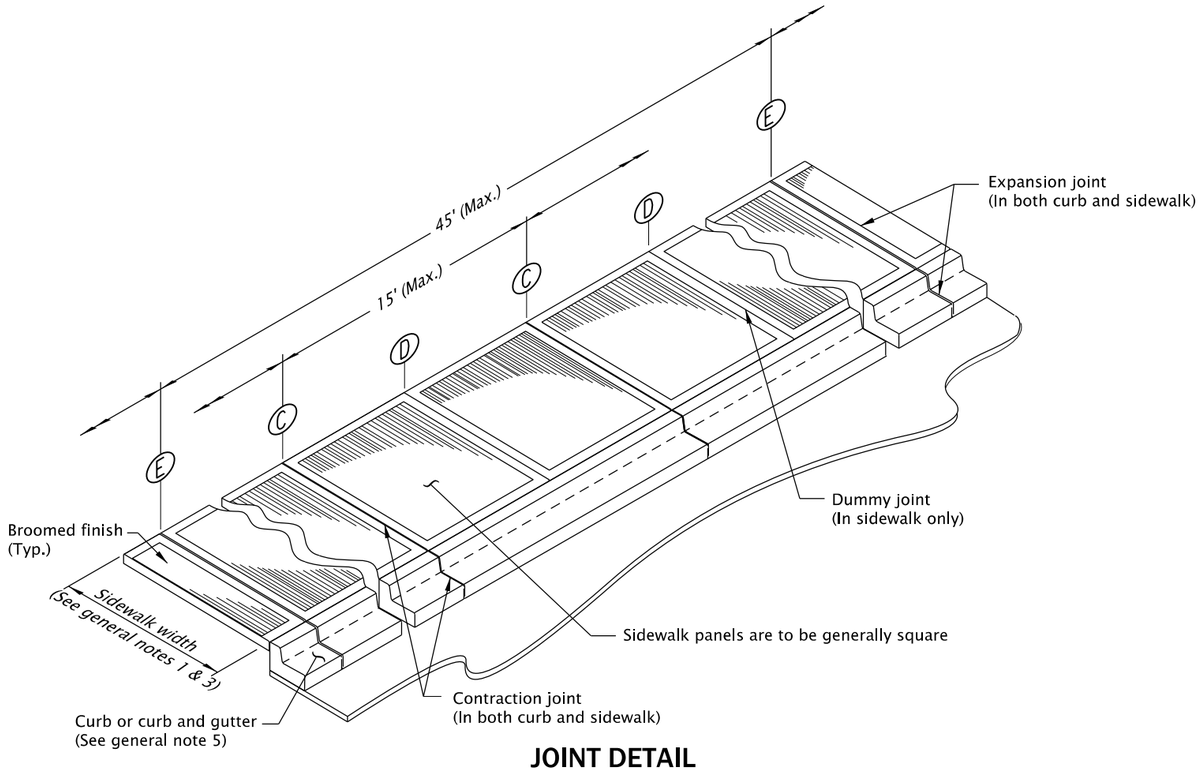
14-JAN-2022

RD710.dgn

Effective Date: June 1, 2024 - November 30, 2024

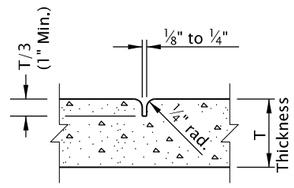
08-JUL-2022

RD722.dgn

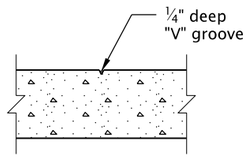


JOINT DETAIL

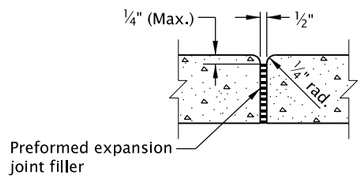
(Curb line sidewalk with curb and gutter shown)



Ⓒ **CONTRACTION JOINT**
(See general note 6)



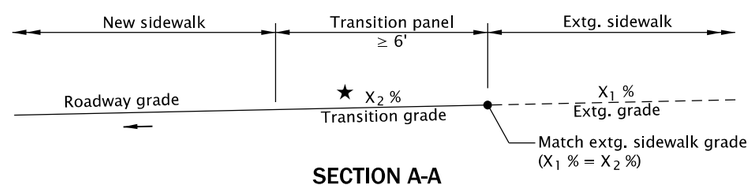
Ⓓ **DUMMY JOINT**



Ⓔ **EXPANSION JOINT**
(See general notes 2 & 5)

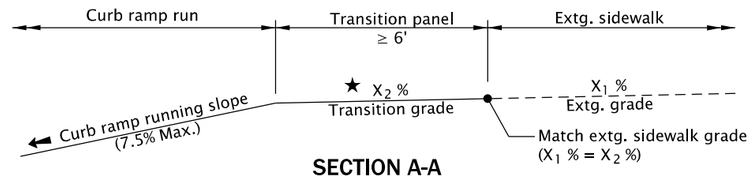
GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See Std. Dwgs. RD720 and RD721 for concrete sidewalk details. See project plans for sidewalk width, placement and design specified.
2. Provide expansion joints around poles, boxes, at ends of each driveway and other fixtures which protrude through or against the structures. For sidewalk, monolithic curb and sidewalk, provide construction expansion joints at 45 feet maximum spacing.
3. On sidewalks 8 feet and wider, provide a longitudinal joint at the midpoint of sidewalk panel.
4. See Std. Dwgs. RD700 and RD701 for concrete curb details. See project plans for the curb design specified.
5. Do not place expansion joints between separate concrete pours for curb ramp system components construction. Place expansion joints outside of curb ramp runs when required. Install expansion joints flush with surface for structures protruding through the curb ramp system. See Std. Dwg. RD900.
6. Construct contraction joints at 15 feet maximum spacing, and at each curb ramp, driveway, sidewalk and curb.

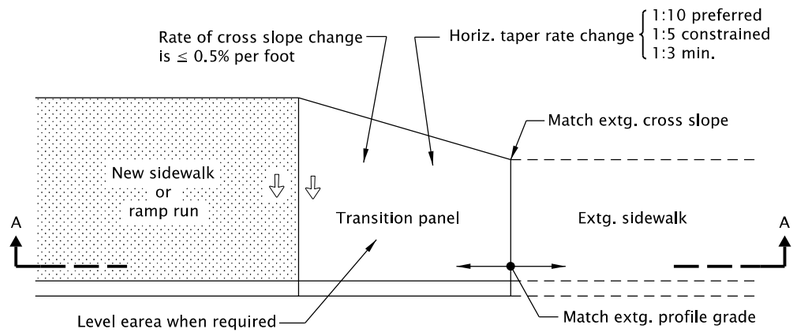


SECTION A-A
(SIDEWALK TRANSITION PANEL SHOWN)

★ Project the existing sidewalk profile grade through transition panel to new sidewalk or curb ramp run.



SECTION A-A
(CURB RAMP TRANSITION PANEL SHOWN)



PLAN

SIDEWALK AND CURB RAMP TRANSITION PANELS

LEGEND:

- New sidewalk or ramp run
- Slope 1.5% max. (Max. 2.0% finished surface slope) (Normal sidewalk cross slope)
- Slope 7.5% max. (Max. 8.3% finished surface slope)
- Zero exposure

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SIDEWALK JOINTS AND TRANSITION PANELS

2024

DATE	REVISION DESCRIPTION
07-2022	REVISED NOTES

CALC. BOOK NO. N/A | SDR DATE 08-JUL-2022 | **RD722**

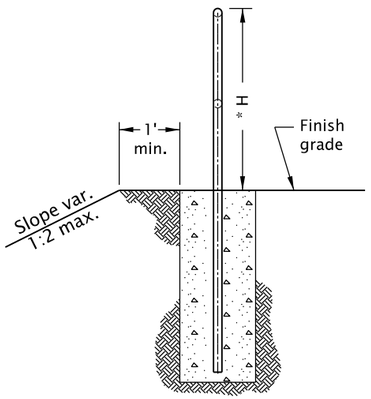
Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020

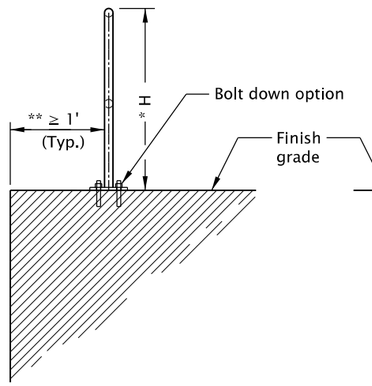
RD770.dgn

* H varies { 34" min. / 38" max.

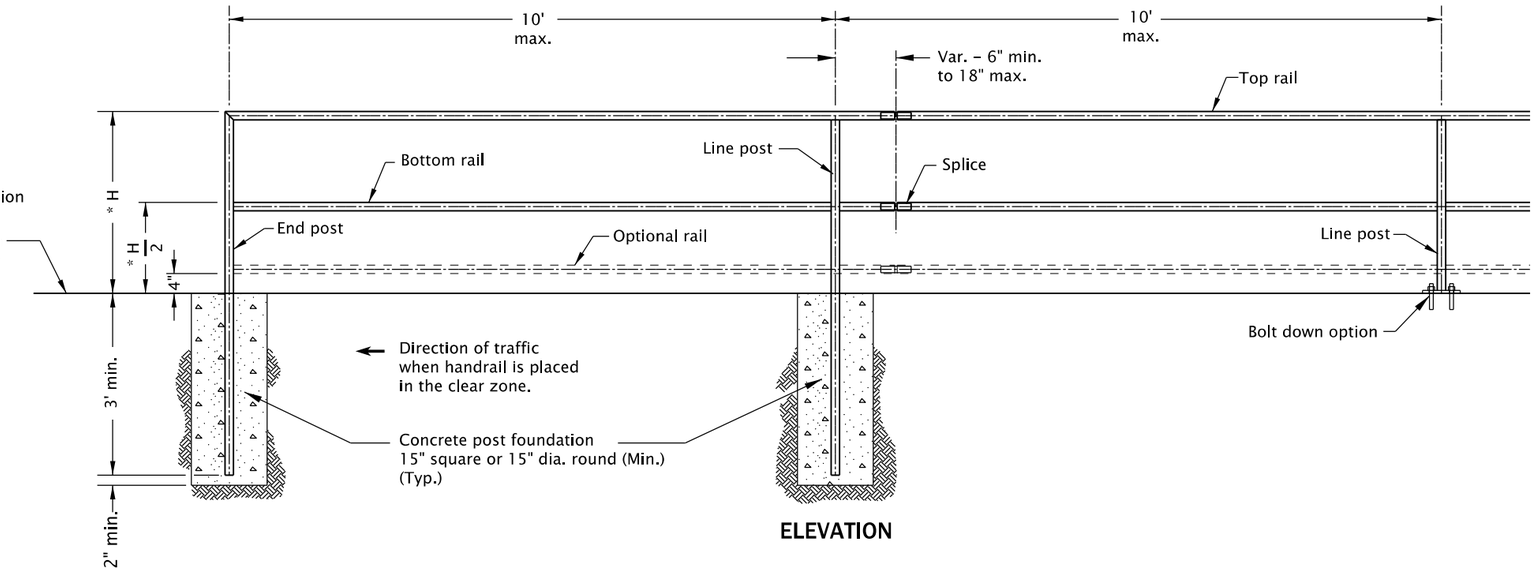
** Optional rail is required when min. 1' dimension could not be meet.



SIDE VIEW (ON GRADE)



SIDE VIEW (ON STRUCTURE)
(See general note 4)

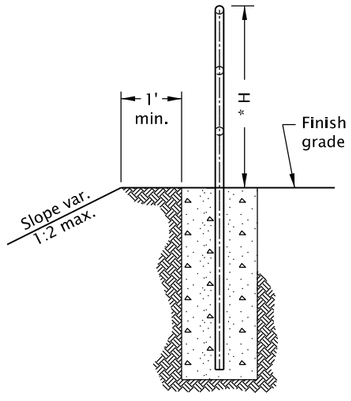


ELEVATION

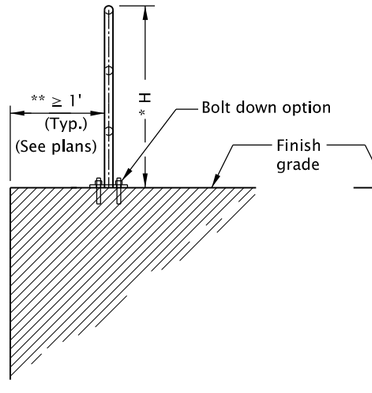
TWO RAIL HANDRAIL

* H varies { 34" min. / 38" max.

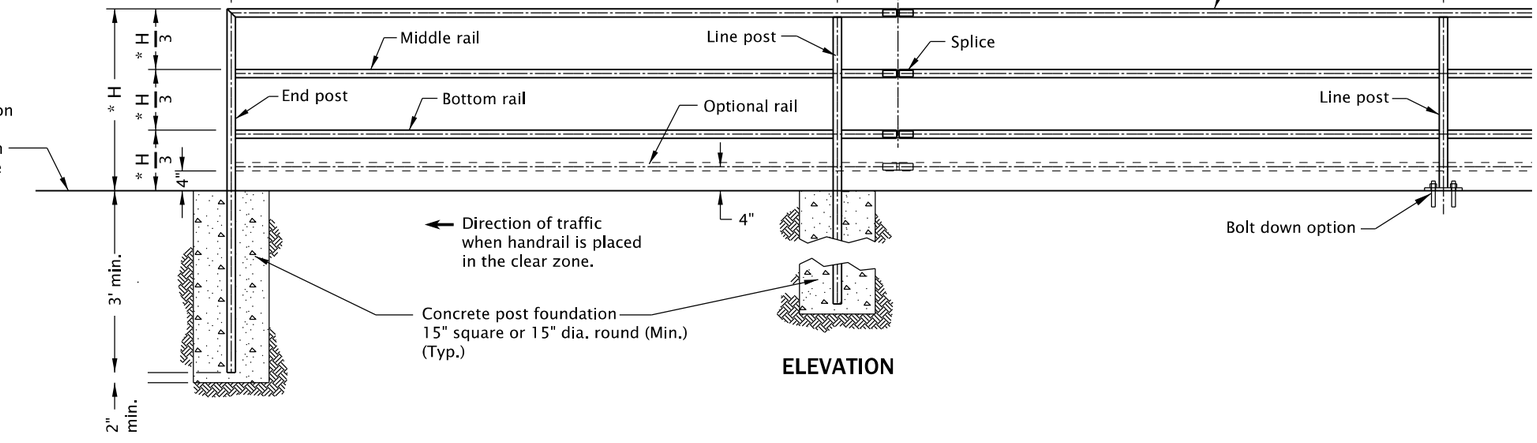
** Optional rail is required when min. 1' dimension could not be meet.



SIDE VIEW (ON GRADE)



SIDE VIEW (ON STRUCTURE)
(See general note 4)



ELEVATION

THREE RAIL HANDRAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Handrail details are based on applicable ODOT Standards.
2. See Std. Dwg. RD771 for details not shown.
3. Hot-dip galvanize all metal parts after fabrication.
4. Structure varies, see project plans.
5. Handrail height (H) shall be constant within a ramp run or stairway.
6. All concrete shall be commercial grade concrete.
7. See Std. Dwg. RD120 for concrete stairway.
8. See project plans for details not shown.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

METAL HANDRAIL

2024

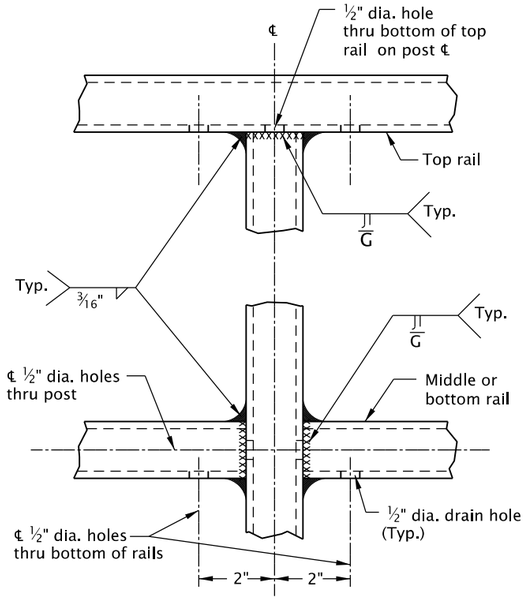
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 20-JUL-2020 | **RD770**

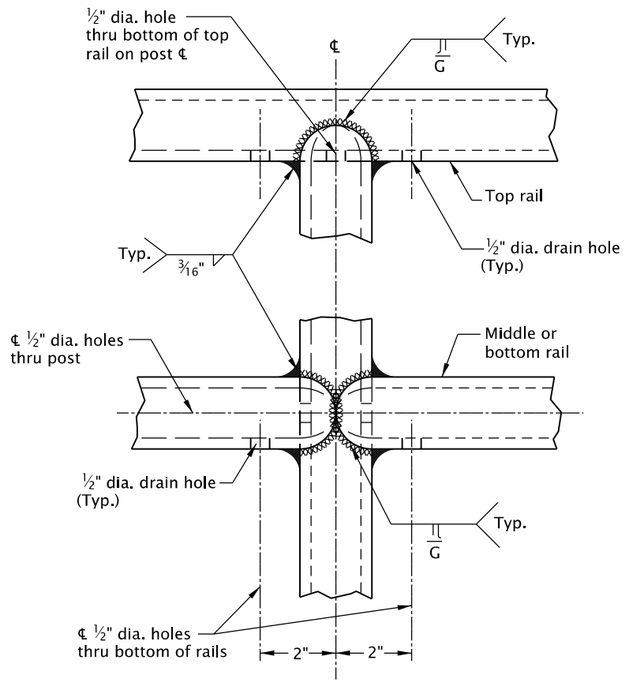
Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020

RD771.dgn



WELD DETAILS FOR STEEL TUBING



WELD DETAILS FOR STEEL PIPE

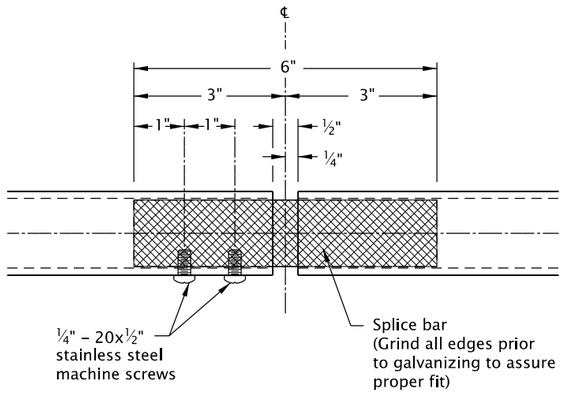
MATERIAL TABLES

STEEL PIPE POST & RAIL MEMBERS				ROUND SPLICE BAR
NOM. DIA.	SCH.	O.D.	I.D.	O.D.
1¼"	40	1.660"	1.380"	1¼"
1½"	10	1.900"	1.682"	1½"
	40	1.900"	1.610"	

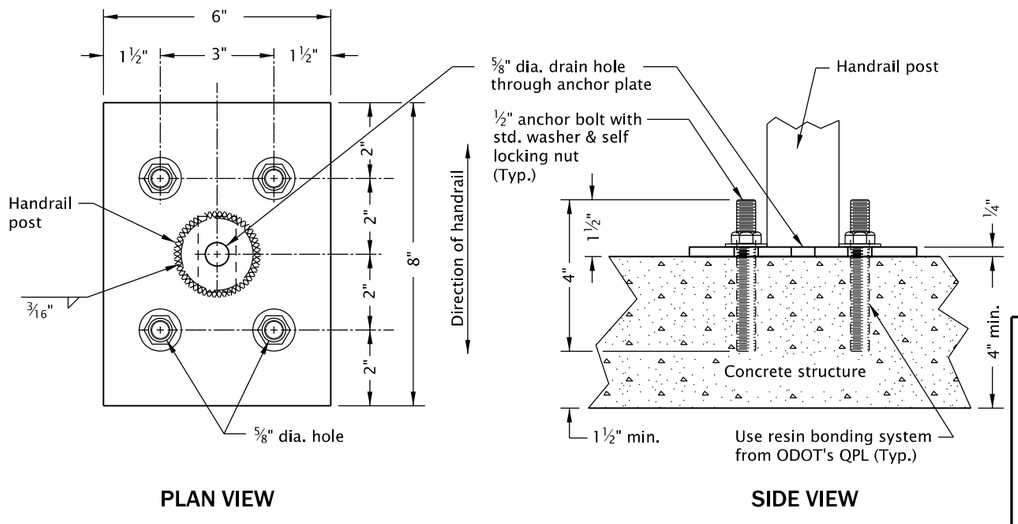
SQUARE STRUCTURAL STEEL TUBING POST & RAIL MEMBERS		SQUARE SPLICE BAR
Outside Dimensions	Wall Thickness	Outside Dimensions
1½"x1½"	⅛"	1"x1 "
	3/16"	¾"x¾"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Handrail details are based on applicable ODOT Standards.
2. Select materials from tables. Posts and rails shall be identical material. Structural steel tubing shall conform to ASTM specification A500, grade B.
3. Posts shall be vertical. The top rail shall be continuous over a minimum of two posts.
4. On structure, the railing shall conform to the vertical alignment of the structure. Rails shall have a splice in the post space occurring at expansion joints.
5. On grade, rails shall have splices at intervals not to exceed 100'.
6. Hot-dip galvanize all metal parts after fabrication.
7. See Std Dwg. RD770 for details not shown.
8. See Std Dwg. RD120 for concrete stairway.
9. See project plans for details not shown.



SPLICE DETAIL



ANCHOR PLATE FOR BOLT DOWN OPTION

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

METAL HANDRAIL DETAILS

2024

DATE	REVISION DESCRIPTION

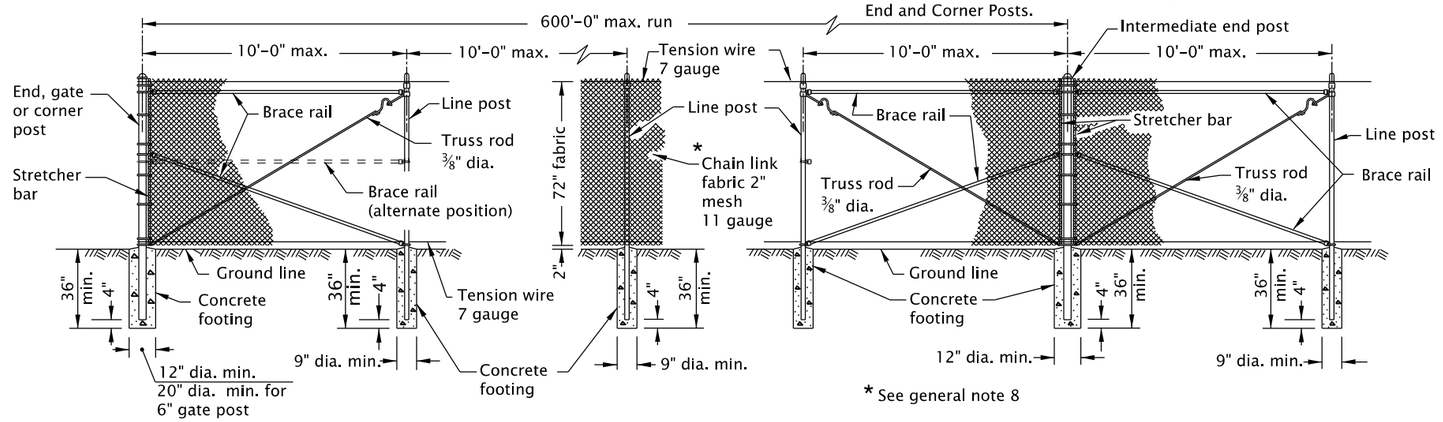
CALC. BOOK NO. N/A | SDR DATE 20-JUL-2020 | **RD771**

Effective Date: June 1, 2024 – November 30, 2024

20-JUL-2020

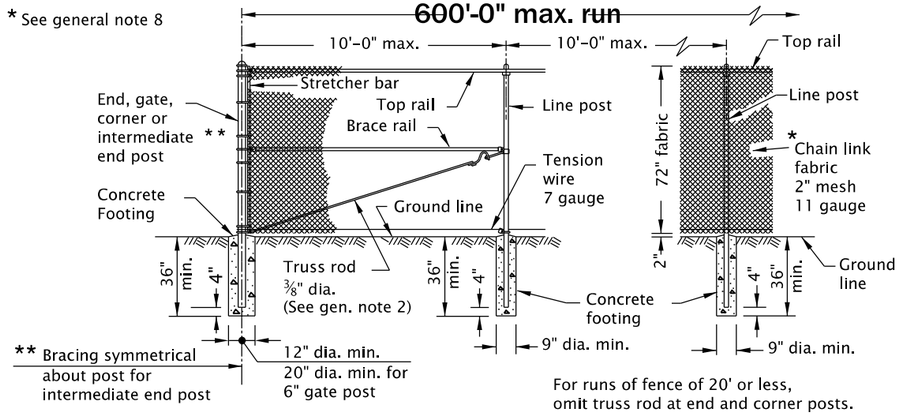
RD815.dgn

TYPE CL-6

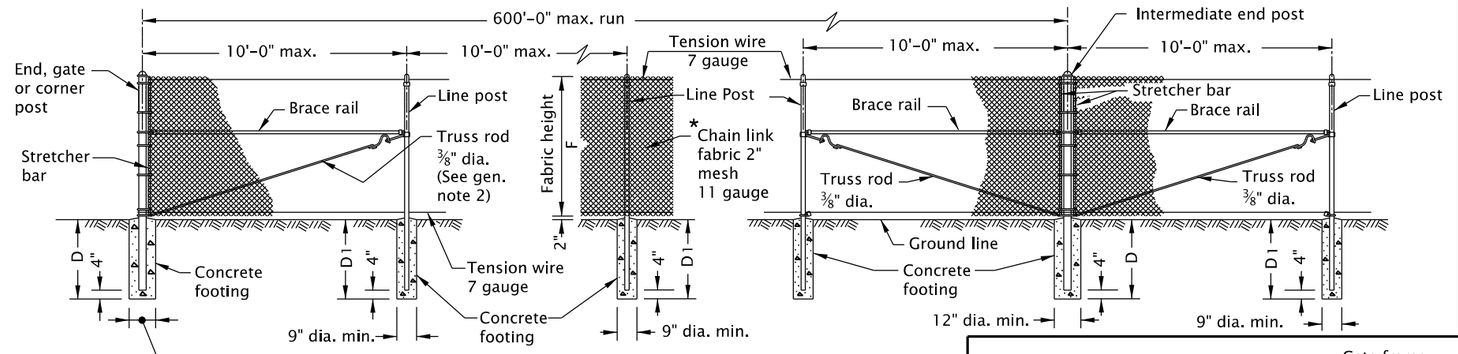


* See general note 8

TYPE CL-6R
600'-0" max. run



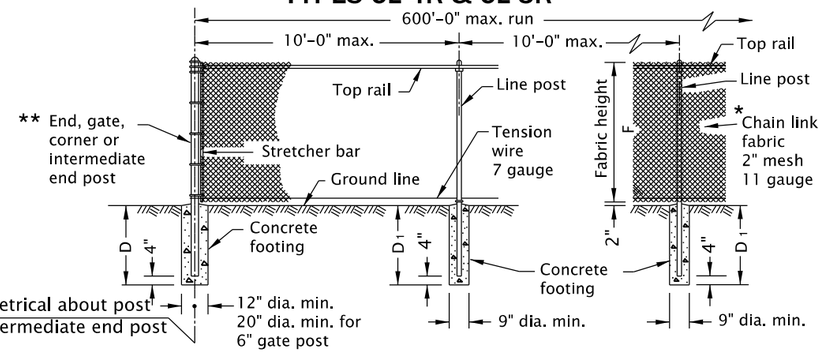
TYPES CL-4 & CL-5



* See general note 8

TYPE	D min. (in)	D1 min. (in)	F nom. (in)
CL-4	30	24	48
CL-5	36	36	60

TYPES CL-4R & CL-5R

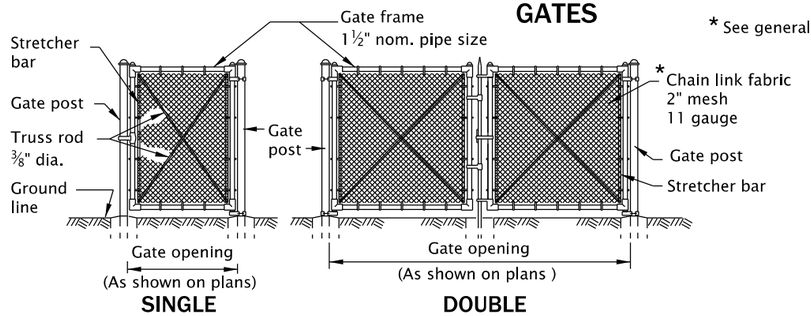


* See general note 8

TYPE	D min. (in)	D1 min. (in)	F nom. (in)
CL-4R	30	24	48
CL-5R	36	36	60

For runs of fence of 20' or less, omit truss rod at end and corner posts.

GATES



* See general note 8

TABLE 1

TYPE	MEMBER								GATE OPENING (ft)		GATE POSTS		
	BRACE AND TOP RAILS		LINE POSTS				END, CORNER & INTERMEDIATE END POST						
	TUBULAR		TUBULAR		H-SECTION		TUBULAR				TUBULAR		
	Fence Industry (in)	Nom. Dia. (in)	Fence Industry (in)	Nom. Dia. (in)	Size (in)	Wt. lb/ft	Fence Industry (in)	Nom. Dia. (in)	SINGLE GATE	DOUBLE GATE	Fence Industry (in)	Nom. Dia. (in)	
CL-4 & CL-4R CL-5 & CL-5R	1⅝	1¼	1⅞	1½	1⅞ x 1⅝	2.72	2⅜	2	Up thru 6	Up thru 12	2⅞	2½	STEEL
CL-6 & CL-6R	1⅝	1¼	2⅜	2	2¼ x 2	4.10	2⅞	2½	7 thru 13	13 thru 26	4	3½	
									14 thru 18	27 thru 36	6⅝	6	

NOTE: For CL-6, CL-6R, CL-8, CL-8R, CL-10 & CL-10R, the hardware is minimum and does not include slat wind loading.

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Do not use top rail where fence can be struck by an errant vehicle.
2. Fittings shown are illustrative of use and not specific as to design.
3. Gate posts on each side of a gate opening to be the same size. At a double gate installation with unequal width gates, size of both posts to be as indicated for a single gate installation of the wider gate width.
4. For cross sectional dimensions of members, see Table 1.
5. Posts and rails with sections not shown that meet the requirements of AASHTO M181 are acceptable alternates. See ODOT's QPL for acceptable alternates.
6. All concrete shall be commercial grade concrete.
7. All chain link fabric top and bottom selvage shall be knuckled finish.
8. Chain link fabric for the fence to be installed with pickets shall be 9 gauge wire woven in 3½" by 5½" diamond mesh.
9. See project plans for details not shown.
10. Add fence grounding as required.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

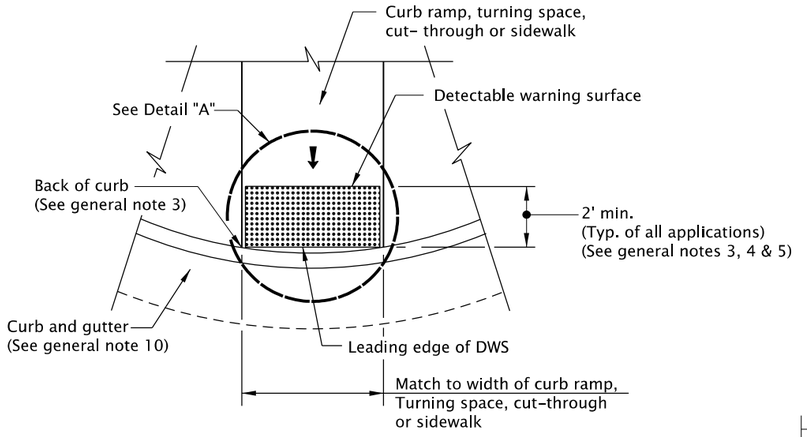
CHAIN LINK FENCE

2024

DATE	REVISION DESCRIPTION

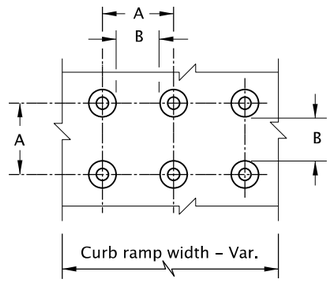
CALC. BOOK NO. N/A | SDR DATE 13-JAN-2020 | **RD815**

Effective Date: June 1, 2024 - November 30, 2024

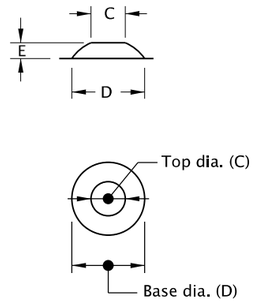


DETECTABLE WARNING SURFACE DETAIL

	A	B	C	D	E
MIN.	1.60"	0.65"	0.45"	0.90"	0.20"
MAX.	2.40"	--	0.91"	1.40"	0.20"

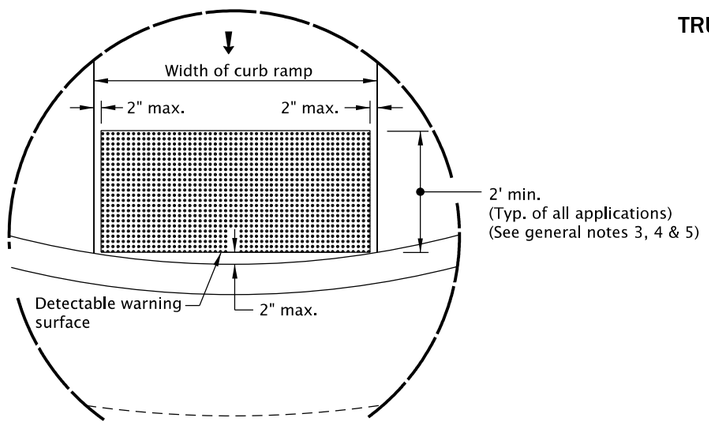


TRUNCATED DOME SPACING



TRUNCATED DOME

TRUNCATED DOME DETAILS



DETAIL "A"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Detectable warning surface details & locations are based on applicable ODOT Standards.
2. See project plans for details not shown.
   See Std. Dwgs. RD700 & RD701 for curbs.
3. The detectable warning surface shall extend the full width of the curb ramp opening, shared use path, blended transition, turning space, or other roadway entrance as applicable. A gap of up to 2 inches on each side of the detectable warning surface is permitted (measured at the leading edge of the detectable warning surface panel as shown in Detail "A").
4. Detectable warning surface shall be placed at the back of curb for a minimum depth of 2 ft. in the direction of pedestrian travel at curb ramps that are adjacent to traffic. Detectable warning surface may be radial or rectangular, but must comply with the truncated dome size and spacing standards. Detectable warning surface may be cut to meet necessary shape as shown in plans. Detectable warning surface across a grade break is prohibited. Place abutting panels within¼ inch of each other and install anchors, as specified by manufacturers, along cut edge.
5. Color to be safety yellow if no color specified in construction note. Alternative colors require a design exception on or along state highways.
6. Detectable warning surface shall be used in the following locations:
   a) Curb ramps at street crossings.
   b) Crossing islands (Accessible Route Islands).
   c) Rail crossings.
7. Where public transportation stations (rail, bus, etc.) use platform boarding, detectable warning surface shall be placed along the full edge length of the station, when not protected by platform screens or guards, (see Std. Dwg. RD908).
8. Detectable warning surface shall not be used on the following locations:
   a) End of sidewalk transitions that are not at a crosswalk, (see Std. Dwgs. RD950, RD952 and RD960).
   b) Driveways, unless constructed with curb return or are signalized.
   c) Parking lots, access aisles and passenger loading zones where curb ramp does not lead to vehicular way.
9. Where no curb is present, the detectable warning surface shall be placed at the edge of the roadway.
10. On or along state highways, curb and gutter is required at curb ramps.

LEGEND:

Detectable warning surface

Cross slope 1.5% max.
(Max. 2.0% finished surface slope)
(Normal sidewalk cross slope)

Running slope 7.5% max.
(Max. 8.3% finished surface slope)

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

DETECTABLE WARNING SURFACE DETAILS

2024

DATE	REVISION DESCRIPTION
07-2020	NEW DRAWING CREATED
07-2021	REVISED DETAILS AND NOTES

CALC. BOOK NO. N/A | SDR DATE 19-JUL-2021 | **RD902**

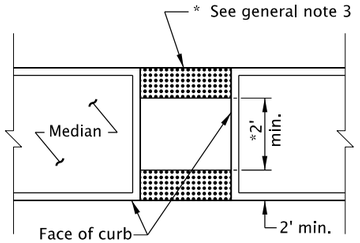
19-JUL-2021

RD902.dgn

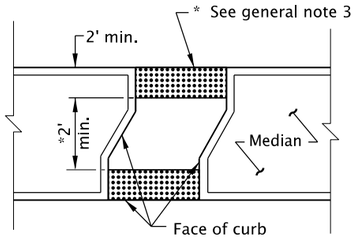
Effective Date: June 1, 2024 - November 30, 2024

20-JUL-2020

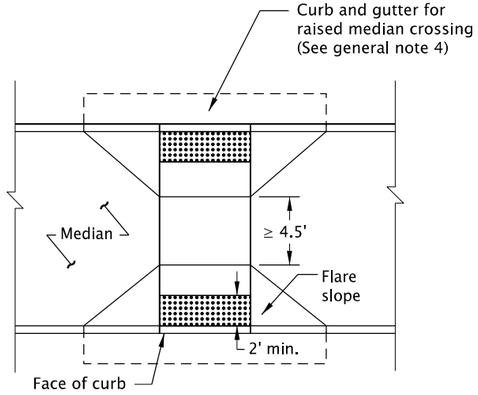
RD906.dgn



* Omit detectable warning surfaces if less than 2'



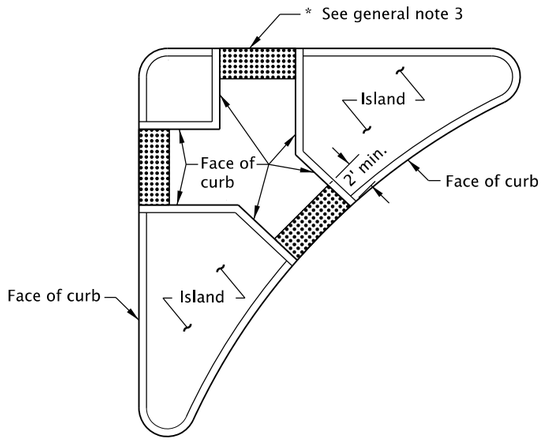
CUT-THROUGH
(Asph. conc. surface shown)



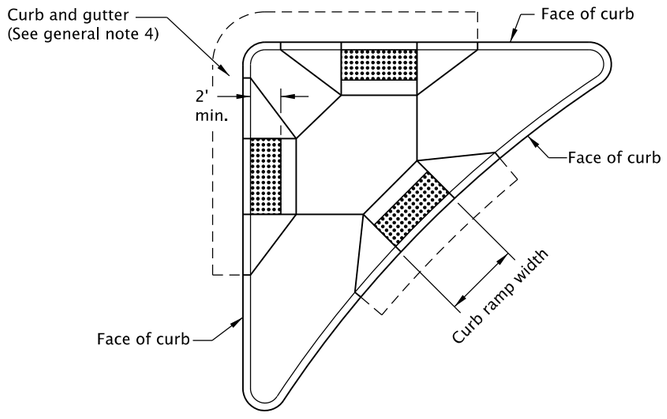
RAISED MEDIAN
(P.C. conc. surface shown)

MEDIAN CROSSING

* Omit detectable warning surfaces if less than 2'



CUT-THROUGH ISLAND
(Asph. conc. surface shown)



RAISED ISLAND
(P.C. conc. surface shown)

RIGHT TURN CHANNELIZATION ISLAND

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Detectable warning surface details & locations are based on applicable ODOT Standards.

2. See project plans for details not shown.
   See Std. Dwgs. RD700 & RD701 for curbs.
   See Std. Dwgs. RD710 & RD711 for accessible route island.
   See Std. Dwg. RD902 for detectable warning surface installation details.

3. Detectable warning surfaces shall be separated by a 2.0 ft minimum length of walkway without detectable warnings. Where the island has no curb, the detectable warning surface shall be placed at the edge of roadway.

4. On or along state highways, curb and gutter is required at curb ramps.

5. Details intended for pedestrian route only. For protected bike lanes on multi-use paths, see project plans for specific details.

LEGEND:

Detectable warning surface

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

DETECTABLE WARNING SURFACE PLACEMENT FOR ACCESSIBLE ROUTE ISLAND

2024

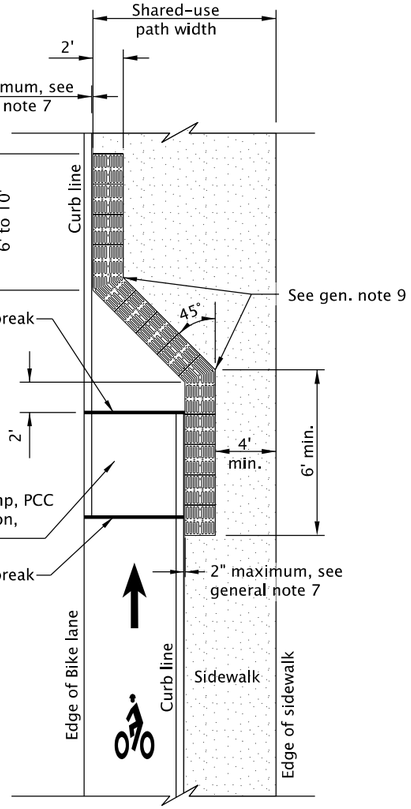
DATE	REVISION DESCRIPTION
07-2020	NEW DRAWING CREATED

CALC. BOOK NO. N/A | SDR DATE 20-JUL-2020 | **RD906**

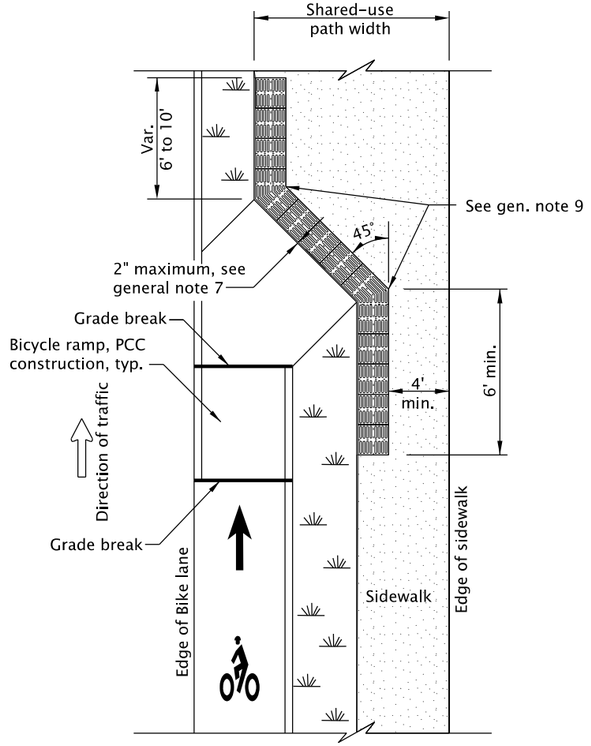
Effective Date: June 1, 2024 - November 30, 2024

14-JAN-2022

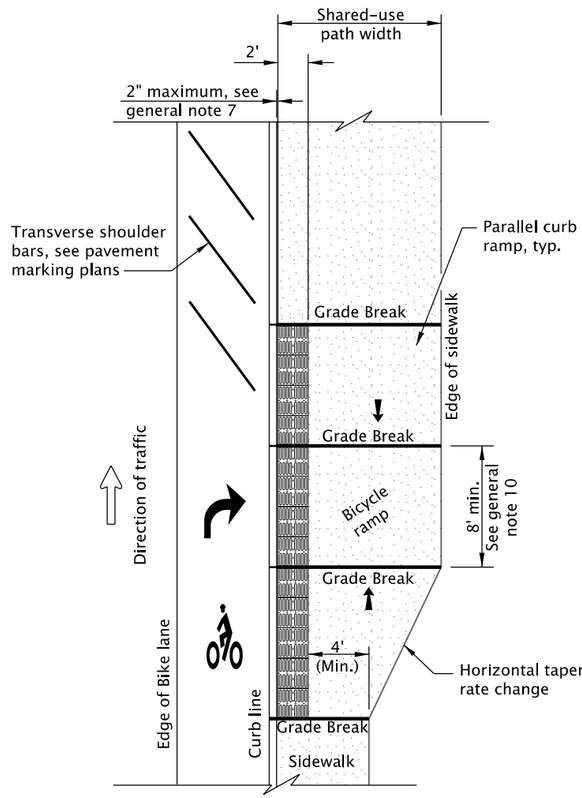
RD909.dgn



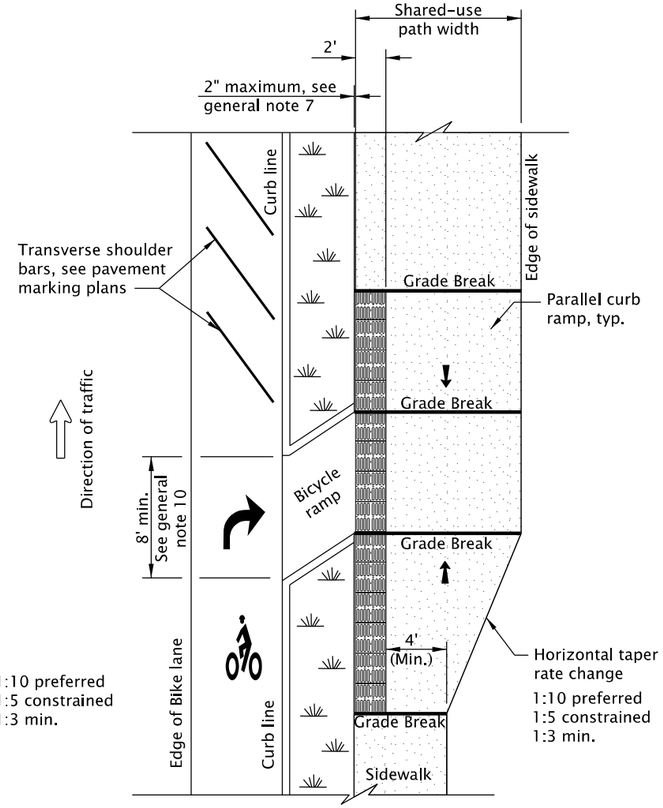
OPTION "BR-1"
BICYCLE LANE DROP TO CURB LINE SIDEWALK



OPTION "BR-2"
BICYCLE LANE DROP TO SEPARATED SIDEWALK



OPTION "BR-3"
BICYCLE LANE PARALLEL RAMP APPROACH



OPTION "BR-4"
BICYCLE LANE ANGLED RAMP APPROACH

LEGEND:

Detectable guide strip

Sidewalk

Running slope 7.5% maximum (maximum 8.3% finished surface slope)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Bicycle ramp details are based on applicable ODOT Standards. If curb ramp serves both bicycles and pedestrians, do not use this drawing. See Std. Dwg. RD902.
2. See project plans for details not shown.
   See Std. Dwgs. RD700 and RD702 for curbs.
   See Std. Dwgs. RD720 & RD721 for sidewalks.
   See Std. Dwg. RD920 for parallel curb ramp details.
   See Std. Dwg. RD1140 for separated bike lanes.
   See Std. Dwg. TM500 for transverse shoulder bars details
3. Site conditions normally require a project specific design. See project plans for details not shown.
4. Curb ramps for shared use paths intersecting a roadway shall be full width of path, excluding flares.
5. Detectable guide strip color shall be blue if no color specified. Color shall be contrasting to the surrounding area, light on dark, or dark on light. Blue markings are reserved for accessibility features. Alternative colors require a design exception on or along state highways.
6. Agency review and approval required for detectable guide strip products.
7. Detectable guide strip shall be placed a maximum of 2-inches from the edge of the sidewalk.
8. Place abutting panels within 1/4-inch of each other and install anchors, as specified by manufacturers, along cut edge.
9. Miter panels at 45 degree angle. Detectable guide strips may be cut to meet necessary shape as shown.
10. When a curb ramp is used to provide bicycle access from a roadway to a sidewalk, the curb ramp opening will be ≥ 8' wide.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

DETECTABLE GUIDE STRIP PLACEMENT AT BIKE RAMPS

2024

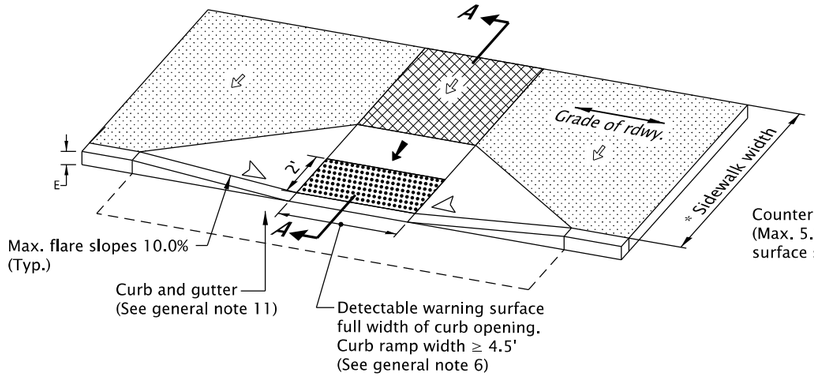
DATE	REVISION DESCRIPTION
12-2021	NEW DRAWING CREATED

CALC. BOOK NO. N/A | SDR DATE 14-JAN-2022 | **RD909**

Effective Date: June 1, 2024 - November 30, 2024

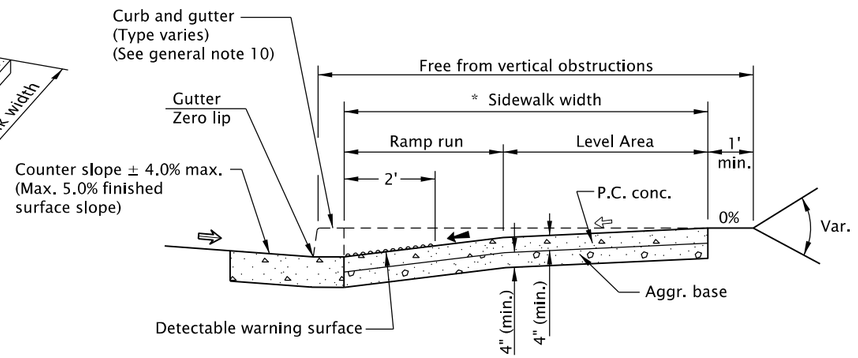
14-JAN-2022

RD910.dgn



PERPENDICULAR CURB RAMP DETAIL

(Use "Parallel Curb Ramp Detail" or "Combination Curb Ramp Detail" when reqd. turning space cannot be obtained)



SECTION A-A

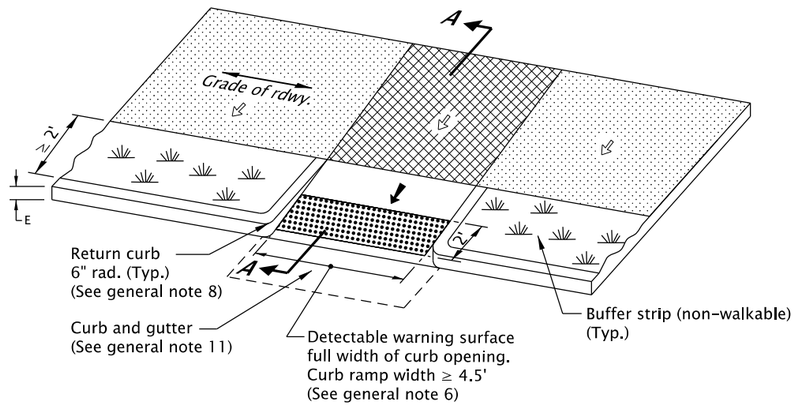
* NOTE: Minimum width of 14.25 feet sidewalk for E=7"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

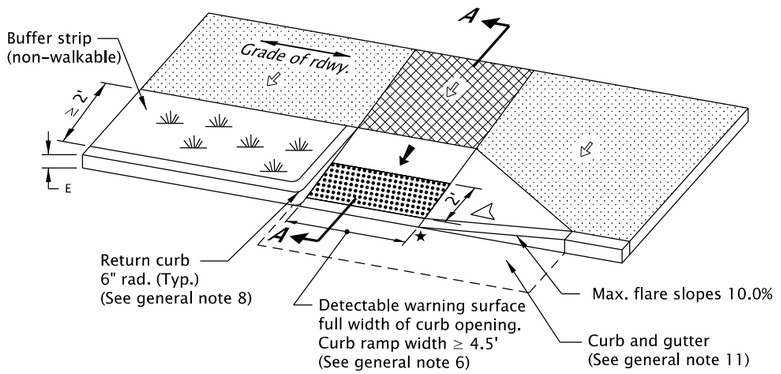
1. Curb ramp details are based on applicable ODOT Standards.
2. See Std. Dwgs. RD700 & RD701 for curbs.
   See Std. Dwgs. RD720 & RD721 for sidewalks.
   See Std. Dwgs. RD902 through RD908 for detectable warning surface installation details.
   See Std. Dwgs. RD912 through RD916 for curb ramp placement options.
3. Site conditions normally require a project specific design. See project plans for details not shown.
4. Tooled dummy joints are required at all curb ramp grade break lines, (see Std. Dwg. RD722).
5. Curb ramp slopes shown are relative to the true level horizon (zero bubble).
6. Place detectable warning surface at the back of curb for a minimum depth of 2' in the direction of pedestrian travel full width of curb ramp opening that is adjacent to traffic.
7. Grade breaks at the top and bottom of curb ramp runs shall be perpendicular to the direction of the ramp run. Grade breaks shall not be permitted on the surface of ramp runs and turning spaces. Surface slopes that meet at grade breaks shall be flush.
8. Return curb may be provided in lieu of flared slope only if protected from traverse travel by landscaping, see Std. Dwg. RD721. Return curb shall not reduce width of approaching sidewalk.
9. Curb ramps for shared use paths intersecting a roadway shall be full width of path, excluding flares. When a curb ramp is used to provide bicycle access from a roadway to a sidewalk, the curb ramp opening will be ≥ 8' wide, (see Std. Dwg. RD909 for additional details).
10. Place an inlet at upstream side of curb ramp or perform other approved design mitigation. Check the gutter flow depth at curb ramp locations to assure that the design flood does not overtop the back of sidewalk.
11. On or along state highways, curb and gutter is required at curb ramps.

LEGEND:

- Sidewalk
- Detectable warning surface
- Level area (Turning space/landing)
  Unobstructed 4.5' x 4.5'
  With obstruction 4.5' x 5.5' (Longer dimension in direction of pedestrian street crossing).
  For the purposes of this application, a max. 2.0% finished surface slope (for drainage) measured perpendicular in two directions is considered level.
- Cross slope 1.5% max.
  (Max. 2.0% finished surface slope)
  (Normal sidewalk cross slope)
- Running slope 7.5% max.
  (Max. 8.3% finished surface slope)
- Counter slope 4.0% max. ascending or descending,
  (Max. 5.0% finished surface slope)
  Slope as required for drainage
- Flare slope
  (Max. 10% finished surface slope)



THROUGH BUFFER STRIP



WITH SINGLE FLARE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

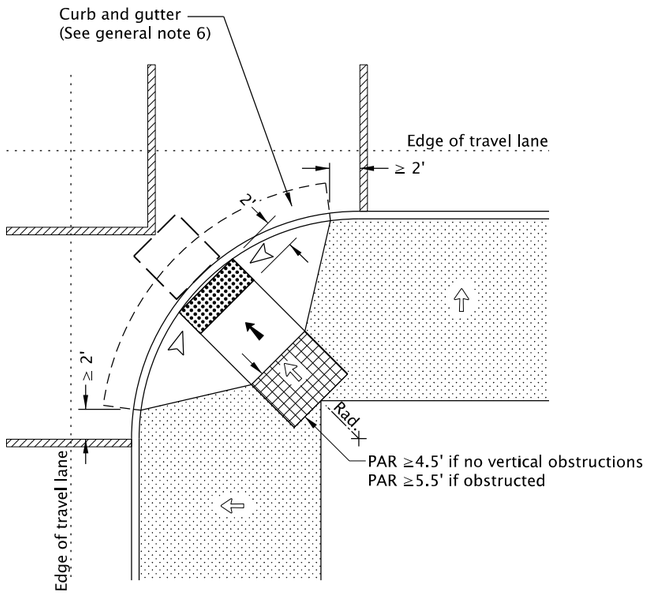
PERPENDICULAR CURB RAMP

2024

DATE	REVISION DESCRIPTION
12-2021	NEW DRAWING CREATED
01-2022	REVISED NOTES

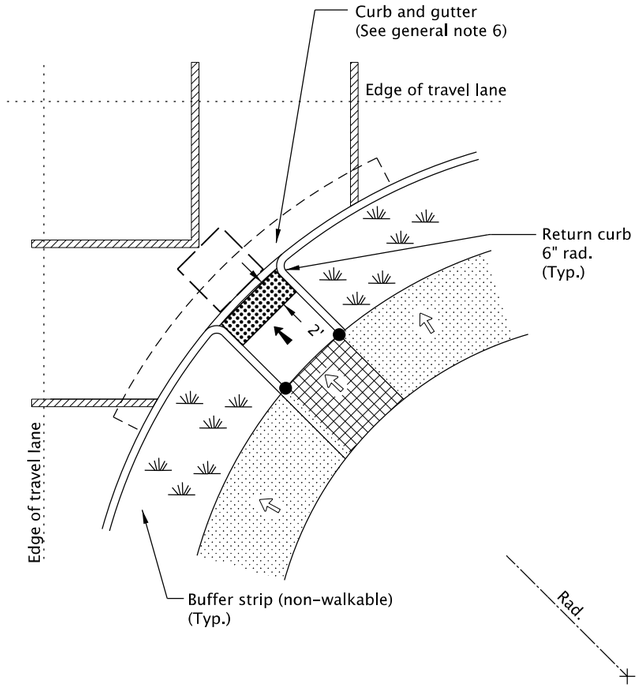
CALC. BOOK NO. N/A | SDR DATE 14-JAN-2022 | **RD910**

Effective Date: June 1, 2024 - November 30, 2024



DIAGONAL CURB RAMP FOR WIDE SIDEWALKS OPTION "PR-9"

(Use only when site constraints prohibit installing two curb ramps)



DIAGONAL CURB RAMP WITH LANDSCAPED BUFFER STRIP OPTION "PR-10"

(Use only when site constraints prohibit installing two curb ramps)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Curb ramp details are based on applicable ODOT Standards.

2. See project plans for details not shown.
   See Std. Dwgs. RD700 & RD701 for curbs.
   See Std. Dwgs. RD720 & RD721 for sidewalks.
   See Std. Dwg. RD910 for perpendicular curb ramp details.
   See Std. Dwgs. RD902 through RD908 for detectable warning surface installation details.

3. Tooled dummy joints are required at all curb ramp slope break lines, (see Std. Dwg. RD722).

4. Curb ramp slopes shown are relative to the true level horizon (zero bubble).

5. Only use curb ramp options allowed by jurisdiction. Single ramps required design exceptions on or along state highways.

6. On or along state highways, curb and gutter is required at curb ramps.

LEGEND:

- Marked or intended crossing location
- Sidewalk
- Detectable warning surface
- Level area (Turning space/landing)
  Unobstructed 4.5' x 4.5'
  With obstruction 4.5' x 5.5' (Longer dimension in direction of pedestrian street crossing).
  For the purposes of this application, a max. 2.0% finished surface slope (for drainage) measured perpendicular in two directions is considered level.
- Cross slope 1.5% max.
  (Max. 2.0% finished surface slope)
  (Normal sidewalk cross slope)
- Running slope 7.5% max.
  (Max. 8.3% finished surface slope)
- Flare slope
  (Max. 10% finished surface slope)
- 4'x4' clear space
- PAR — Pedestrian Access Route
- Zero curb exposure

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

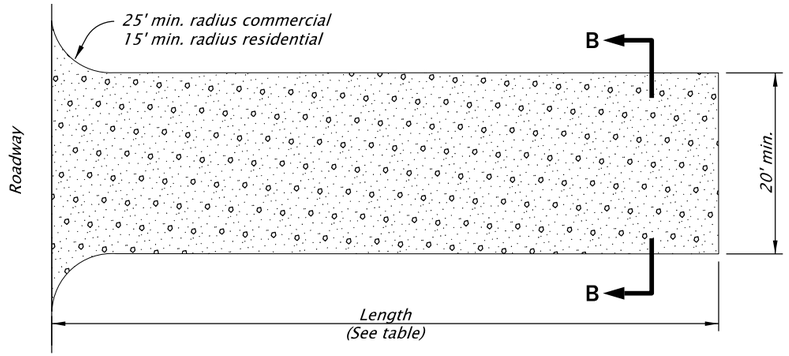
OREGON STANDARD DRAWINGS

PERPENDICULAR CURB RAMP SINGLE RAMP

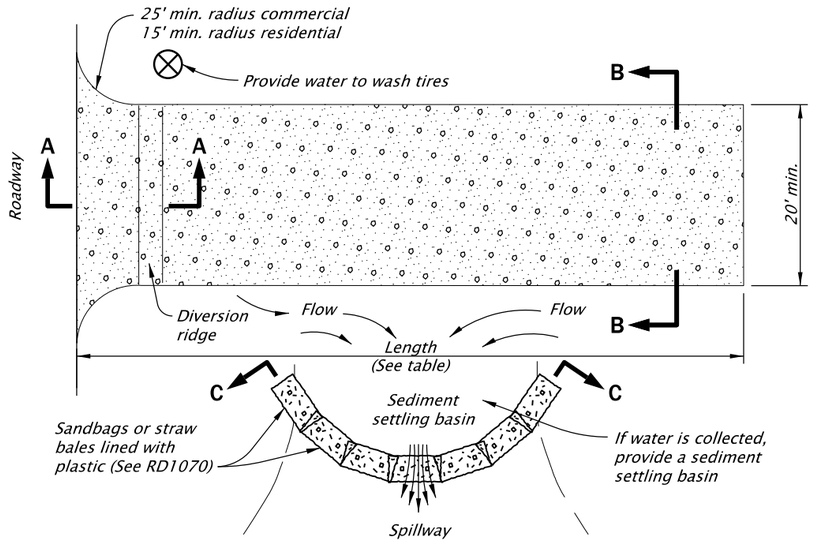
2024

DATE	REVISION DESCRIPTION
07-2020	NEW DRAWING CREATED

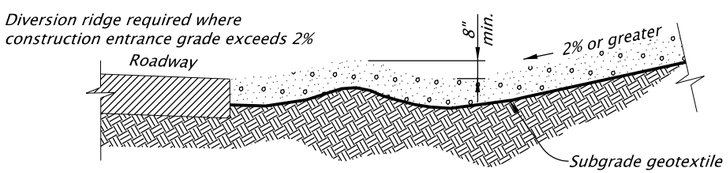
CALC. BOOK NO. N/A | SDR DATE 20-JUL-2020 | **RD916**



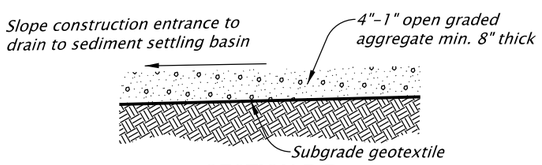
CONSTRUCTION ENTRANCE - TYPE 1
NOT TO SCALE



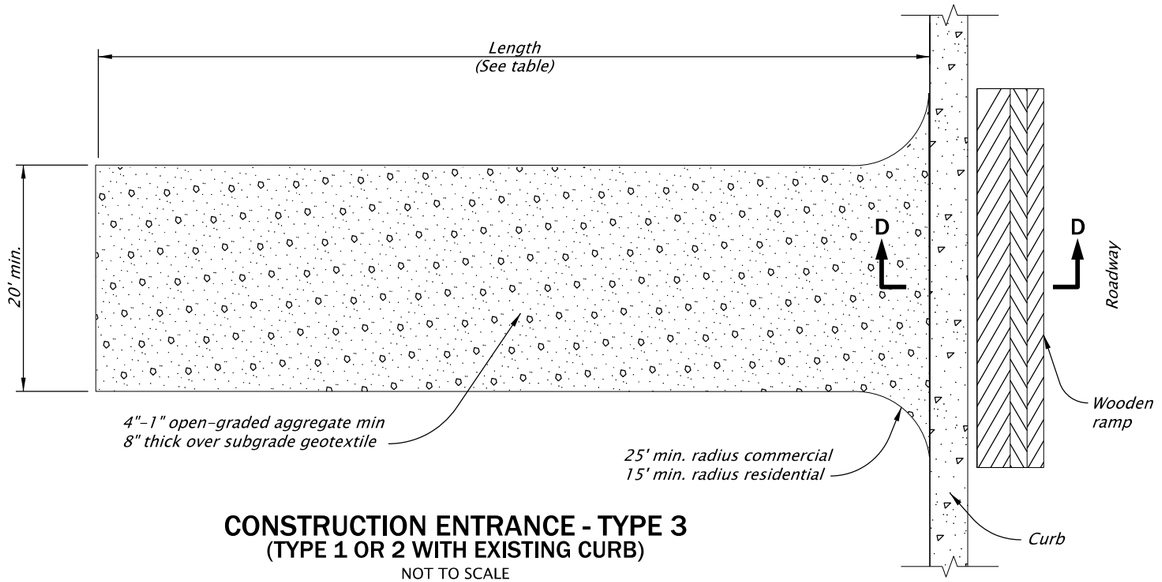
CONSTRUCTION ENTRANCE - TYPE 2
NOT TO SCALE



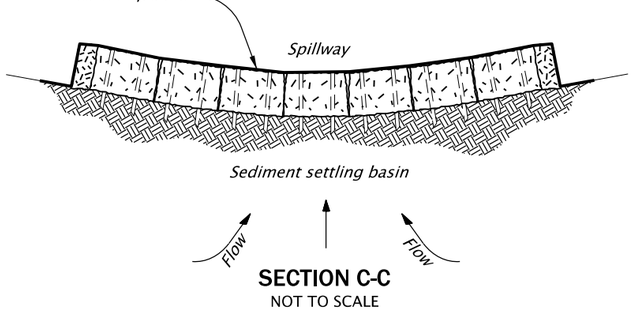
SECTION A-A
NOT TO SCALE



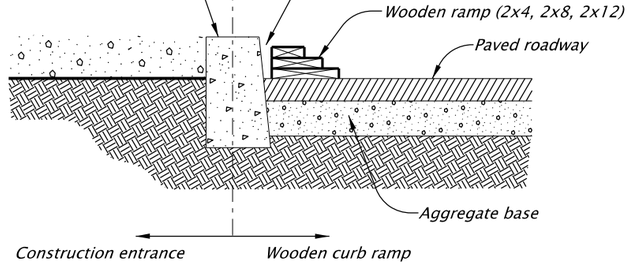
SECTION B-B
NOT TO SCALE



CONSTRUCTION ENTRANCE - TYPE 3
(TYPE 1 OR 2 WITH EXISTING CURB)
NOT TO SCALE



SECTION C-C
NOT TO SCALE



WOODEN CURB RAMP SECTION D-D
NOT TO SCALE

NOTES:
1. *The Type 1 entrance is a simple entrance without a diversion ridge or settling basin.*
2. *The wooden ramp may be used on either Type 1 or Type 2 entrances in situations where there is curb and the curb is not removed for the construction entrance.*

CONSTRUCTION ENTRANCE TABLE MINIMUM LENGTH	
Length (FT)	*Area Of Exposed Soil (Acre)*
20	*0.25*
50	*0.25 < A < 1.0*
100	*A > 1.0*

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

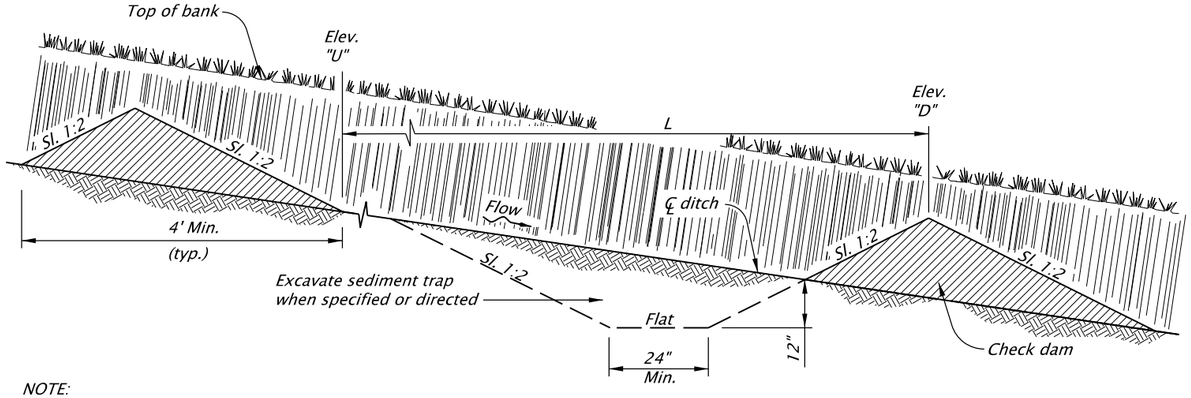
CONSTRUCTION ENTRANCES

2024

DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1000**

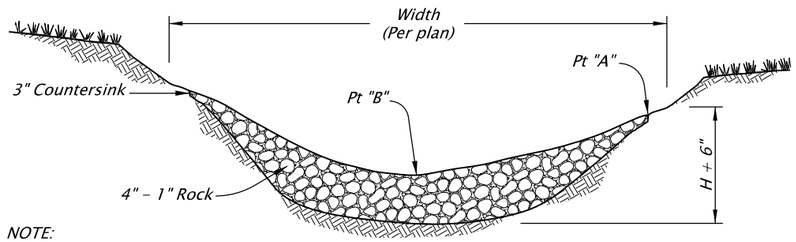
Effective Date: June 1, 2024 - November 30, 2024



NOTE:
L = Spacing along swale or ditch so that Elevation "U" equals Elevation "D".

TYPICAL PROFILE SECTION CHECK DAMS (SHOWN WITH AGGREGATE)

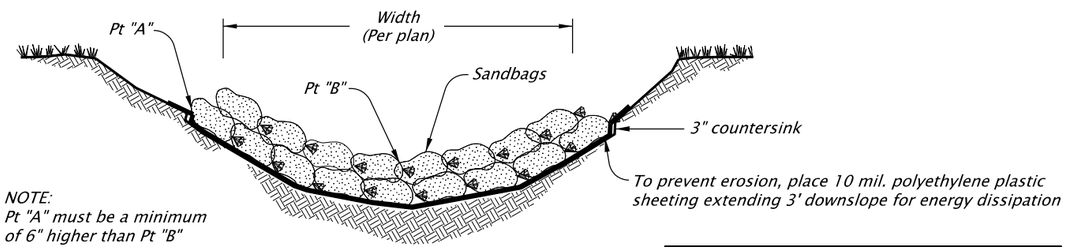
NOT TO SCALE



NOTE:
Pt "A" must be a minimum of 6" higher than Pt "B"

AGGREGATE CHECK DAM - TYPE 1

NOT TO SCALE



NOTE:
Pt "A" must be a minimum of 6" higher than Pt "B"

SANDBAG CHECK DAM - TYPE 4

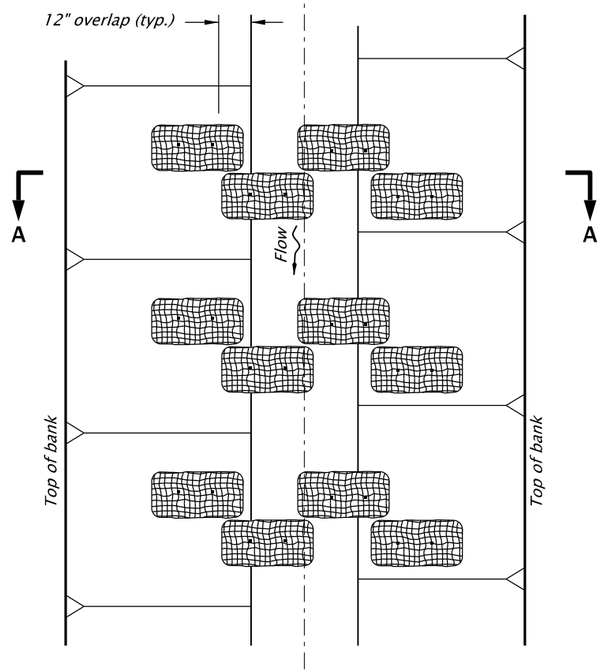
NOT TO SCALE

MAXIMUM CHECK DAM SPACING "L"				
Ditch Grade	H=8"	H=12"	H=18"	H=24"
10%	* *	* *	15'	20'
9%	* *	* *	16'	22'
8%	* *	* *	18'	25'
7%	* *	* *	21'	28'
6%	* *	16'	25'	33'
5%	* *	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

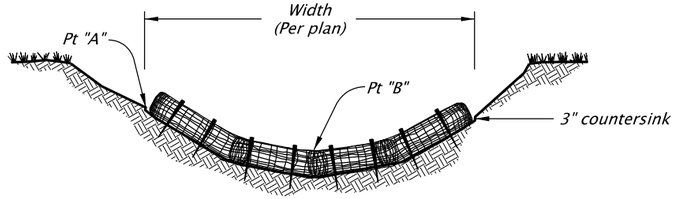
** * Not allowed* *H = Min. dam height*

NOTES:

1. *Type 3 - stake biofilter bags with two 2"x2"x18" (minimum) wood stakes per bag. Drive stakes a minimum of 6" into the ground and flush with the top of the bags. Omit stakes if placed over paved surfaces. Overlap bags 12" minimum at each joint.*
2. *Type 4 - Tightly abut or overlap ends of sandbags at each joint.*
3. *Spacing between check dams for all check dam types shall comply with the typical profile section shown above.*



PLAN



SECTION A-A

BIOFILTER BAG CHECK DAM - TYPE 3

NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CHECK DAMS TYPE 1, 3 AND 4

2024

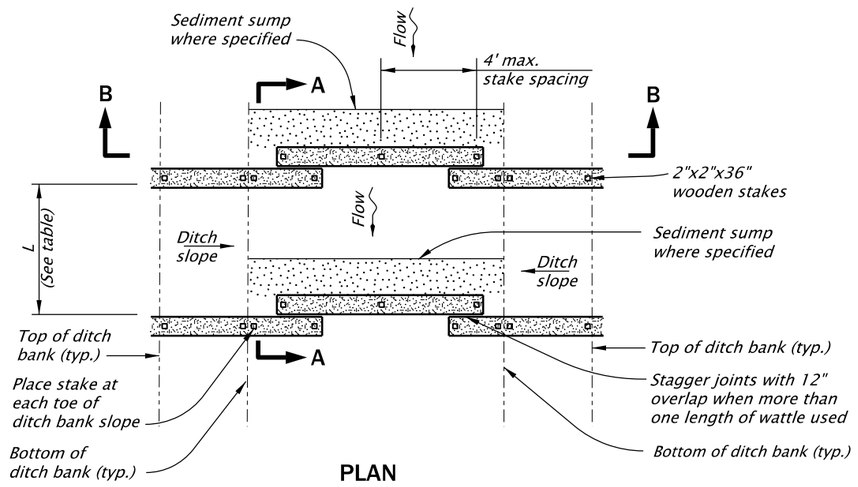
DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1005**

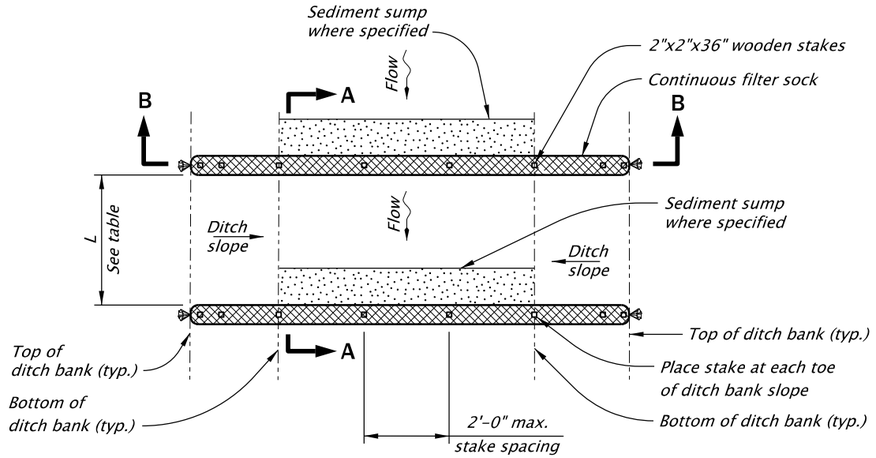
20-JAN-2021

RD1005.dgn

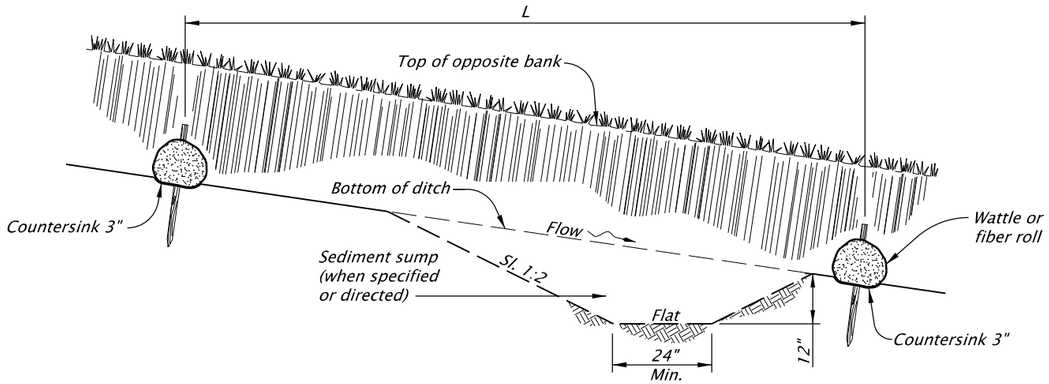
Effective Date: June 1, 2024 - November 30, 2024



PLAN



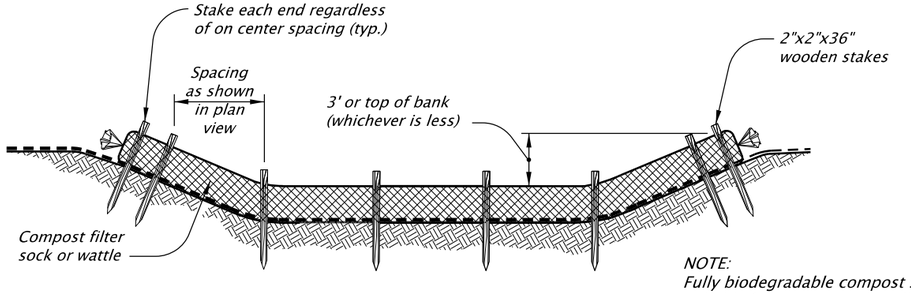
PLAN



SECTION A-A

WATTLE / FIBER ROLL CHECK DAM - TYPE 2

NOT TO SCALE

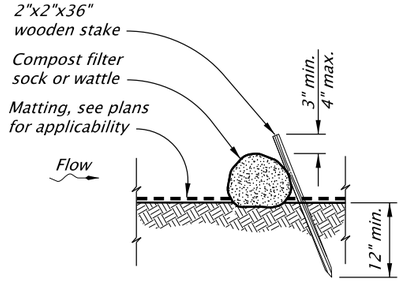


SECTION B-B

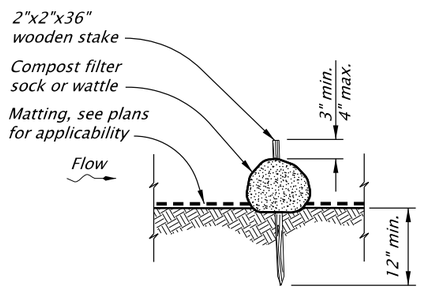
NOTE:
Fully biodegradable compost socks are suitable for permanent installation only. Product becomes too fragile to be moved or removed intact.

COMPOST FILTER SOCK CHECK DAM - TYPE 6

NOT TO SCALE



ALTERNATIVE 1



ALTERNATIVE 2

FIBER ROLL AND COMPOST SOCK STAKING ALTERNATIVES

NOT TO SCALE

MAXIMUM CHECK DAM SPACING "L"

Ditch Grade	H=8"	H=12"	H=18"	H=24"
10%	* *	* *	15'	20'
9%	* *	* *	16'	22'
8%	* *	* *	18'	25'
7%	* *	* *	21'	28'
6%	* *	16'	25'	33'
5%	* *	20'	30'	40'
4%	16'	25'	37'	50'
3%	22'	33'	50'	66'
2%	33'	50'	75'	100'

* * Not allowed H = Min. dam height

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CHECK DAMS TYPE 2 AND 6

2024

DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. N/A

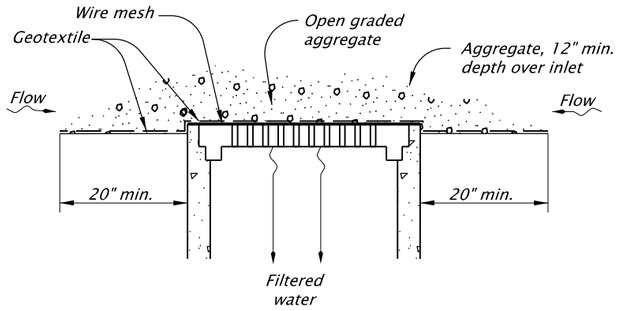
SDR DATE 20-JAN-2021

RD1006

Effective Date: June 1, 2024 - November 30, 2024

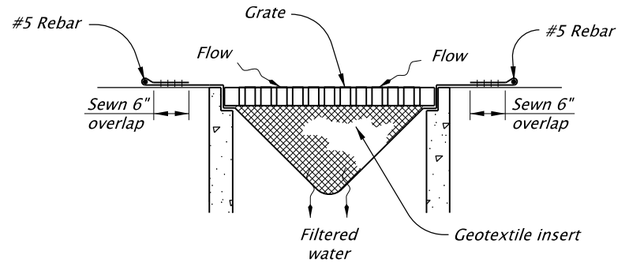
20-JAN-2021

RD1006.dgn



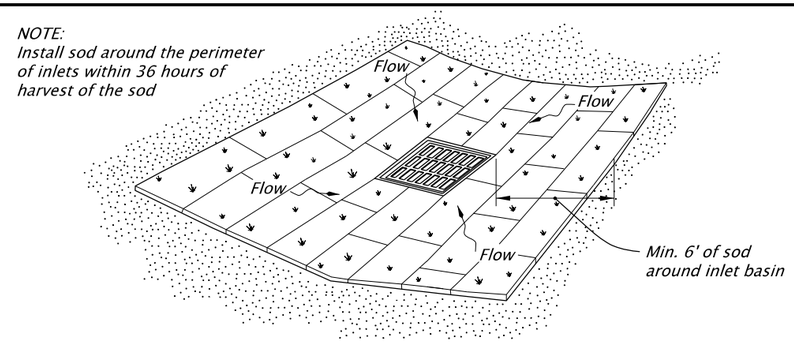
GEOTEXTILE/WIRE MESH/AGGREGATE - TYPE 2

NOT TO SCALE



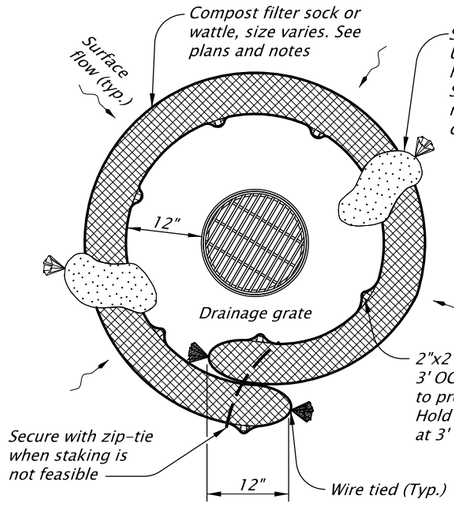
PREFABRICATED FILTER INSERT - TYPE 3

NOT TO SCALE

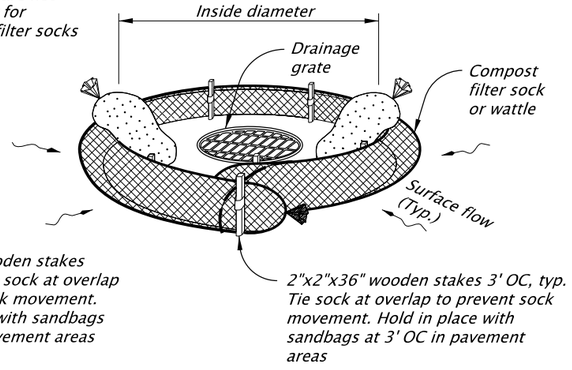


SOD PROTECTION - TYPE 6

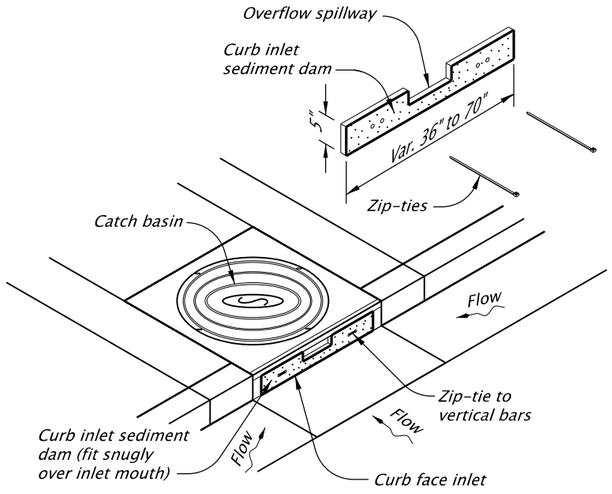
NOT TO SCALE



AREA DRAIN PLAN

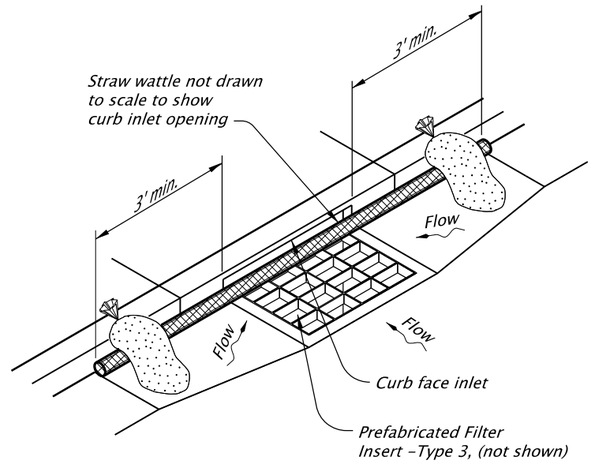


AREA DRAIN PERSPECTIVE VIEW



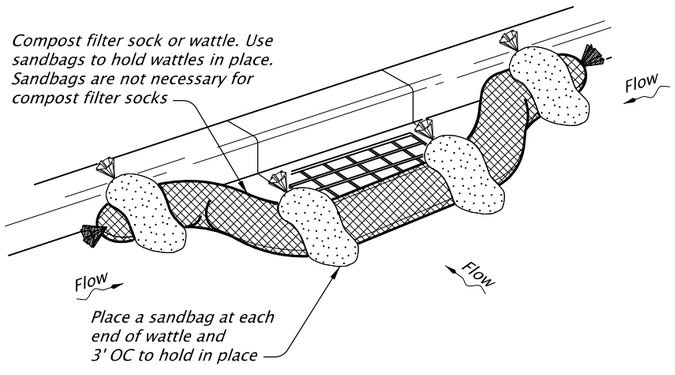
CURB INLET SEDIMENT DAM - TYPE 10

NOT TO SCALE



WATTLE BARRIER WITH FILTER INSERT - TYPE 11

NOT TO SCALE



CURB INLET PERSPECTIVE VIEW

COMPOST FILTER SOCK OR WATTLE - TYPE 7

NOT TO SCALE

NOTES:
Type 2 - Geotextile/wire mesh/aggregate
Place the wire mesh over the grate.
Place sediment fence geotextile over the wire mesh and perimeter area around structure.
Install aggregate over the geotextile fabric.

Type 3 - Prefabricated filter inserts
Install prefabricated filter inserts according to the plans, special provisions, and manufacturer recommendations.
Prefabricated inserts with provisions for overflow are allowed only when accompanied by additional BMP's to prevent the potential of sediments entering project storm systems.
Field fabricated inserts are not allowed.

Type 7 - Compost filter sock
Drive 2"x2" wood stakes a minimum of 6" into ground and flush with the top of the sock.
Overlap ends of sock per manufacturers recommendations (12"min., 36" max.).
Use 8" to 12" dia sock on curbside in traffic areas.

(Type 7 cont.)
Use 12" to 18" dia sock in non-traffic areas or areas where the larger socks can be used safely.
use synthetic mesh socks for temporary installations.

Type 10 - Curb inlet sediment dam
Fit curb inlet sediment dam snugly into inlet mouth. Curb inlet sediment dam is required for use with inlet filter insert where at-grade inlet grate and curb inlet are combined at a catch basin.

Type 11 - Wattle barrier with filter insert
Install prefabricated filter insert per Type 3 detail.
Install wattles over opening and 36" to each side of opening tight against curb. Adjust wattle to force storm water to flow through filter insert or wattle prior to leaving the site.
Adjust, replace or modify the inlet protection as needed to prevent sediment laden water from entering the catch basin.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

INLET PROTECTION TYPE 2, 3, 6, 7, 10 AND 11

2024

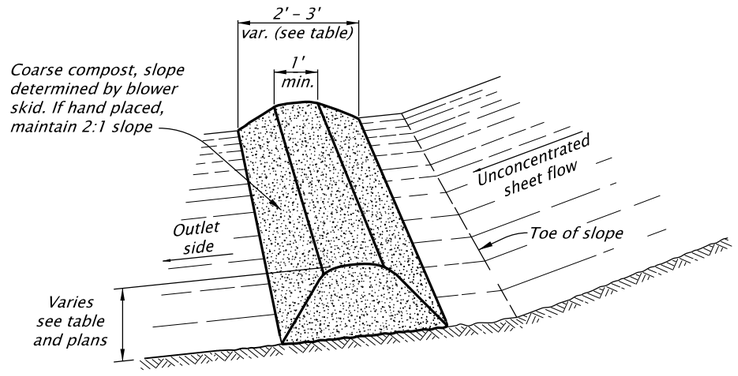
DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS
01-2021	MOVED NOTES UP FROM OVERLAPPING THE SHEET BORDER

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1010**

Effective Date: June 1, 2024 - November 30, 2024

20-JAN-2021

RD1010.dgn



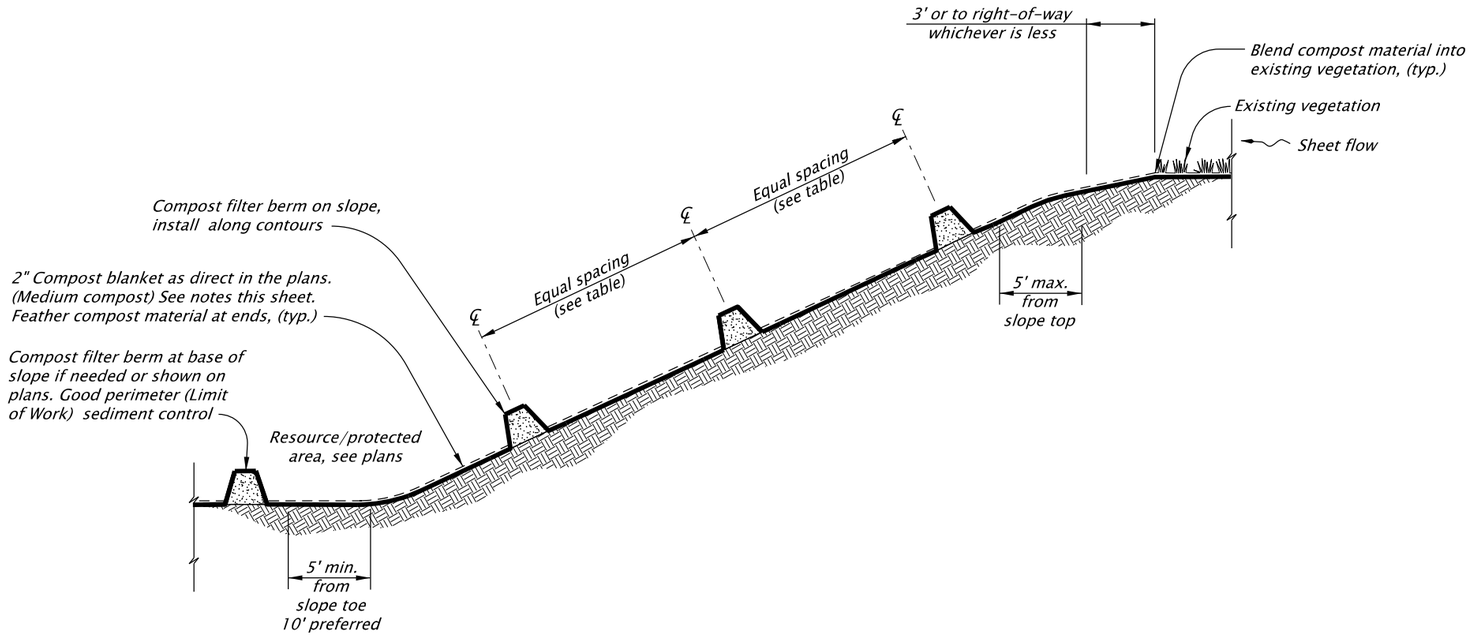
COMPOST FILTER BERM - TYPE 9

NOT TO SCALE

COMPOST FILTER BERM DIMENSIONS AND SPACING BASED ON SLOPE				
SLOPE	BERM SPACING	BERM DIMENSIONS		
		HEIGHT	BOTTOM WIDTH	TOP WIDTH
> 50:1	250 ft	1 ft	2 ft (min.)	1 ft
50:1 – 10:1	125 ft	1 ft	2 ft (min.)	1 ft
10:1 – 5:1	100 ft	1 ft	2 ft (min.)	1 ft
3:1 – 2:1	50 ft	1.3 ft	2.6 ft (min.)	1 ft
> 2:1		1.5 ft	3 ft (min.)	1 ft

NOTES:

1. Compost filter berm's are sediment control devices for areas where runoff occurs as sheet flow. See Section 00280, Oregon Standard Specifications.
2. The maximum drainage area for a continuous berm shall be 1/4 acre per 100 linear feet of filter berm.
3. Where possible, berm's should be placed away from the toe of slopes a minimum of 5 feet (10 feet preferred) to allow for energy dissipation and sediment storage.
4. Direct the outlet side of filter berm, located at base of slope, onto a stabilized area, such as vegetation and/or aggregate.
5. Place filter berm's along or on the ground contour with the ends of the filter berm turned up slope. Adequate area shall be provided behind berm for ponding.
6. Compost filter berm's may be vegetated with temporary or permanent seeding after placement.
7. If placed in area with existing ground vegetation, cut vegetation to 2–4 inches above grade at berm footprint. Do not remove existing vegetation or cut back outside berm footprint unless directed by Agency.
8. If soils are exposed apply compost blanket per details and specifications.



COMPOST FILTER BERM SERIES

NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SEDIMENT BARRIER TYPE 9

2024

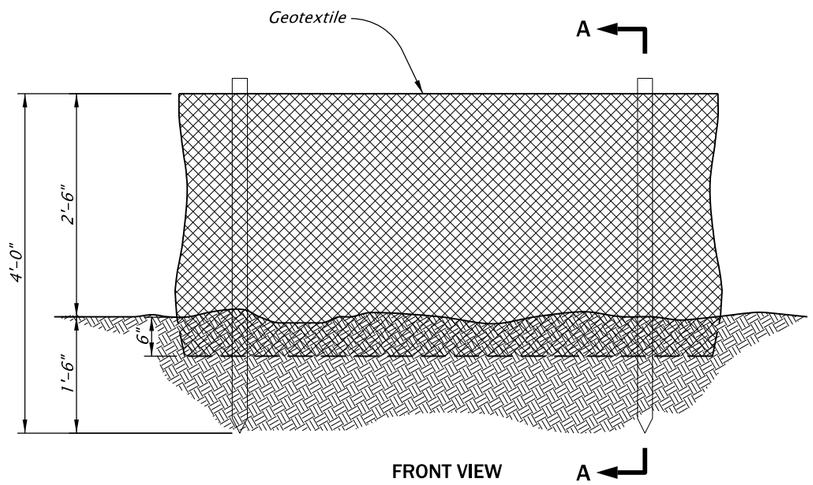
DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. _ _ _ _N/A_ _ _ | SDR DATE_ 20-JAN-2021 | **RD1033**

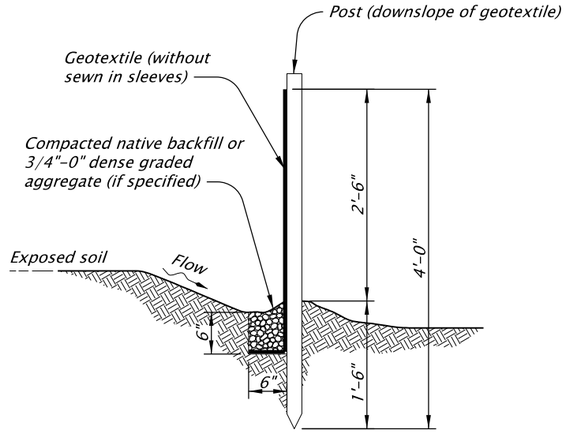
Effective Date: June 1, 2024 – November 30, 2024

20-JAN-2021

RD1033.dgn



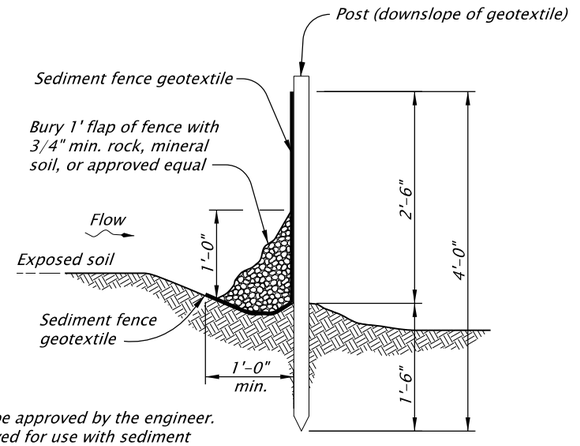
FRONT VIEW



SECTION A-A

SEDIMENT FENCE AND GEOTEXTILE BURY DETAIL - TYPE 1

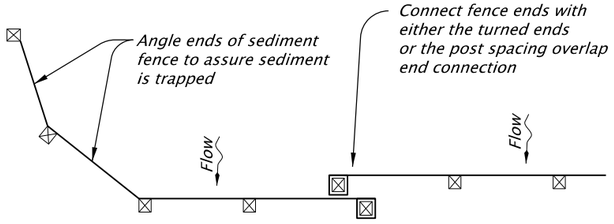
NOT TO SCALE



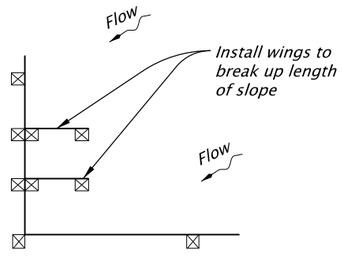
NOTES:
1. Use must be approved by the engineer.
2. Not approved for use with sediment fencing with sewn-in post sleeves.

ALTERNATE SEDIMENT FENCE WITHOUT TRENCHING - TYPE 2

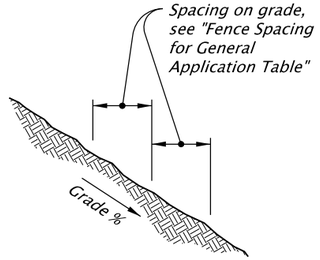
NOT TO SCALE



PLAN VIEW



TERMINATION AT CORNER OR PROPERTY LINE



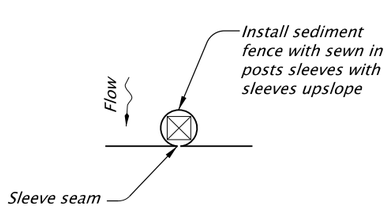
GENERAL NOTES:
1. Use 2"x2" wood fence posts.
2. Posts to be installed on downhill side of sediment fence geotextile. Position posts to prevent separation from geotextile.
3. Compact filter fabric trench backfill and soil on uphill side of fence.
4. Locate fence no closer than three feet to the toe of a slope.
5. Wing spacing shall comply with "Fence Spacing for General Application Table".

FENCE SPACING FOR GENERAL APPLICATION TABLE

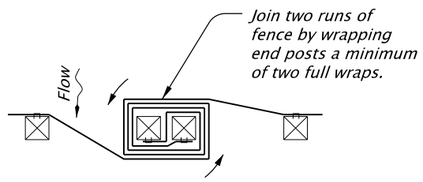
INSTALL PARALLEL ALONG CONTOURS AS FOLLOWS	
GRADE	MAXIMUM SPACING ON GRADE
Grade < 10%	300'
10% ≤ Grade < 15%	150'
15% ≤ Grade < 20%	100'
20% ≤ Grade < 30%	50'
30% ≤ Grade	25'

POST SPACING TABLE

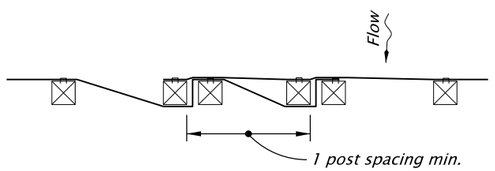
6'	Sediment Fence with Geotextile elongation less than 50%
4'	Sediment Fence with Geotextile elongation 50% or more



GEOTEXTILE WITH POST SLEEVES



TURNED ENDS CONNECTION



POST SPACING OVERLAP CONNECTION

GEOTEXTILE END CONNECTIONS

NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SEDIMENT FENCE

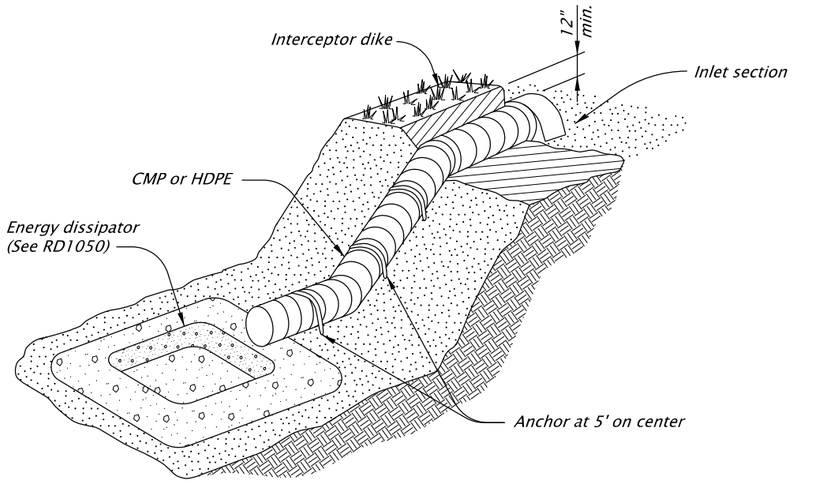
2024

DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

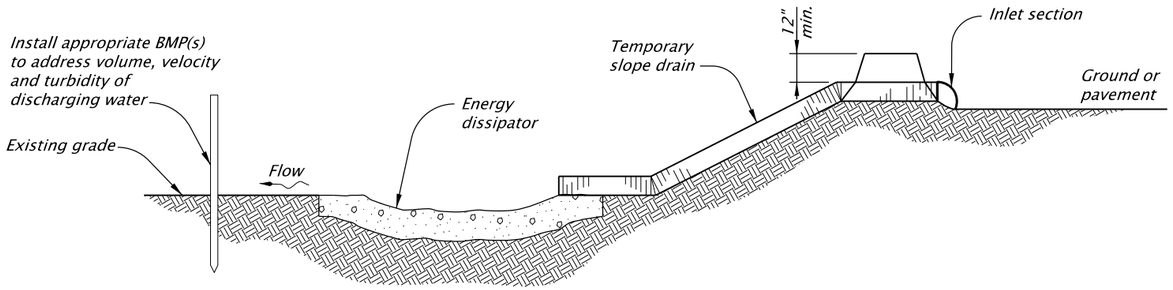
CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1040**

Effective Date: June 1, 2024 - November 30, 2024

RD1045.dgn 20-JAN-2021



PERSPECTIVE

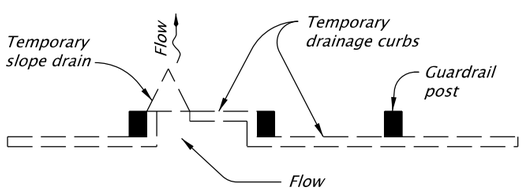


PROFILE

TEMPORARY SLOPE DRAIN
NOT TO SCALE

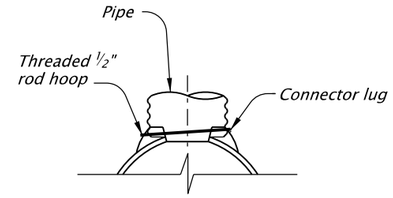
NOTES:

1. *Temporary slope drains shall be used at the top of fill slopes as the embankment is constructed to prevent erosion.*
2. *Temporary drainage curbs shall be used in conjunction with temporary slope drains to prevent erosion on completed slopes and to direct flow into end section.*
3. *All dimensions not indicated will be as directed.*

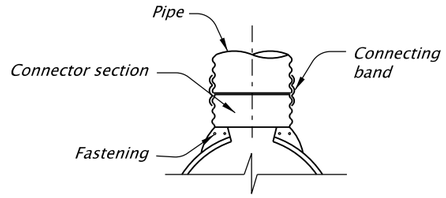


PLAN

TEMPORARY DRAIN AT GUARDRAIL
NOT TO SCALE

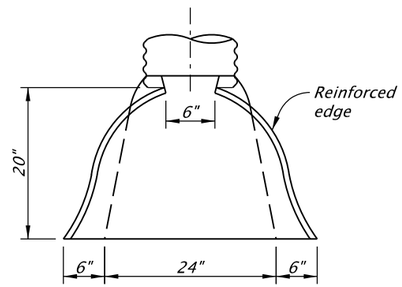


OPTION 1

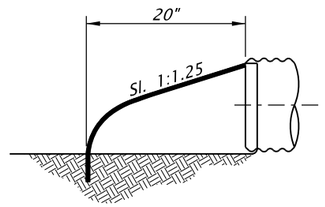


OPTION 2

CONNECTION DETAILS
NOT TO SCALE

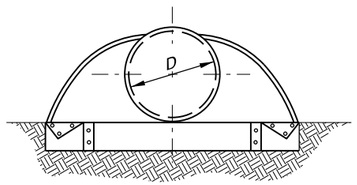


PLAN



SIDE VIEW

PIPE SIZE TABLE		
PIPE		CONTRIBUTING AREA
Slope (min.)	D in. (min.)	TO SLOPE DRAIN (sq ft)
3.8%	6	A < 200
2.5%	8	200 ≤ A < 500
1.9%	10	500 ≤ A < 850
1.5%	12	850 ≤ A < 1400
–	special design reqd.	1400 ≤ A



FRONT VIEW

INLET SECTION DETAILS
NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TEMPORARY SLOPE DRAIN WITH ENERGY DISSIPATOR

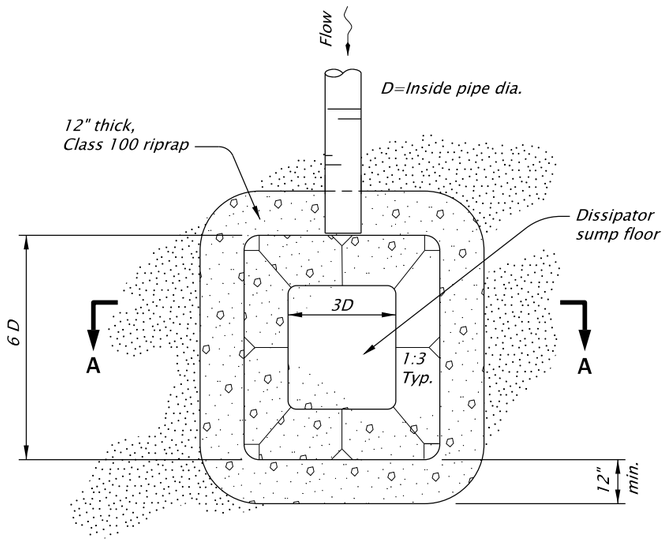
2024

DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

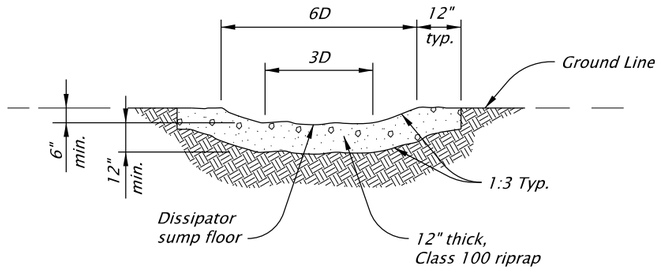
CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1045**

Effective Date: June 1, 2024 – November 30, 2024

RD1050.dgn 20-JAN-2021



PLAN



SECTION A-A

NOTES:
1. *All dimensions not indicated will be as directed.*

2. *Install level spreader, sediment barrier(s), check dam(s) or other appropriate BMP(s) to address volume, velocity and turbidity of discharge water.*

TEMPORARY SCOUR BASIN / ENERGY DISSIPATOR
NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TEMPORARY SCOUR BASIN / ENERGY DISSIPATOR

2024

DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1050**

Effective Date: June 1, 2024 - November 30, 2024

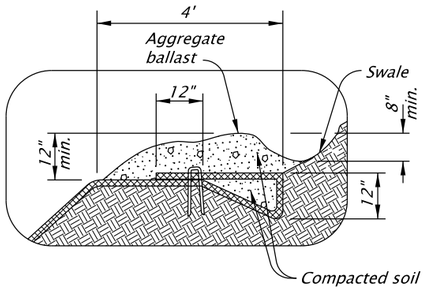


FIGURE A1:
TOP OF BANK ANCHOR TRENCH, H>3' AND TERMINAL SLOPE
NOT TO SCALE

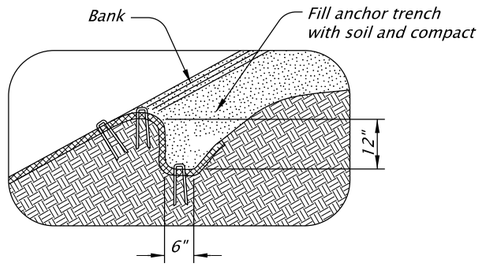


FIGURE A2:
TOP OF BANK ANCHOR TRENCH, H<3'
NOT TO SCALE

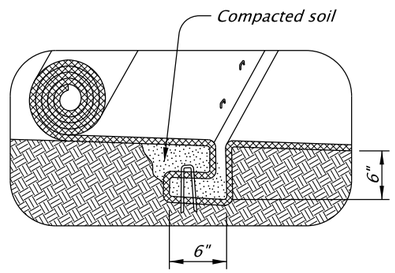


FIGURE A3:
CHANNEL CHECK SLOT
NOT TO SCALE

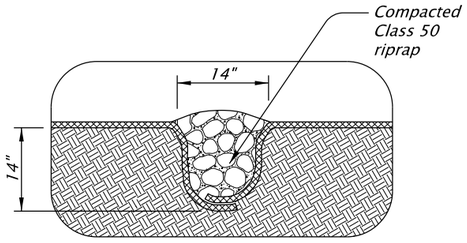


FIGURE A4:
CHANNEL CHECK SLOT WITH ROCK BACKFILL
NOT TO SCALE

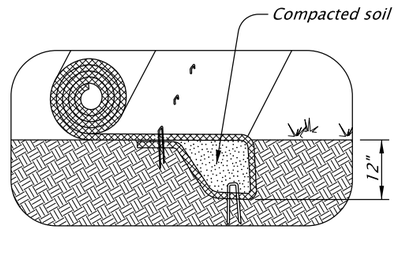
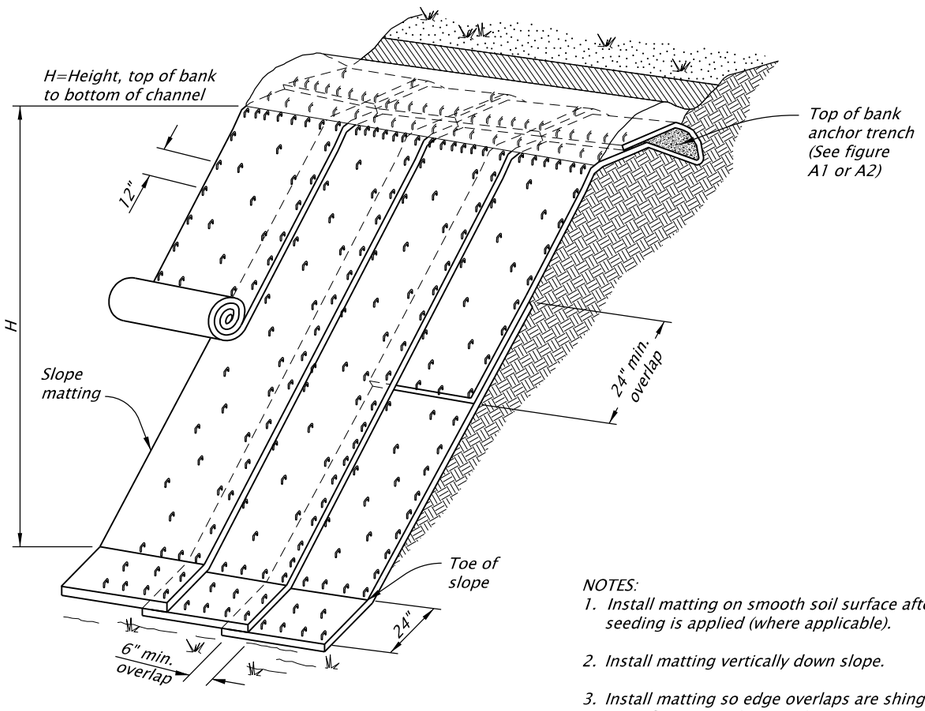
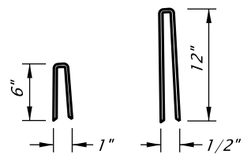


FIGURE A5:
INITIAL CHANNEL ANCHOR TRENCH
NOT TO SCALE

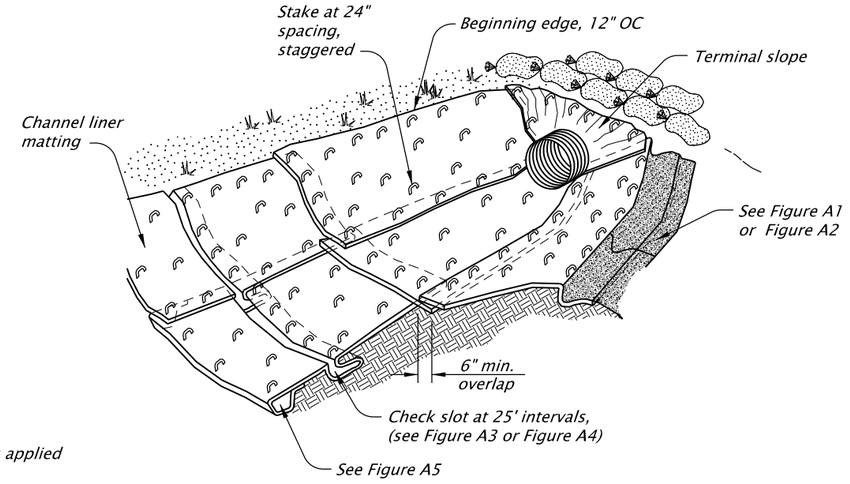


SLOPE MATTING ISOMETRIC VIEW
NOT TO SCALE

NOTES:
1. *Install matting on smooth soil surface after seeding is applied (where applicable).*
2. *Install matting vertically down slope.*
3. *Install matting so edge overlaps are shingled away from prevailing winds.*
4. *Place fastener at 12" OC on matting edges*
5. *Overlap upper mat over lower mat, and fasten.*
6. *Stagger alternate rows of fasteners placed at 24" OC*
7. *Extend mat 24" beyond toe of slope; fold mat back under 4" and fasten.*
8. *Matting Types A through E: Furnish fully biodegradable product. Matting with plastic or photodegradable components will not be accepted.*



STAPLES
NOT TO SCALE



CHANNEL MATTING ISOMETRIC VIEW
NOT TO SCALE

NOTES:
1. *Install matting on smooth soil surface after seeding is applied (where applicable).*
2. *Install channel liner matting, in the direction of water flow. Anchor upstream end of mat with check slot for culvert outfalls, place mat under pipe 12" minimum upstream from pipe outlet.*
3. *Construct check slots across channel bottom at 25' spacing and at the end of each mat (Fig. A3 or A4).*
4. *Overlap side channel liner matting edges 6" over the center channel liner matting and fasten edges 12" OC Continue overlap and stapling pattern for each additional side channel liner mat.*
5. *Lap upstream matting end 12" over beginning edge of downstream matting. Fasten 12" OC*
6. *Anchor top edge of side channel matting in trench and fasten 12" OC (Fig. A2).*
7. *Fasten matting interior at 24" OC with staggered spacing.*
8. *Construct initial anchor trench at downstream end of matting and terminal slope anchor at upstream end.*
9. *Matting Types A through E: Furnish fully biodegradable product. Matting with plastic or photodegradable components will not be accepted.*

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

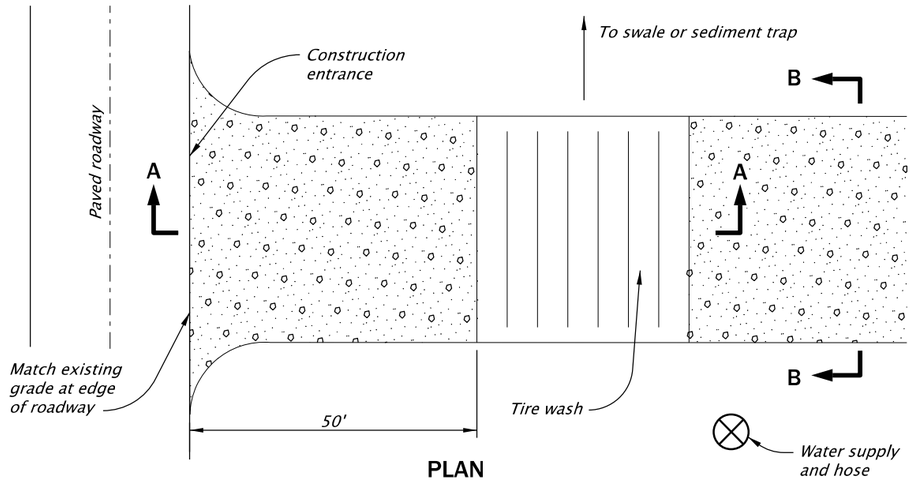
SLOPE AND CHANNEL MATTING

2024

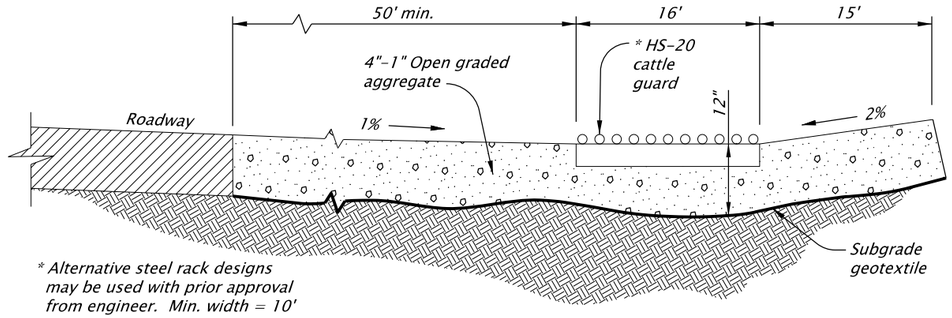
DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1055**

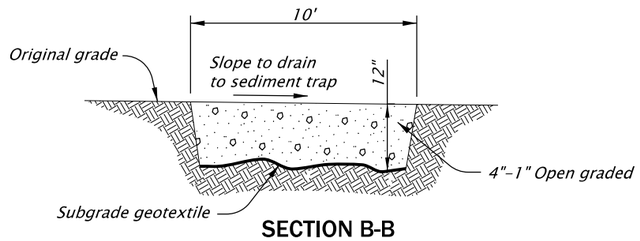
Effective Date: June 1, 2024 - November 30, 2024



PLAN



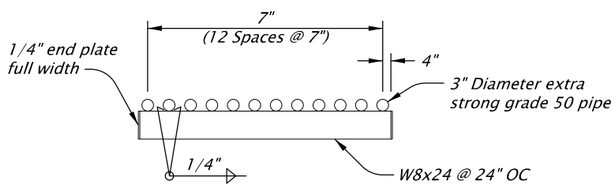
SECTION A-A



SECTION B-B

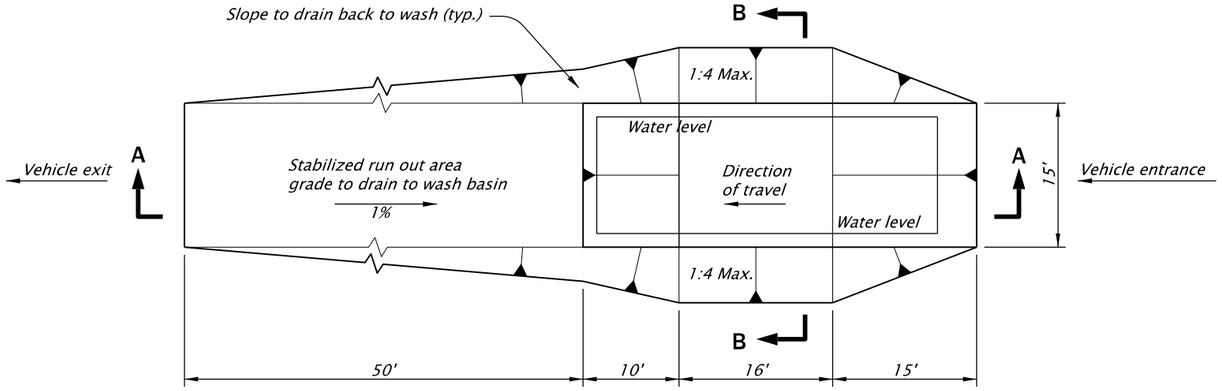
TIRE WASH - TYPE 1 (MANUAL HOSE WASH)

NOT TO SCALE

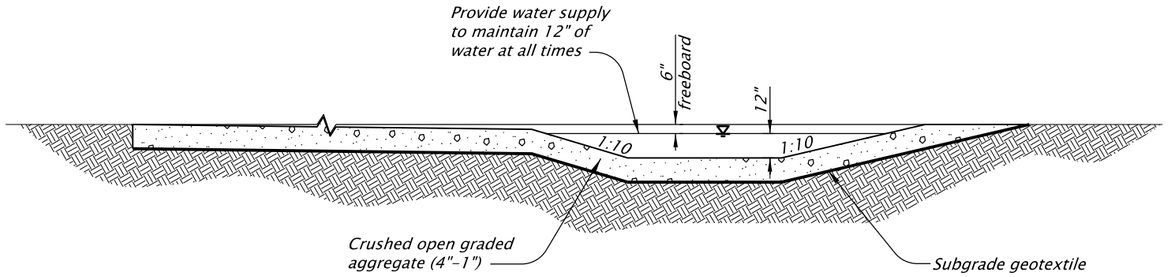


HS-20 CATTLE GUARD

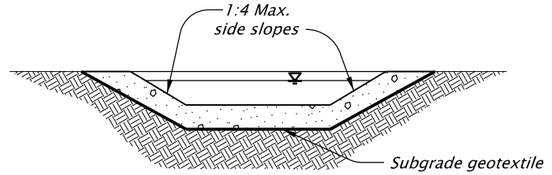
NOT TO SCALE



PLAN



SECTION A-A



SECTION B-B

TIRE WASH - TYPE 2

NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TIRE WASH FACILITY TYPE 1 AND 2

2024

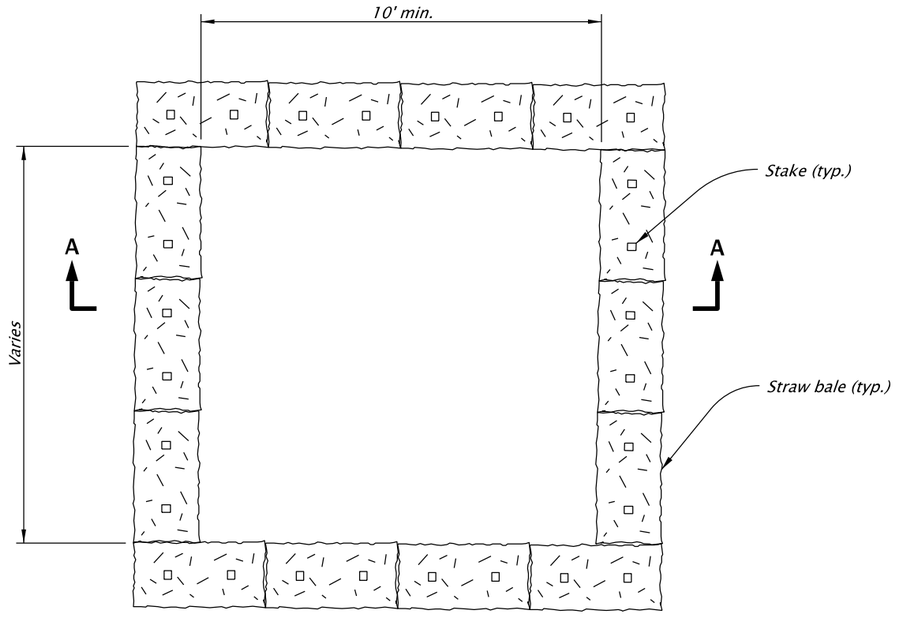
DATE	REVISION DESCRIPTION
01-2021	REMOVED CALC BOOK NUMBERS

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1060**

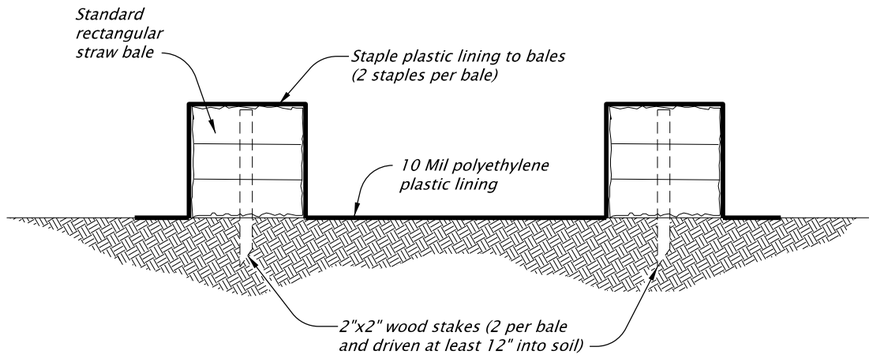
20-JAN-2021

RD1060.dgn

Effective Date: June 1, 2024 - November 30, 2024



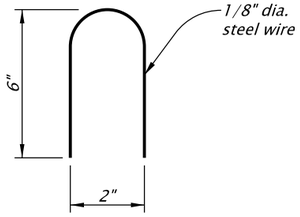
PLAN



SECTION A-A

CONCRETE TRUCK WASH OUT FACILITY

NOT TO SCALE



STAPLE DETAIL

NOT TO SCALE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CONCRETE TRUCK WASH OUT

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 20-JAN-2021 | **RD1070**

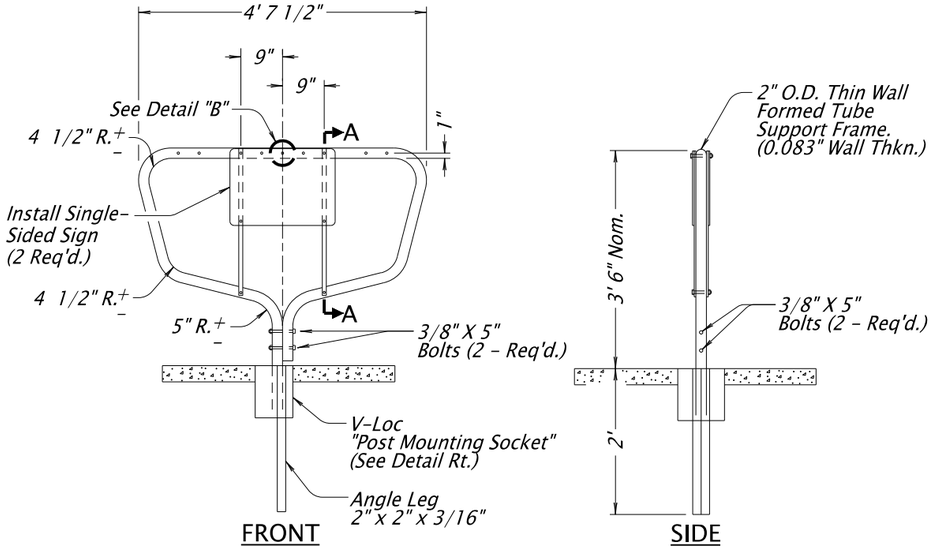
Effective Date: June 1, 2024 - November 30, 2024

20-JAN-2021

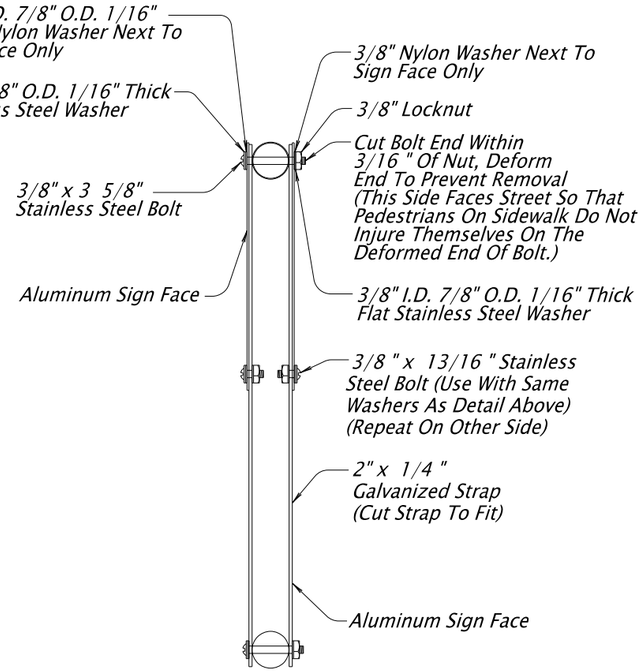
RD1070.dgn

02-JUL-2018

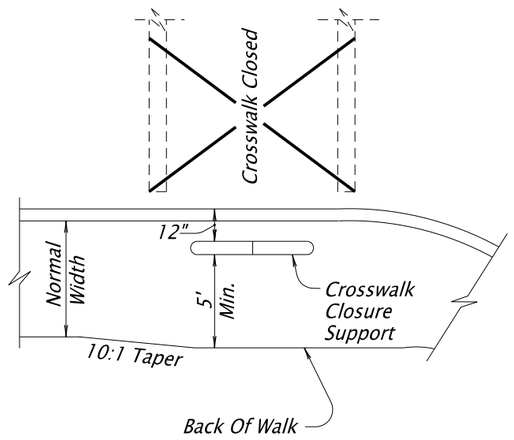
TM240.dgn



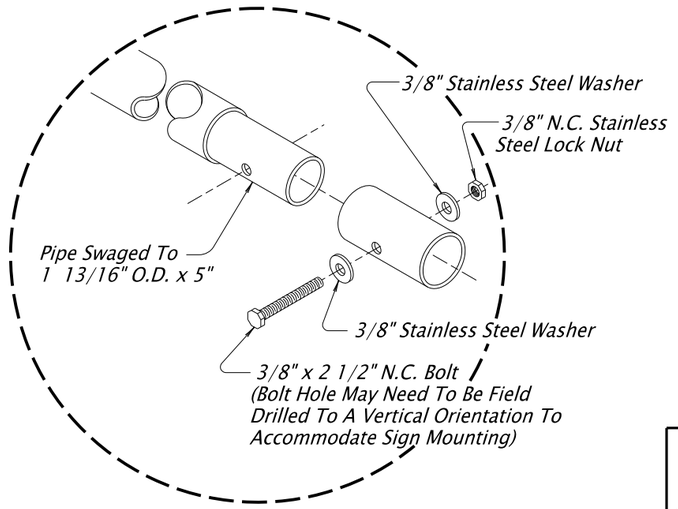
CROSSWALK CLOSURE SUPPORT DETAIL



SECTION A-A



PLAN VIEW



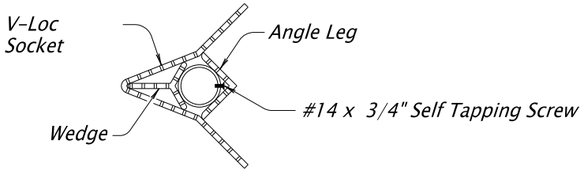
DETAIL "B"

GENERAL NOTES:

1. All Holes In The Tube Support Frame To Be Predrilled By The Manufacturer. (1/32" Larger Than Mounting Bolt)
2. Pipe Swaged By The Manufacturer.

SIGN DETAIL

OR22-7
24" x 18"



POST MOUNTING SOCKET

For Additional Details See Standard Drg. No. RD100

NOTE:

Care Shall Be Taken That No Concrete Is Placed Within Mounting Socket.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CROSSWALK CLOSURE DETAIL

2024

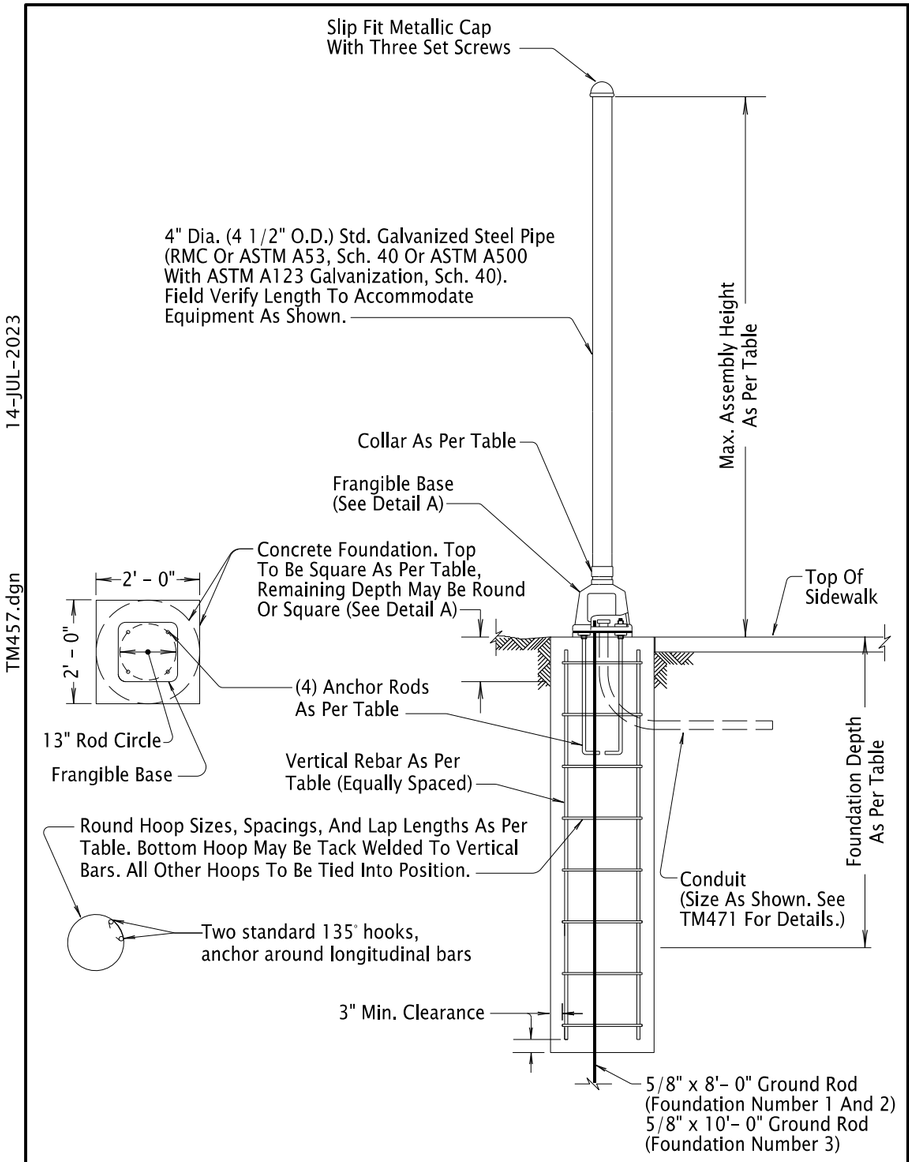
DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 02-JUL-2018 | **TM240**

Effective Date: June 1, 2024 - November 30, 2024

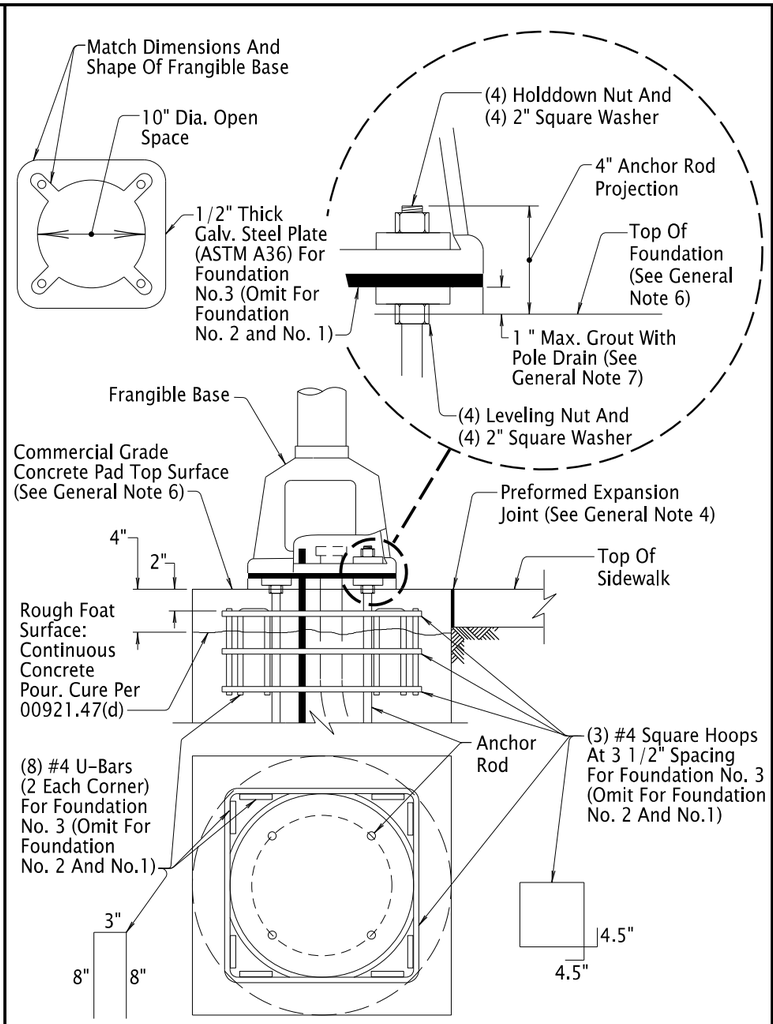
14-JUL-2023

TM457.dgn



Pedestal Foundation Number	Max. Assembly Height	Foundation Depth	Depth of Square Foundation	Anchor Rods (ASTM F 1554 Grade 36)	Reinforcing Steel			Collar
					Vertical Rebar	Hoop Size & Spacing	Hoop Lap Length	
1	6' - 0"	2' - 0"	4"	3/4" x 18" x 4" (6" Thread)	N/A	N/A	N/A	N/A
2	10' - 0"	3' - 0"	4"					
3	20' - 6"	8' - 0"	12"	1" x 36" x 4" (6" Thread)	8-#6	#4-12"	6" with 2 hooks	Req'd

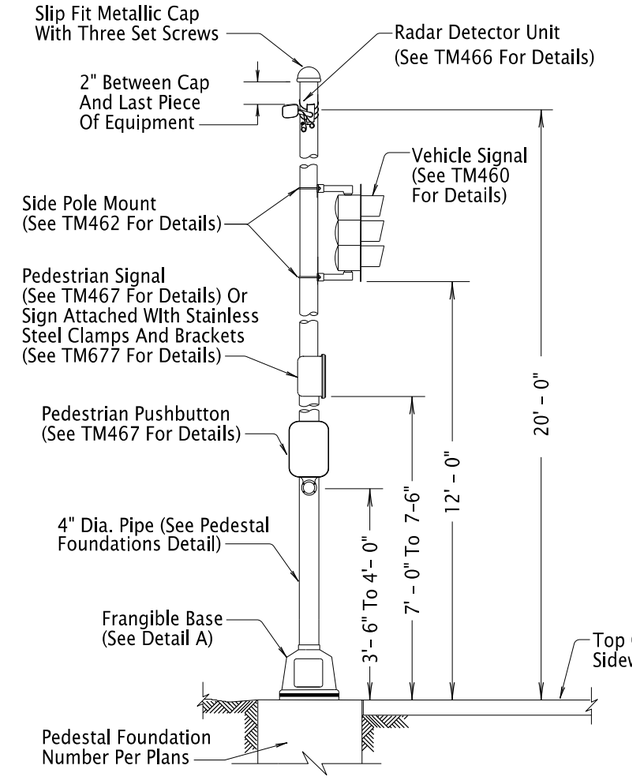
PEDESTAL FOUNDATIONS



DETAIL A - FRANGIBLE BASE

General Notes:

1. All Bolts, Nuts And Washers To Conform To 02560.20 And Be Galvanized Steel According To 02560.40 Unless Noted Otherwise.
2. All Anchor Rods To Be Galvanized Steel Conforming To 02560.30.
3. All Pole Entrances Containing Wiring To Be Smooth.
4. Install 1/4" Thick Preformed Expansion Joint Filler Around Footing In Sidewalk Areas.
5. The Entire Foundation To Be Located On A Single Plane With Less Than 2% Slope. The Flat Edge(s) Of The Foundation May Be Adjacent To The Turn Space, Back Of Walk, Or A Curb Ramp Grade Break Line.
6. Install Commercial Grade Concrete Pad Above Rough Float Surface With Top Surface Matching Sidewalk Grade And Less Than 1/4 " Vertical Exposure From Adjacent Grade. Clean Rough Float Surface Prior To Placing Fresh Concrete By Removing All Scum, Laitance, Loose Gravel, And Sediment. Pour During Sidewalk Installation After Installing Pipe And Appurtenances.
7. Non-Shrink High Early Strength Grout (Non-Ferrous) with 3/4" Diameter Pole Drain And A Minimum Strength of 5000 psi. Do Not Use Footing Concrete.



Notes:

1. Equipment Shown In the Assembly Detail Is An Example Of The Equipment That May Be Mounted. Install Equipment As Shown.
2. See TM492 For Ramp Meter Pedestal Mounting Details.
3. See TM493 For RRFB Pedestal Mounting Details.

TRAFFIC SIGNAL PEDESTAL ASSEMBLY

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

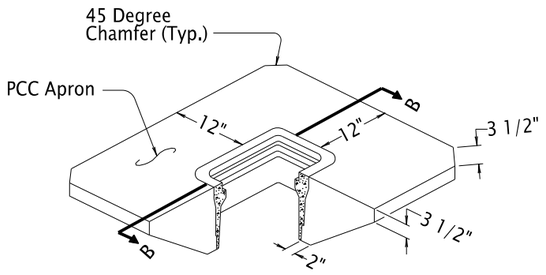
PEDESTAL FOUNDATION AND TRAFFIC SIGNAL ASSEMBLY

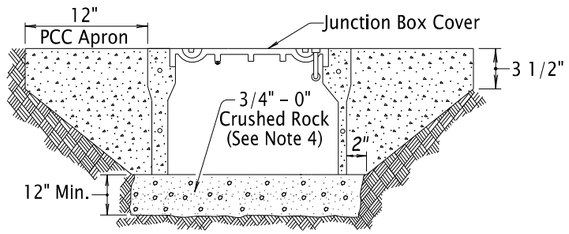
2024

DATE	REVISION DESCRIPTION
01-2021	UPDATED ALL ANCHOR ROD DETAILS, CORRECTED STD. DWG. REFERENCE
07-2022	COMPLETE REDESIGN OF FOUNDATION AND INSTALLATION PROCEDURE
07-2023	NOTE 5 - CHANGED TO 2% SLOPE. ADDED RMC AS PIPE OPTION. MINOR TEXT CHANGES FOR CLARITY.

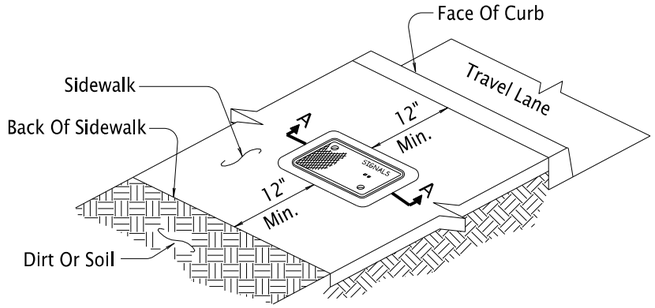
CALC BOOK NO. N/A | SDR DATE 14-JUL-2023 | **TM457**

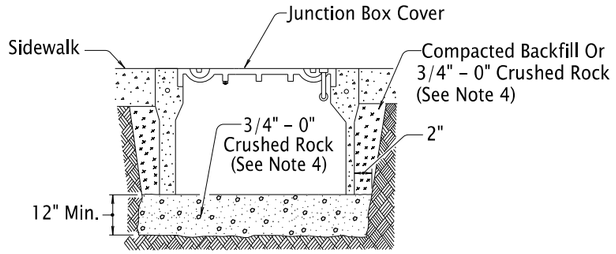
Effective Date: June 1, 2024 - November 30, 2024





SECTION B–B

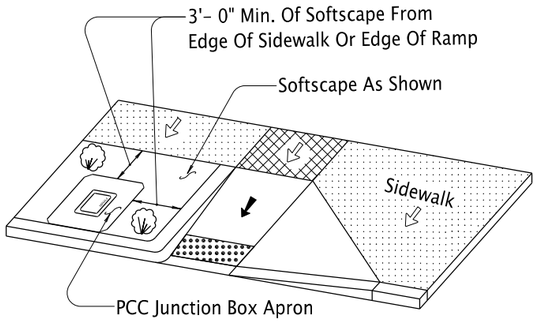




SECTION A–A

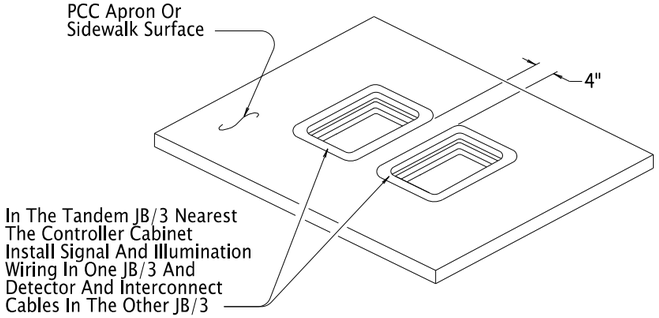
JUNCTION BOX INSTALLATION IN PCC SIDEWALK

(This Detail Only Applicable for Junction Boxes Located In Flat Areas Of Sidewalks. Do Not Install In Slopes Of Ramps Or Driveways)

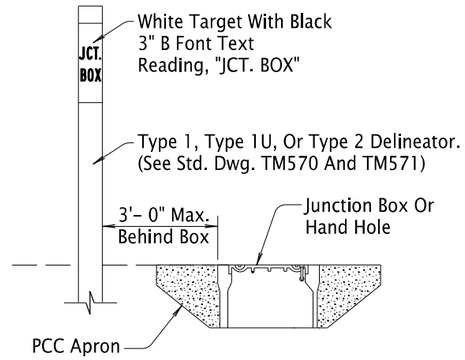


JUNCTION BOX INSTALLATION IN UNSURFACED AREA

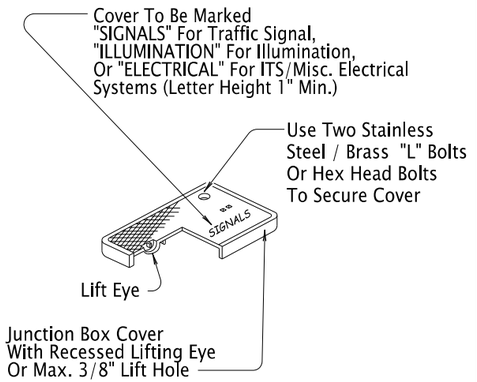
(This Detail Only Applicable for Junction Boxes Located In Incidental Travel Areas; Gravel Shoulders, Behind Guardrail, Etc. Do Not Install In Travel Lanes, Paved Shoulders, Or Other Areas Exposed To Traffic.)



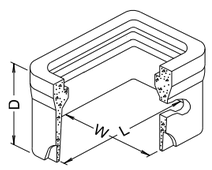
TANDEM JB/3A JUNCTION BOX DETAILS



DELINEATION OF JUNCTION BOX & HAND HOLE IN UNSURFACED AREA



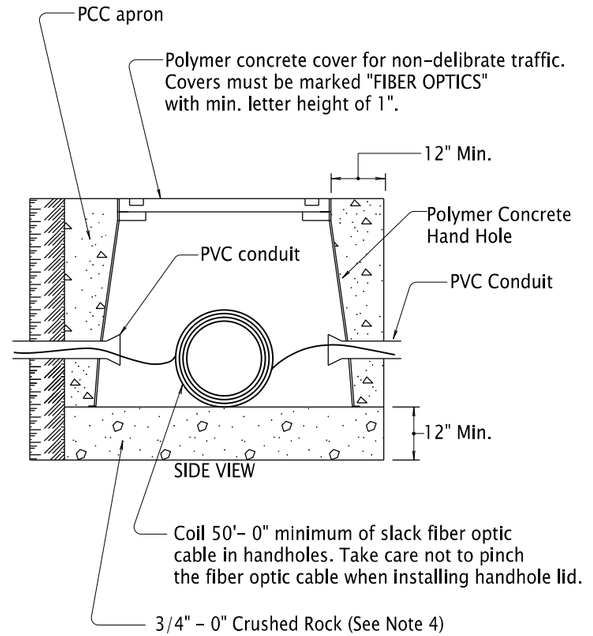
JUNCTION BOX COVER DETAILS

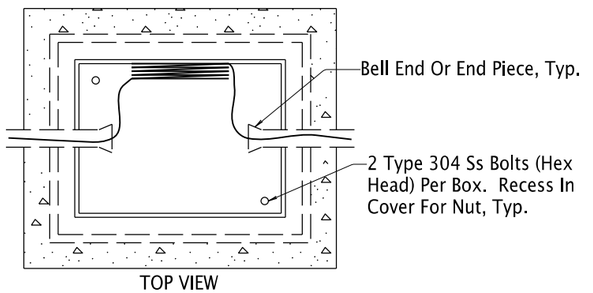


Type*	L	W	D
JB1	17"	10"	12"
JB2	22"	12"	12"
JB3	30"	17"	12"
HH–1	24"	30"	24"
HH–2	30"	48"	24"
HH–3	30"	48"	36"

*Junction Box Or Handhole
Type As Shown On Plans

DIMENSION TABLE





FIBER OPTIC CABLE HAND HOLE INSTALLATION

GENERAL NOTES:

1. Install Top of Junction Box And Hand Hole Flush With The Sidewalk, Surrounding Grade, Or Top Of Curb. For Hand Holes Installed In The Roadway Or Shoulder, Leave The Top Of The Hand Hole 1/2" Below The Pavement Surface.
2. Install Junction Boxes And Hand Holes At The Approximate Locations Shown, Or If Not Shown, No More Than 300 Feet Apart For Junction Boxes And No More Than 1000 Feet Apart For Hand Holes.
3. More Junction Boxes And Hand Holes Than Specified May Be Installed To Facilitate The Work At The Option And Cost Of The Contractor
4. Use Materials According To 00640.10 and 00640.16. Use Compaction Equipment Suitable For Area And Compact Each Six Inch Layer With Sufficient Coverages To Produce A Firm Unyielding Surface. Do Not Install Conductors Until Surface Has Been Constructed.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

JUNCTION BOXES/HAND HOLES

2024

DATE	REVISION DESCRIPTION
07–2022	ADDED NEW MARKING (ILLUMINATION & ELECTRICAL) FOR JB COVER
01–2024	CHANGED DIMENSION FOR JB DELINEATION

CALC. BOOK NO. N/A | SDR DATE 19-JAN-2024 | **TM472**

19-JAN-2024

TM472.dgn

Effective Date: June 1, 2024 – November 30, 2024

07-01-2020

TM500.dgn

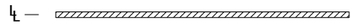
W

4" WHITE LINE

W-2

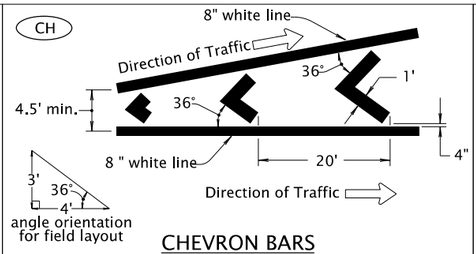
8" WHITE LINE

Y



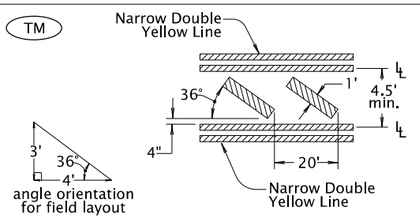
4" YELLOW LINE

CH



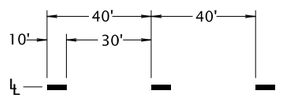
CHEVRON BARS
1' WHITE BARS AT 20' SPACING

TM



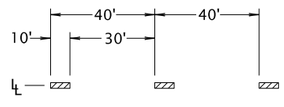
TRANSVERSE MEDIAN BARS
1' YELLOW BARS AT 20' SPACING

WB



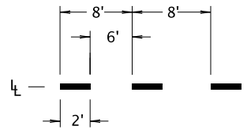
4" WHITE BROKEN LINE

YB



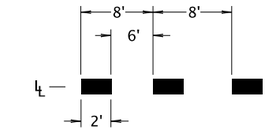
4" YELLOW BROKEN LINE

WD



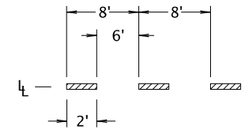
4" WHITE DOTTED LINE
For lane extensions

WD-2



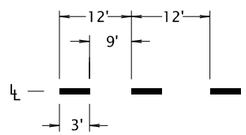
8" WHITE DOTTED LINE
For lane extensions and bike lane extensions

YD



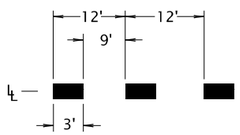
4" YELLOW DOTTED LINE
For lane extensions

DLL



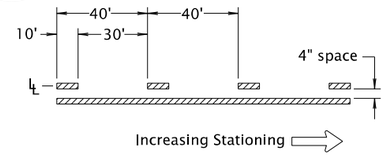
4" WHITE DOTTED LANE LINE
For lane lines in acceleration/deceleration lanes

DLL-2



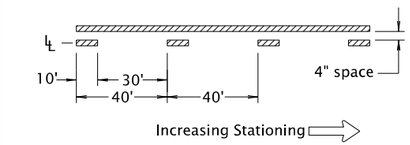
8" WHITE DOTTED LANE LINE
For lane lines in drop lanes

NPR



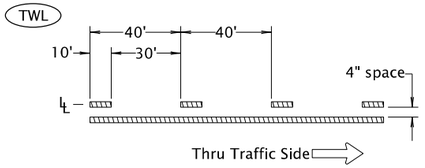
NO-PASS RIGHT
4" YELLOW LINES

NPL



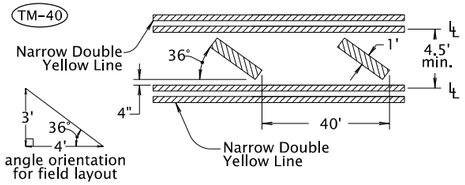
NO-PASS LEFT
4" YELLOW LINES

TWL



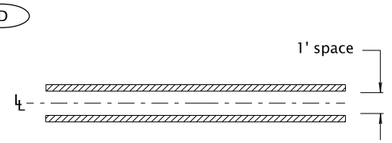
TWO-WAY LEFT TURN
4" YELLOW LINES

TM-40



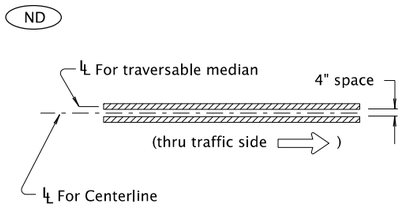
TRANSVERSE MEDIAN BARS
1' YELLOW BARS AT 40' SPACING
For use at painted medians where
distance between left turn refuges exceeds 200'

D



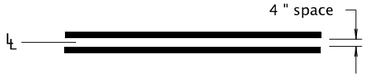
DOUBLE NO-PASS
TWO 4" YELLOW LINES

ND



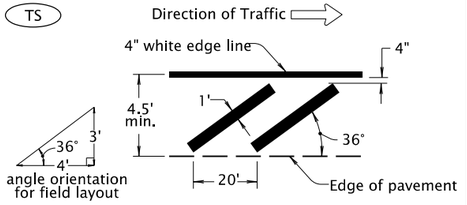
NARROW DOUBLE NO-PASS
TWO 4" YELLOW LINES

NDW



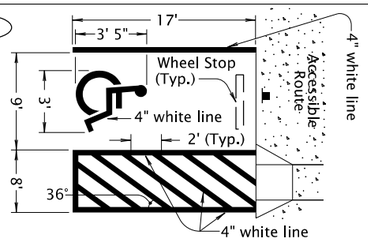
NARROW DOUBLE NO-LANE CHANGE
TWO 4" WHITE LINES

TS



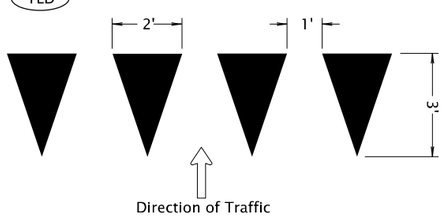
TRANSVERSE SHOULDER BARS
1' WHITE BARS AT 20' SPACING

HC



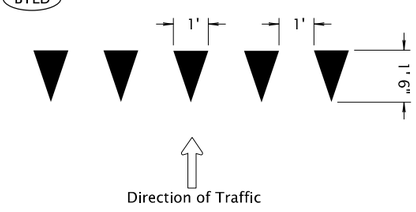
DISABLED PARKING DETAIL (white)

YLD



YIELD LINE (white)

BYLD



BICYCLE YIELD LINE (white)

LEGEND

Direction Of Traffic, Increasing Stationing
Or Thru Traffic Side

℄ — Lane line dimensions are shown on the striping plans

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with
the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PAVEMENT MARKING STANDARD DETAIL BLOCKS

2024

DATE	REVISION DESCRIPTION
07-2020	Changed Min. widths for CH, TM, TM-40, and TS

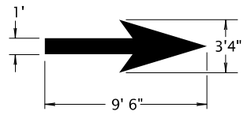
CALC. BOOK NO. N/A | SDR DATE 07-01-2020 | **TM500**

Effective Date: June 1, 2024 - November 30, 2024

01-03-2022

TM501.dgn

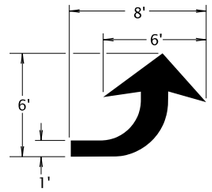
SA



STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

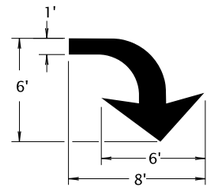
LA



LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

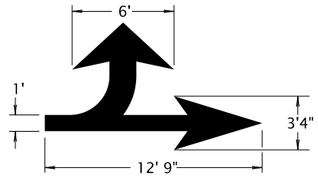
RA



RIGHT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

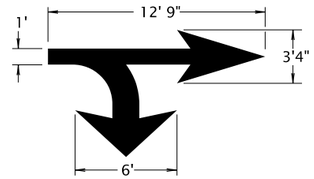
LSA



LEFT TURN STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

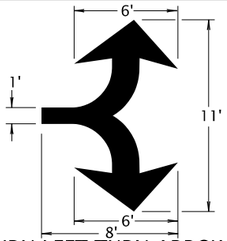
RSA



RIGHT TURN STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

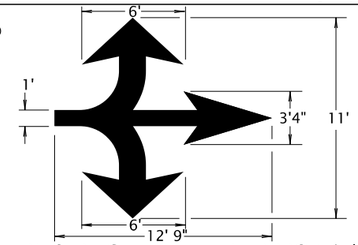
RALA



RIGHT TURN LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

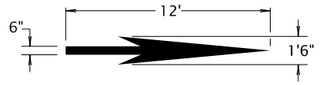
RSLA



RIGHT TURN STRAIGHT LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

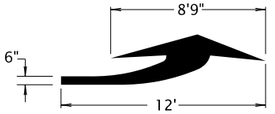
E-SA



ELONGATED STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

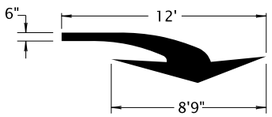
E-LA



ELONGATED LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

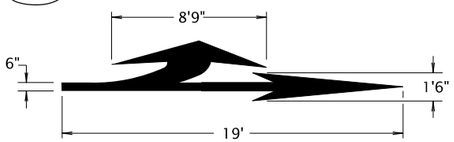
E-RA



ELONGATED RIGHT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

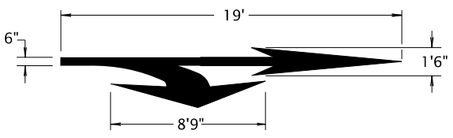
E-LSA



ELONGATED LEFT TURN STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

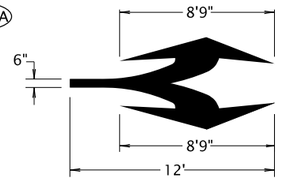
E-RSA



ELONGATED RIGHT TURN STRAIGHT ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

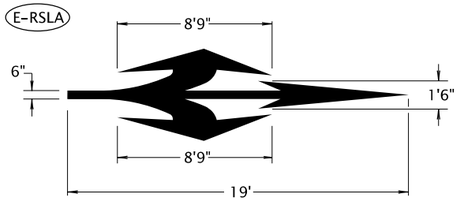
E-RALA



ELONGATED RIGHT TURN LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

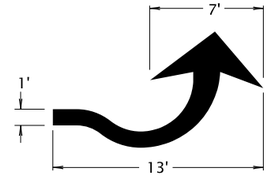
E-RSLA



ELONGATED RIGHT TURN STRAIGHT LEFT TURN ARROW (white)

For arrow proportion details, see current version of Standard Highway Signs

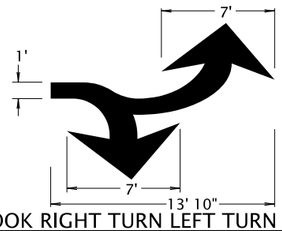
F-LA



FISH-HOOK LEFT TURN ARROW (white)

For arrow proportion details, see the current ODOT Traffic Line Manual

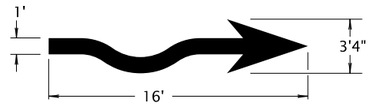
F-RALA



FISH-HOOK RIGHT TURN LEFT TURN ARROW (white)

For arrow proportion details, see the current ODOT Traffic Line Manual

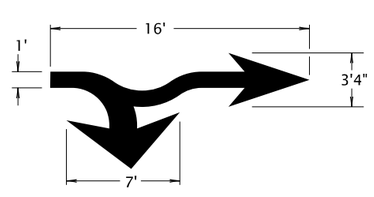
F-SA



FISH-HOOK STRAIGHT ARROW (white)

For arrow proportion details, see the current ODOT Traffic Line Manual

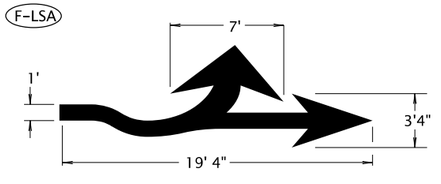
F-RSA



FISH-HOOK RIGHT TURN SRAIGHT ARROW (white)

For arrow proportion details, see the current ODOT Traffic Line Manual

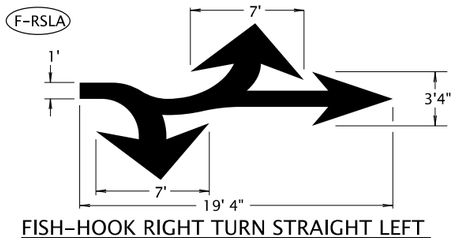
F-LSA



FISH-HOOK LEFT TURN STRAIGHT ARROW (white)

For arrow proportion details, see the current ODOT Traffic Line Manual

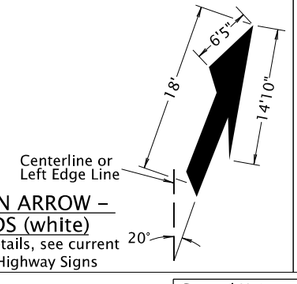
F-RSLA



FISH-HOOK RIGHT TURN STRAIGHT LEFT TURN ARROW (white)

For arrow proportion details, see the current ODOT Traffic Line Manual

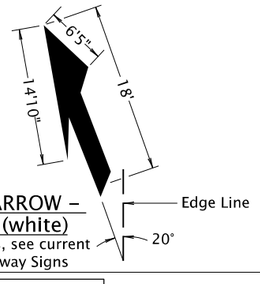
LRA-L



LANE REDUCTION ARROW - LEFT LANE ENDS (white)

For arrow proportion details, see current version of Standard Highway Signs

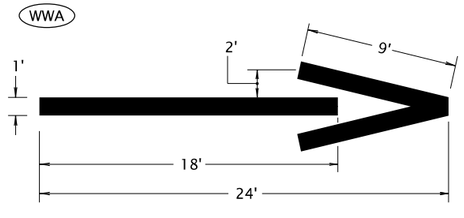
LRA-R



LANE REDUCTION ARROW - RIGHT LANE ENDS (white)

For arrow proportion details, see current version of Standard Highway Signs

WWA



WRONG-WAY ARROW (white)

General Note:

1. Center pavement markings within the lane width.
2. Arrow and letter dimensions nominal, excluding WWA.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PAVEMENT MARKING STANDARD DETAIL BLOCKS

2024

DATE	REVISION DESCRIPTION
07-2020	Some Detail Blocks moved to new Std. Drawing TM504
	Fish-hook Arrows added, LRA split into LRA-L and LRA-R
01-2022	Corrected bubble callout of LRA-L and typo in LRA-R

CALC. BOOK NO. N/A

SDR DATE 01-03-2022

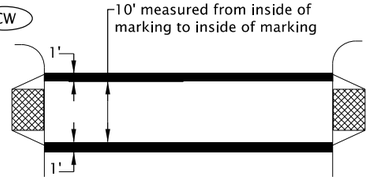
TM501

Effective Date: June 1, 2024 - November 30, 2024

07-08-2022

TM503.dgn

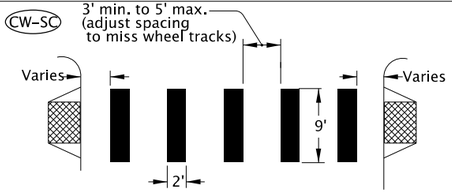
CW



STANDARD CROSSWALK
TWO 1' WHITE BARS

Install per Standard Drawing TM530

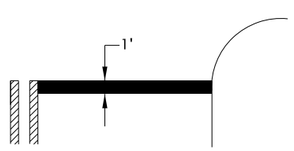
CW-SC



STAGGERED CONTINENTAL CROSSWALK
2' WHITE BARS

Install per Standard Drawing TM530

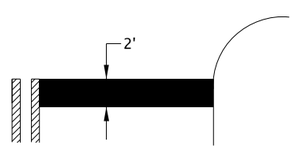
S



STOP BAR
1' WHITE BAR

Install per Standard Drawing TM530

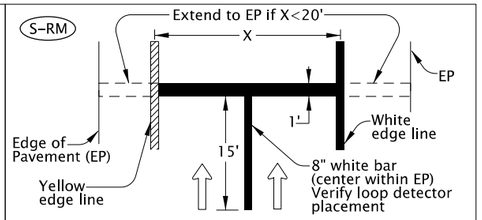
S-2



STOP BAR - LARGE
2' WHITE BAR

Install per Standard Drawing TM530

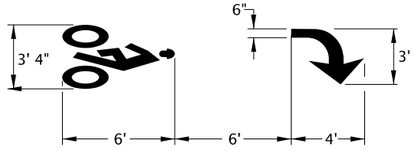
S-RM



RAMP METER STOP BAR
1' & 8" WHITE BARS

For multi-lane ramp meter applications

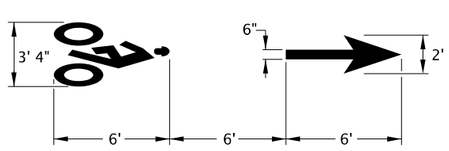
BR



BIKE RIGHT TURN STENCIL (white)

Center marking within lane width
For proportion details, see current version of Standard Highway Signs

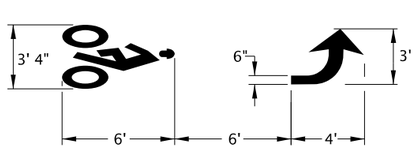
BS



BIKE LANE STANDARD STENCIL (white)

Center marking within lane width
For proportion details, see current version of Standard Highway Signs

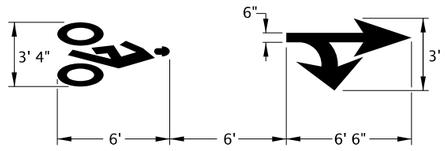
BL



BIKE LEFT TURN STENCIL (white)

Center marking within lane width
For proportion details, see current version of Standard Highway Signs

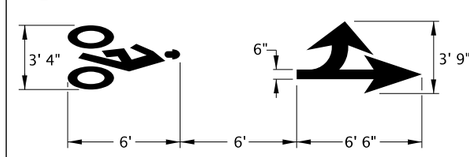
BRS



BIKE RIGHT TURN STRAIGHT STENCIL (white)

Center marking within lane width
For proportion details, see current version of Standard Highway Signs

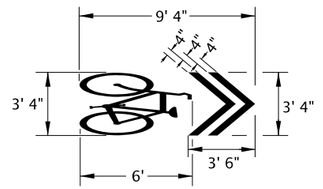
BLS



BIKE LEFT TURN STRAIGHT STENCIL (white)

Center marking within lane width
For proportion details, see current version of Standard Highway Signs

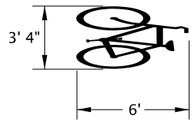
SLM



SHARED LANE MARKING (white)

Center marking within lane width or as shown
For proportion details, see current version of Standard Highway Signs

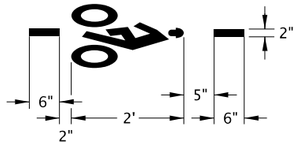
B



BIKE STENCIL (white)

Used for Intersection Bicycle Box applications
Place marking within bicycle box, ceneterd with motor vehicle lane width

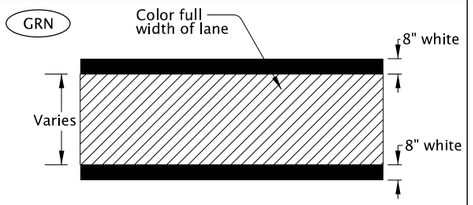
BD



BICYCLE DETECTOR MARKING (white)

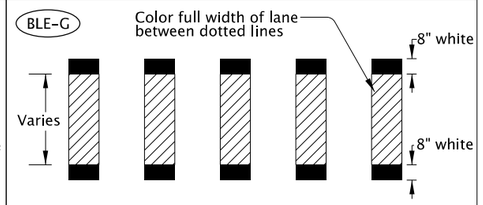
PLace Bicycle Detector Pavement Marking in optimum loction where bicycle acuates the traffic signal

GRN



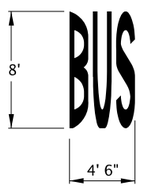
GREEN SUPPLEMENTAL BICYCLE LANE
SOLID LINE (green)

BLE-G



GREEN SUPPLEMENTAL BICYCLE LANE
DOTTED LINE EXTENSION (green)

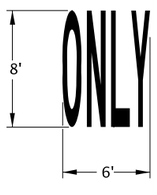
BUS



BUS (white)

Center marking within lane width
For letter proportion details, see current version of Standard Highway Signs

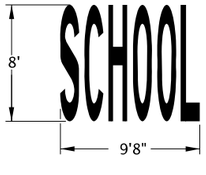
ON



ONLY (white)

Center marking within lane width
For letter proportion details, see current version of Standard Highway Signs

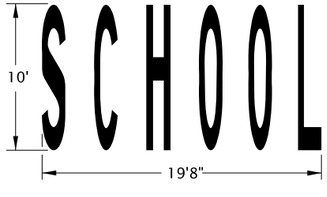
SCH



SCHOOL (white)

Center marking within lane width
For letter proportion details, see current version of Standard Highway Signs

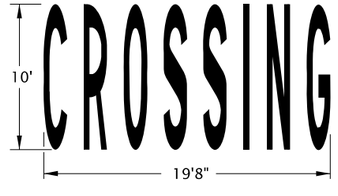
SCH-LG



SCHOOL - LARGE (white)

Center marking within width of two lanes
For letter proportion details, see current version of Standard Highway Signs

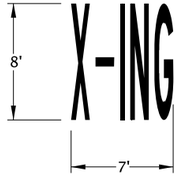
CRS-LG



CROSSING - LARGE (white)

Center marking within width of two lanes
For letter proportion details, see current version of Standard Highway Signs

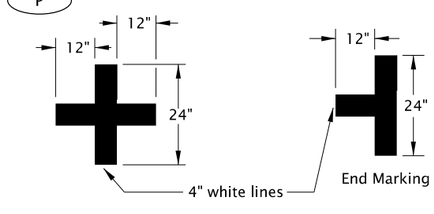
XNG



X-ING (white)

Center marking within lane width
For letter proportion details, see current version of Standard Highway Signs

P



ON-STREET PARKING DETAIL (white)

General Note:

1. Arrow, letter, and bike symbol dimensions nominal.

LEGEND

Direction of Trave

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PAVEMENT MARKING STANDARD DETAIL BLOCKS

2024

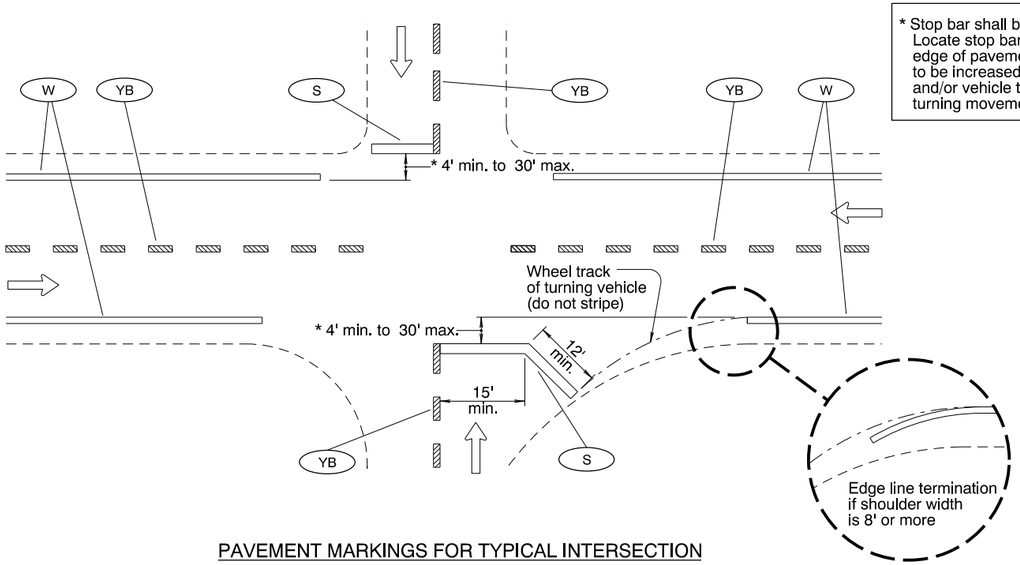
DATE	REVISION DESCRIPTION
07-2022	Added note for measurement of Standard Crosswalk

CALC. BOOK NO. N/A

SDR DATE 07-08-2022

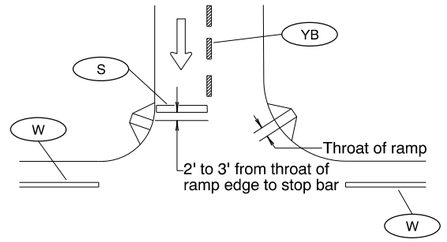
TM503

Effective Date: June 1, 2024 - November 30, 2024

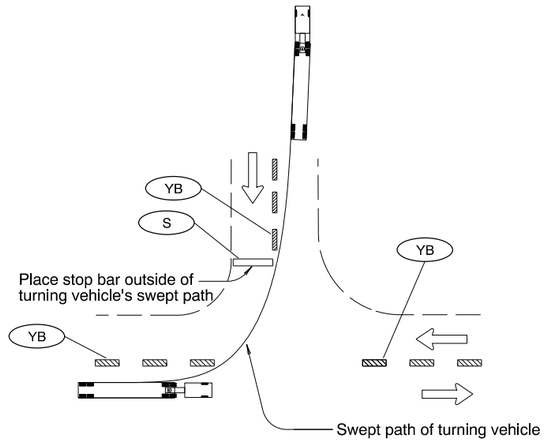


PAVEMENT MARKINGS FOR TYPICAL INTERSECTION

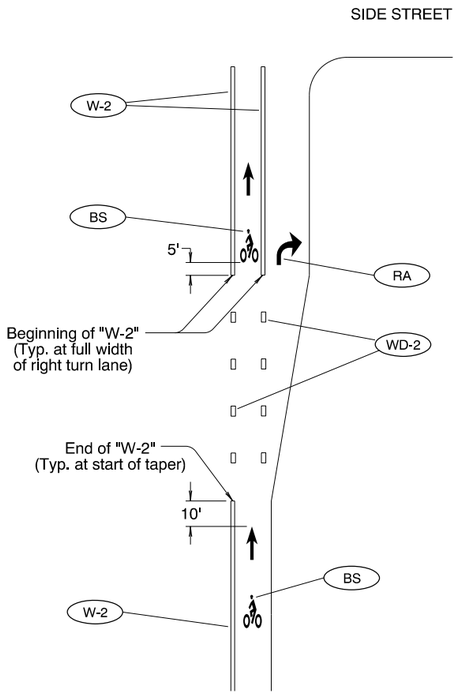
* Stop bar shall be placed as near as possible to the intersecting traveled way. Locate stop bar 4' min. to 30' max. in advance of the extended fog line, edge of pavement, or curb face. Minimum stop bar distance may need to be increased, depending on location of pedestrian ramps (see Detail "A") and/or vehicle turn radii (see Detail "B"). Field verify sight distance and truck turning movements.



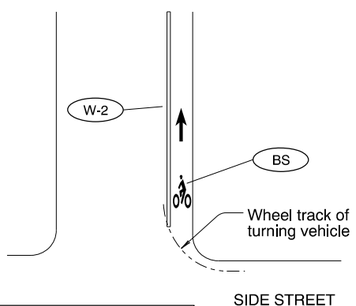
Detail "A"
STOP BAR PLACEMENT WITH
RESPECT TO PEDESTRIAN RAMPS



Detail "B"
STOP BAR PLACEMENT WITH
RESPECT TO TURN RADII



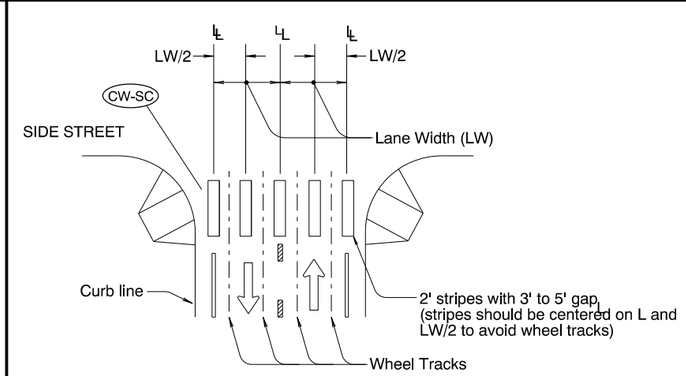
INSTALLATION OF BIKE LANE STENCILS
FOR BIKE LANE SEPARATED BY RIGHT TURN LANE



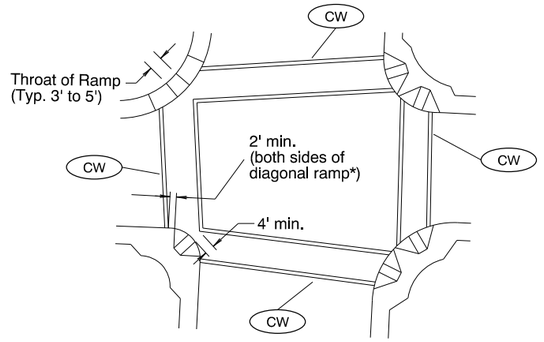
General Note:

Install bike lane stencil to avoid right turning vehicle wheel tracks.

INSTALLATION OF BIKE LANE STENCILS
FOLLOWING INTERSECTIONS



STAGGERED CONTINENTAL LAYOUT



STANDARD CROSSWALK BARS
AT INTERSECTION

* = Refer to Std Dwg RD916

General Note:

1. Install crosswalk bars such that the throat of the ADA ramp is entirely within crosswalk markings, or 5' back of extended fog line, edge of pavement, or curb face.

LEGEND

⇦ Direction of Travel

L - Lane line dimensions are shown on the striping plans

To be accompanied by Standard Dwg. Nos. TM500 thru TM504

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

INTERSECTION PAVEMENT MARKINGS (CROSSWALK, STOP BAR & BIKE LANE STENCIL)

2024

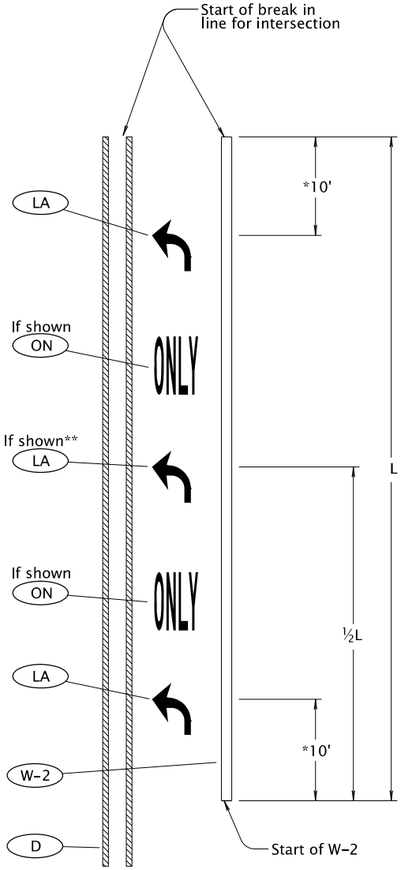
DATE	REVISION DESCRIPTION
07-2022	Added Roadway Standard Drawing reference to detail for clarity

CALC. BOOK NO. N/A | SDR DATE 06-JUL-2022 | **TM530**

06-JUL-2022

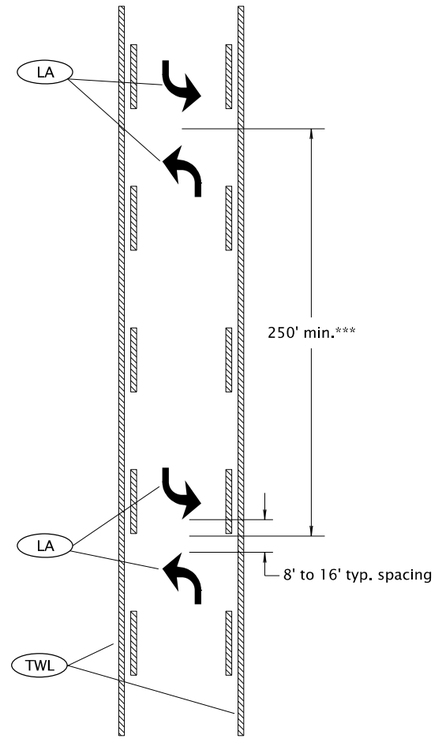
TM530.dgn

Effective Date: June 1, 2024 - November 30, 2024



LANE USE ARROW PLACEMENT FOR TURN LANE

DETAIL "A"



TWO-WAY LEFT TURN LANE ARROW PLACEMENT

DETAIL "B"

General Notes:

1) Center pavement marking legends within the lane.

2) Placement of lane use arrows with respect to the 8" wide white line (W-2) channelization shown in Detail "A" applies to both left and right turn lanes.

3) Center "ONLY" markings between lane use arrows.

* 15' when installing elongated arrows.

** When L is greater than 400', install 3rd lane use arrow at ½ L as shown in Detail "A".

*** Double arrows to be placed at even intervals, proportioned within block or as shown.

To be accompanied by Standard Dwg. Nos. TM500 thru TM504

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

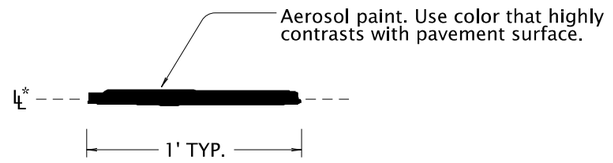
TURN ARROW MARKING DETAILS

2024

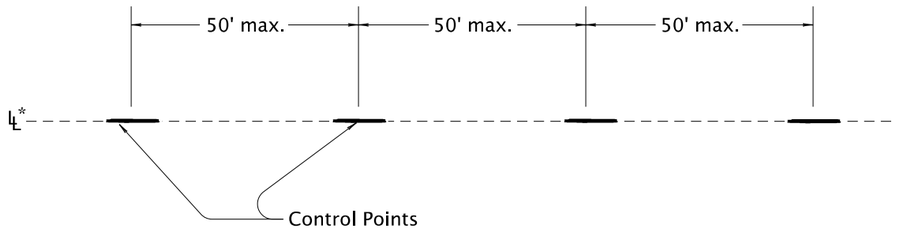
DATE	REVISION DESCRIPTION
07-2020	Extended accompanied by drawings to include TM504

CALC. BOOK NO. N/A | SDR DATE 07-01-2020 | **TM531**

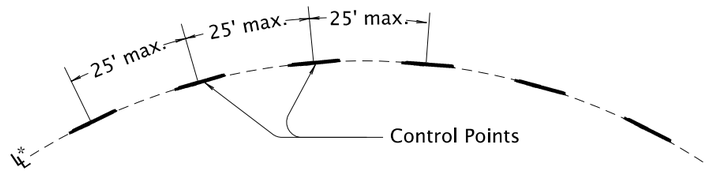
Effective Date: June 1, 2024 - November 30, 2024



CONTROL POINT



CONTROL POINT LAYOUT - TANGENT SECTIONS



CONTROL POINT LAYOUT - CURVE SECTIONS

General note:

1.) Use control points to make continous narrow guideline as specified.

* Control points are placed along the lane line for all longitudinal lines except the following:

ND For center lines only	A control point layout 4" offset from the lane line is required for a ND line when used as a center line.

LEGEND

℄ — Lane line dimensions are shown on the striping plans.

To be accompanied by Standard Dwg. Nos. TM500 thru TM504

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

ALIGNMENT LAYOUT: GENERAL

2024

DATE	REVISION DESCRIPTION
07-2020	Extended accompanied by drawings to include TM504

CALC. BOOK NO. N/A | SDR DATE 07-01-2020 | **TM560**

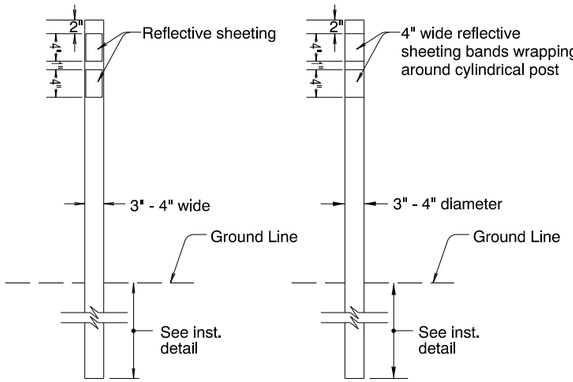
Effective Date: June 1, 2024 - November 30, 2024

07-01-2020

TM560.dgn

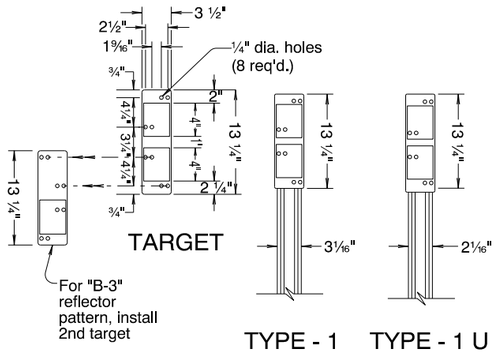
06-JAN-2012

TM570.dgn



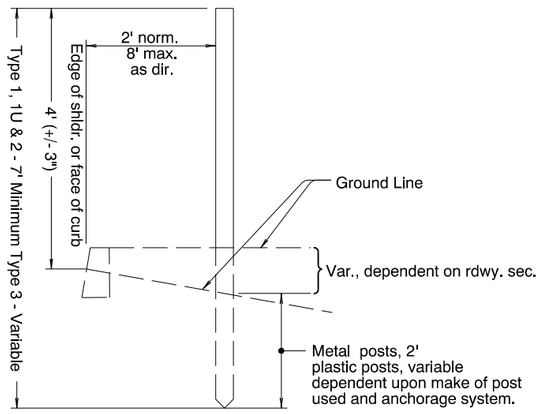
TYPE - 2 TYPE - 3

FLEXIBLE PLASTIC POSTS

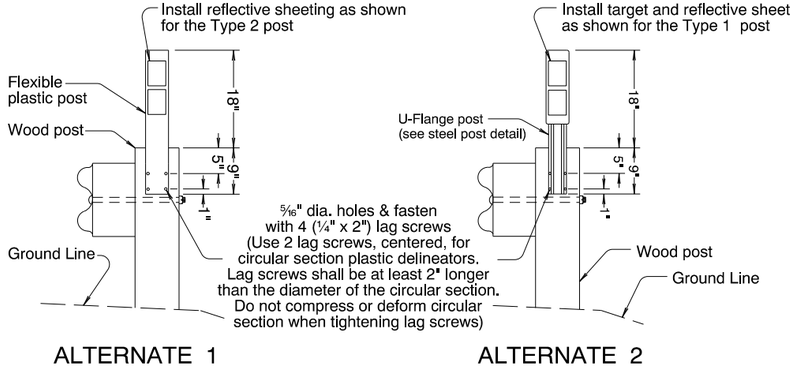


TARGET TYPE - 1 TYPE - 1 U

STEEL POSTS



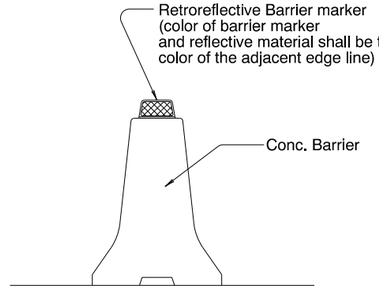
INSTALLATION DETAIL



ALTERNATE 1 ALTERNATE 2

TYPE - 4

GUARDRAIL AREAS (WITH WOOD POSTS)



TYPE - 5

CONCRETE BARRIER AREAS

(Install barrier markers at 50' spacing unless otherwise noted in plans)

NOTES:

POST:
Galv. steel, nominal weight Type 1, 2 lb/ft, Type 1 U, 1.12 lb/ft.

See Standard Drawing TM571 for steel post dimensions and details.

TARGET:
Aluminum sheet, nominal thickness .050". Fasten to post with⅜" dia. aluminum blind rivets and washers.

For "B-3" reflector pattern, top target shall overlap bottom target.

REFLECTORS:
3" x 4" reflective sheeting unless otherwise shown.
(3½" x 4" reflective sheeting is an acceptable alternate unless otherwise shown.)
Acrylic prismatic reflectors acceptable on Type 1, 1 U, 2 and 4 posts and Type 5 barrier mounts.
Place required number in sequence from top of target.

GENERAL NOTES:

1. Spacing shall be measured along the shoulder.
2. On roads with less than 500 vehicle ADT, delineators are not to be used except where situations such as sharp horizontal curves, etc. exist.
3. To clear driveways, crossroads etc., or for required adjustments at ramps and at intersections, either:
   (a) vary placement of that post up to 25% of spacing shown, or;
   (b) eliminate said post if limit of variation must be exceeded.
4. Judgement should be exercised in the installation of delineators in cut section, particularly on roads constructed to older standards where ditches are narrow and where delineators tend to hamper maintenance operations.
5. On horizontal curves place delineators nearly opposite each other.
6. At guard rail locations the delineators are to be installed behind the rail and shall be located adjacent to guard rail posts as shown for Type 4 Delineators.
7. Install all delineators with reflectors facing adjacent oncoming traffic.
8. Offset delineators an additional 4' in areas of heavy snow removal operations.
9. Backside Delineators may be used in frequently snow plowed areas where use of snow poles is not justified. When Backside Delineators are specified, substitute "W-1" and "W-2" with "W-1B" and "W-2B" respectively, on Type 1 steel posts. Do not install Backside Delineators on one-way sections of roadway, freeways and ramps, or on radius sections.
10. Refer to TM 222 for bracket assembly details for Backside Reflector Pattern.

REFLECTOR PATTERN TABLE					
	Color Type	Color Of Reflector And Target Or Post	Number Of Reflectors	Color Of Reflector And Target Or Post On Backside	Number Of Reflectors On Backside
Standard Pattern	"W-1"	White	1	Not Applicable	Not Applicable
	"W-2"	White	2		
	"Y-1"	Yellow	1		
	"Y-2"	Yellow	2		
	"B-1"	Blue	1		
	"B-2"	Blue	2		
	"B-3"	Blue	3		
	"R-1"	Red	1		
Backside Pattern	"W-1B"	White	1	White	2
	"W-2B"	White	2	White	2

TANGENT	HORIZONTAL CURVES				
▲MAX. SPACING EACH SIDE OF ROADWAY IN FEET	▲ MAX. SPACING EACH SIDE OF ROADWAY IN FEET				
	DEGREE OF CURVE	ON CURVE	IN ADVANCE OF & BEYOND CURVE		
			FIRST SPACE	SECOND SPACE	THIRD SPACE
400	Lower Than 1	300	300	300	300
	1	230	300	300	300
	2	160	300	300	300
	3	130	260	300	300
	4	110	220	300	300
	5	100	200	300	300
	6	90	180	270	300
	7 - 8	80	160	240	300
	9 - 11	70	140	210	300
	12 - 16	60	120	180	300
	17 - 22	50	100	150	300
	23 - 34	40	80	120	240
	35 - 53	30	60	90	180
	54 & Higher	20	40	60	120

(Min. spacing 20 feet)

(▲Install "W-1" reflective pattern unless otherwise noted. See Standard Drawings TM575 thru TM577 for spacing, layout, and reflective pattern of delineators at interchange ramps, channelized intersections, lane reductions, emergency escape ramps and freeway crossovers.)

DELINEATOR SPACING TABLE FOR TYPES 1, 1U, 2, and 4

To be accompanied by Drg. No. TM571, TM575, TM576, and/or TM577 as specified.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

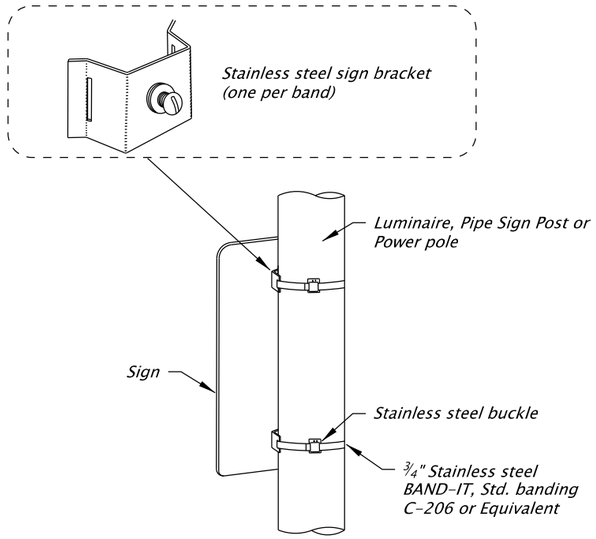
TRAFFIC DELINEATORS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 06-JAN-2012 | **TM570**

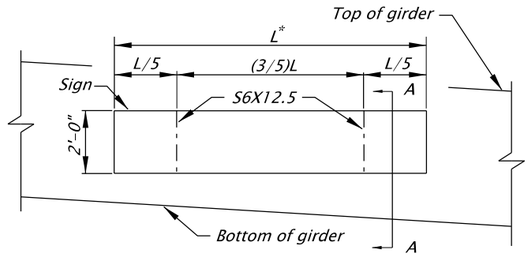
Effective Date: June 1, 2024 - November 30, 2024



Signs mounted to vertical posts that use stainless steel clamps shall not be wider than 36". Use 2 clamps for all signs less than 48" in height and 3 clamps for signs 48" to 60" in height.

STAINLESS STEEL CLAMP (SSC) DETAIL

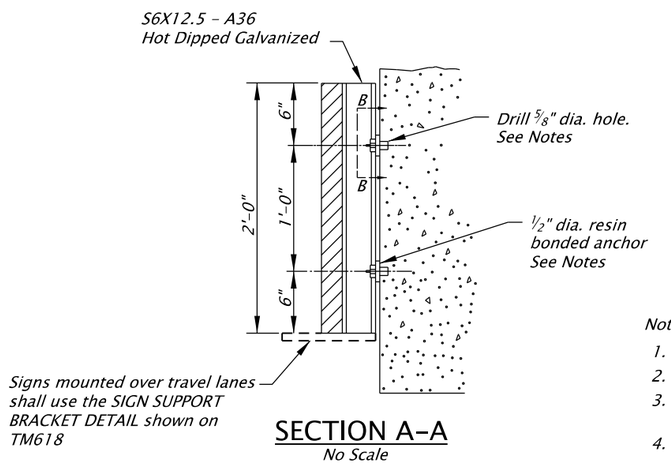
No Scale



** - L maximum is 14'-0".*

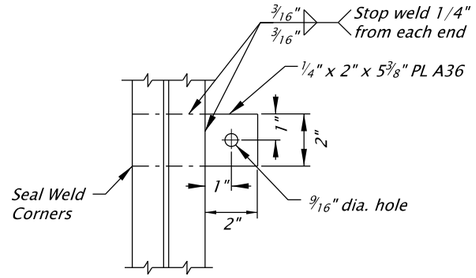
SIGN ELEVATION

No Scale



SECTION A-A

No Scale



SECTION B-B

No Scale

Notes:

1. *Install resin bonded anchors according to Section 00535.*
2. *Resin bonded anchors shall conform to ASTM A307.*
3. *The hole depths shall develop the pullout strength specified in Table 00535-1.*
4. *Tighten 1/2" dia. anchors using 16 ft-lb of torque for waxed galvanized and 40 ft-lb of torque for galvanized only connections.*

ROAD NAME SIGN STRUCTURE MOUNT DETAIL

GENERAL NOTES

1. *For Secondary Sign Mounts See TM678.*

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

SIGN MOUNTS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 06-JUL-2015 | **TM677**

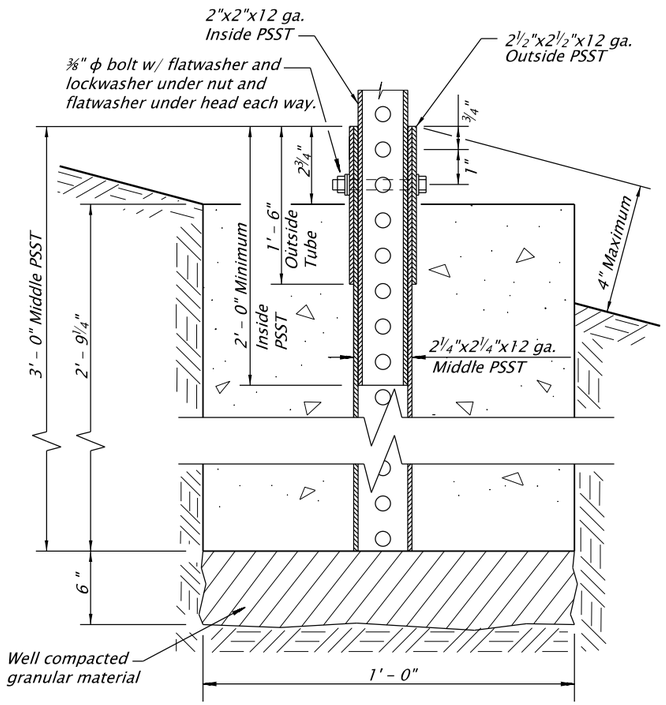
10-JUL-2020

TM677.dgn

Effective Date: June 1, 2024 - November 30, 2024

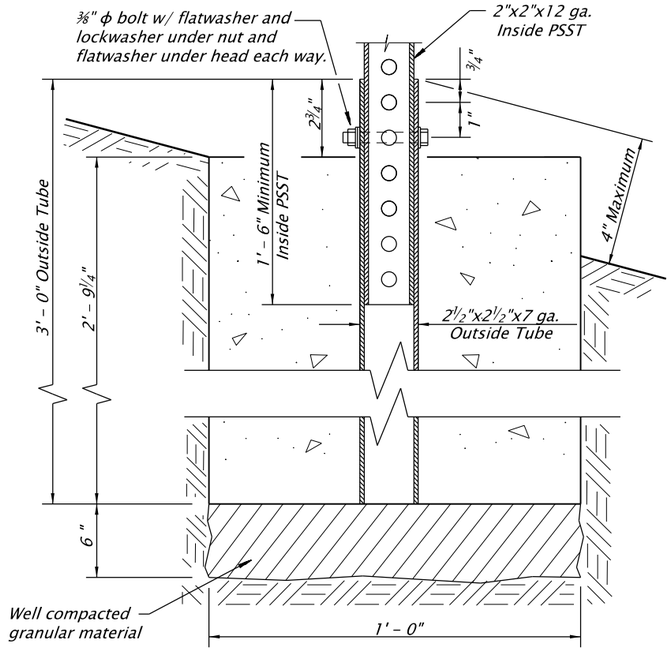
10-JUL-2020

TM687.dgn



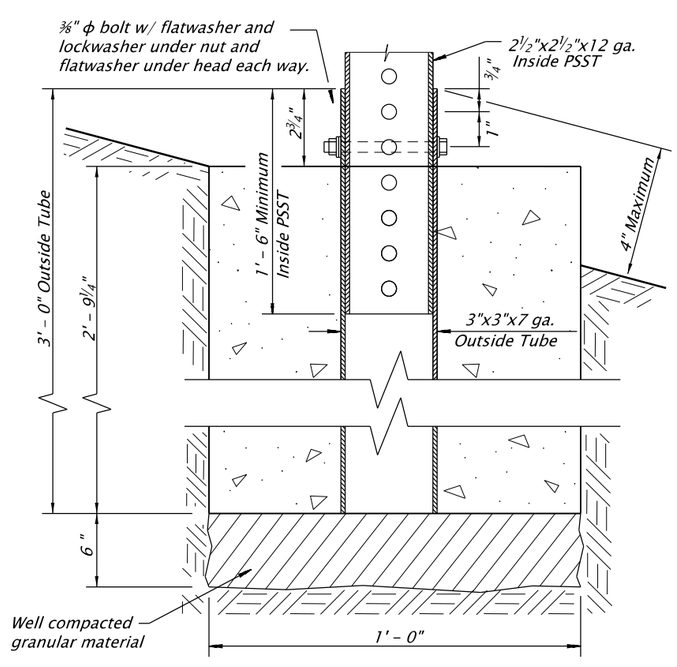
2" ANCHOR DETAIL

No scale



2" OPTIONAL ANCHOR DETAIL

No scale

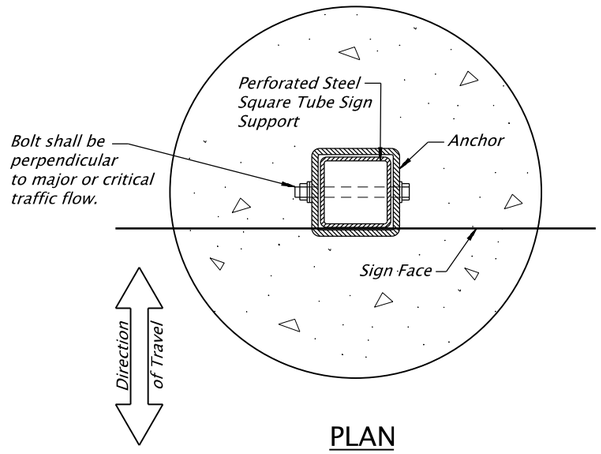


2½" ANCHOR DETAIL

No scale

General Notes:

1. *Material grade for base hardware connection shall be according to the manufacturer's recommendation and based on crash testing.*
2. *Anchor steel shall be hot dipped galvanized or approved equal.*
3. *Footing concrete shall be Commercial Grade Concrete (fc = 3000 psi) per Specification 00440. The CGC mixture may be accepted at the site of placement according to 00440.14.*
4. *The estimated concrete volume is .09 cubic yards.*



PLAN

No scale

Accompanied by dwgs. TM681, TM688

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PERFORATED STEEL SQUARE TUBE (PSST) ANCHOR FOUNDATION

2024

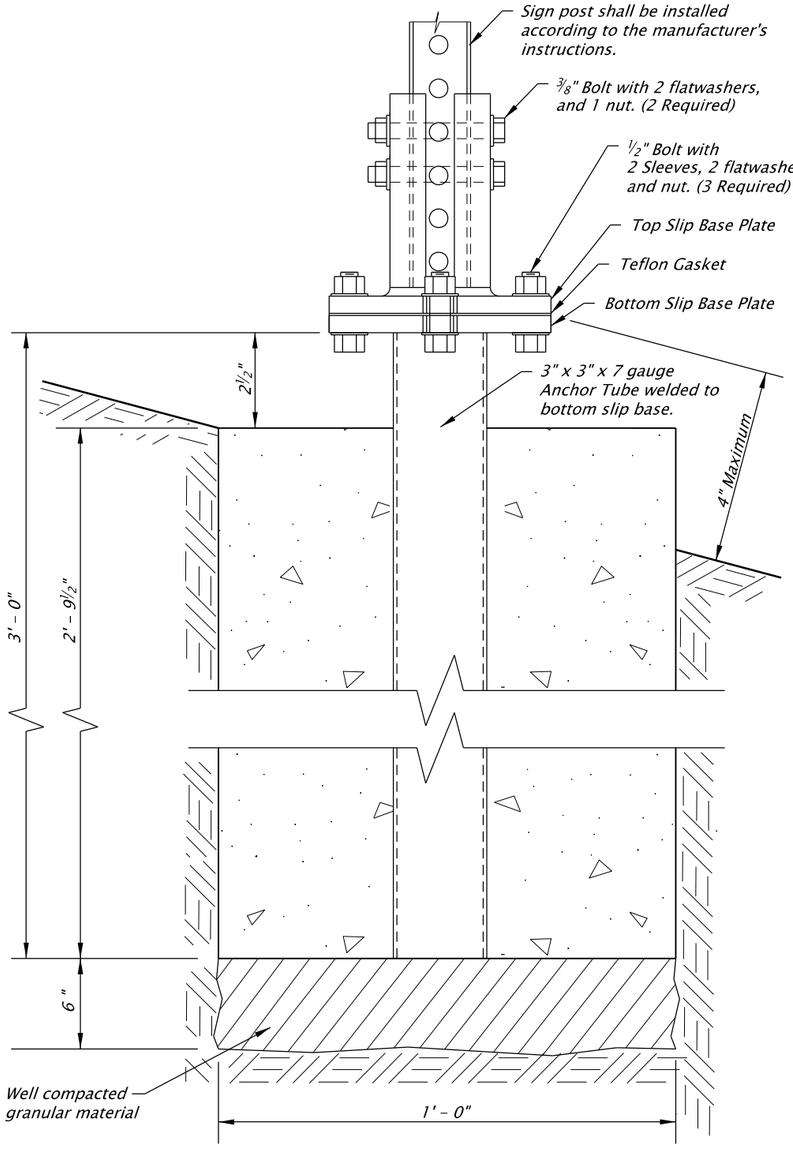
DATE	REVISION DESCRIPTION

CALC. BOOK NO. 5752 | SDR DATE 06-JAN-2012 | **TM687**

Effective Date: June 1, 2024 - November 30, 2024

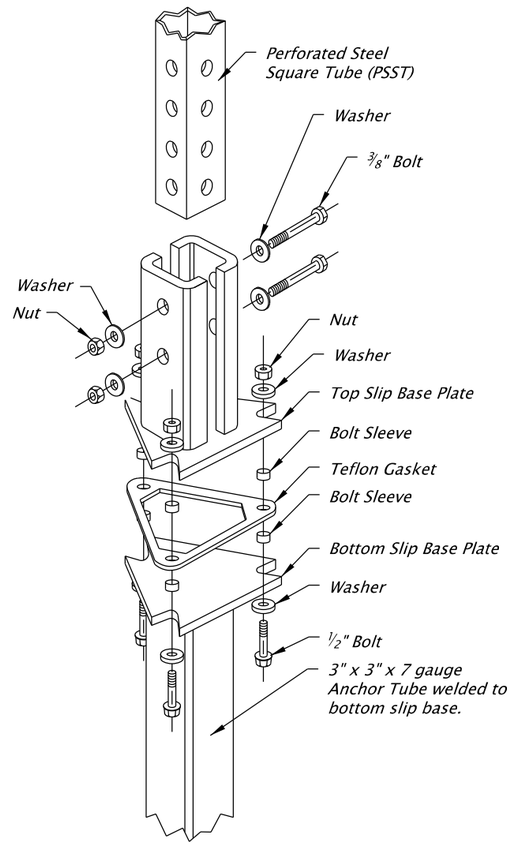
10-JUL-2020

TM688.dgn



SLIP BASE ELEVATION

No scale

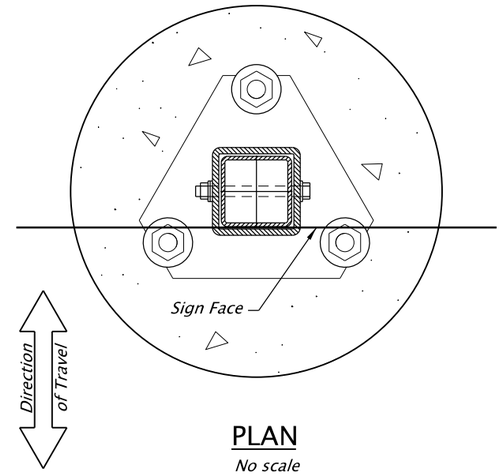


SLIP BASE EXPLODED VIEW

No scale

General Notes:

1. *Material grade for base hardware connection shall be according to the manufacturer's recommendation and based on crash testing.*
2. *Slip base steel shall be hot dipped galvanized or approved equal.*
3. *Footing concrete shall be Commercial Grade Concrete (fc = 3000 psi) per Specification 00440. The CGC mixture may be accepted at the site of placement according to 00440.14.*
4. *Material grade for base hardware connection shall be according to the manufacturer's recommendation and based on crash testing.*
5. *All slip bases shall be pre-assembled by the manufacturer and shall be installed according to the manufacturer's instructions.*
6. *Use slip bases listed on the ODOT Qualified products list or submit crash testing data, installation instructions, and unstamped working drawings according to 00150.35.*
7. *Slip base details shown are not for a specific manufacturer and are only shown to convey general pieces of a slip base system. Specific slip base material will be acccording to the manufacturer's documentation.*



PLAN

No scale

Accompanied by dwgs. TM681, TM687

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

PERFORATED STEEL SQUARE TUBE (PSST) SLIP BASE FOUNDATION

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. 5752 | SDR DATE 06-JAN-2012 | **TM688**

Effective Date: June 1, 2024 - November 30, 2024

01-JUL-2022

TM800.dgn

TAPER TYPES & FORMULAS	
TAPER	FORMULA
Merging (Lane Closure)	"L"
Shifting	"L"/2 or ½"L"
Shoulder Closure	"L"/3 or ⅓"L"
Flagging (See Drg. TM850)	50' – 100'
Downstream (Termination)	Varies (See Drawings)

★ Use Pre-Construction Posted Speed to select the Speed from the Tables below:

TEMPORARY BARRIER FLARE RATE TABLE	
★SPEED (mph)	MINIMUM FLARE RATE
≤ 30	8:1
35	9:1
40	10:1
45	12:1
50	14:1
55	16:1
60	18:1
65	19:1
70	20:1

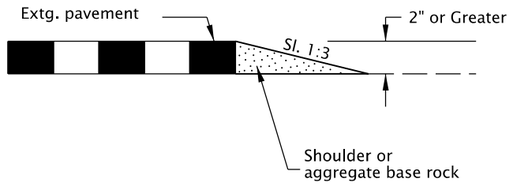
MINIMUM LENGTHS TABLE					
"L" VALUE FOR TAPERS (ft)					BUFFER "B" (ft)
★ SPEED (mph)	W = Lane or Shoulder Width being closed or shifted				
	W ≤ 10	W = 12	W = 14	W = 16	
25	105	125	145	165	75
30	150	180	210	240	100
35	205	245	285	325	125
40	265	320	375	430	150
45	450	540	630	720	180
50	500	600	700	800	210
55	550	660	770	880	250
60	600	720	840	960	285
65	650	780	910	1000	325
70	700	840	980	1000	365
FREEWAYS					
55	1000	1000	1000	1000	250
60	1000	1000	1000	1000	285
65	1000	1000	1000	1000	325
70	1000	1000	1000	1000	365

NOTES:
- For Lane closures where W < 10', use "L" value for W = 10'.
- For Shoulder closures where W < 10', use "L" value for W = 10' or calculate "L" using formula, for Speeds ≥ 45: L = WS, Speeds < 45: L = $S^2W/60$, S = Speed, W=Width

TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE				
★ SPEED (mph)	Sign Spacing (ft)			Max. Channelizing Device Spacing (ft)
	A	B	C	
20 – 30	100	100	100	20
35 – 40	350	350	350	20
45 – 55	500	500	500	40
60 – 70	700	700	700	40
Freeway	1000	1500	2640	40

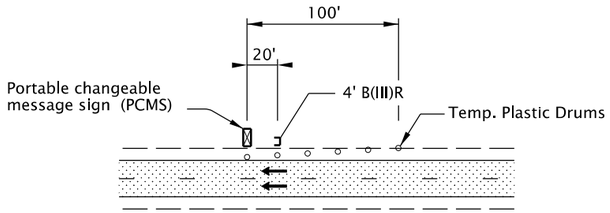
NOTES:
- Place traffic control devices on 10 ft. spacing for intersection and access radii.
- When necessary, sign spacing may be adjusted to fit site conditions. Limit spacing adjustments to 30% of the "A" dimension for all speeds.

NOTES:
- When paved shoulders adjacent to excavations are less than four feet wide protect longitudinal abrupt edge as shown.
- Use aggregate wedge when abrupt edge is 2 inches or greater.



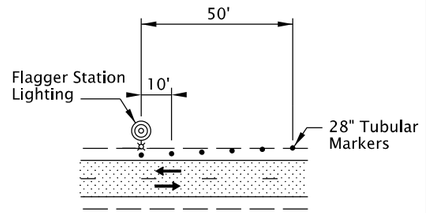
EXCAVATION ABRUPT EDGE

NOTES:
- Install PCMS beyond the outside shoulder, when possible.
- Use the appropriate type of barricade panels for PCMS location. Right shoulder, use Type B(III)R Left shoulder, use Type B(III)L
- Use six drums in shoulder taper on 20' spacing. The drums and barricade may be omitted when PCMS is placed behind a roadside barrier.
- Detail as shown is used for trailered and non-crashworthy components of:
  - Portable Traffic Signals
  - Smart Work Zone Systems



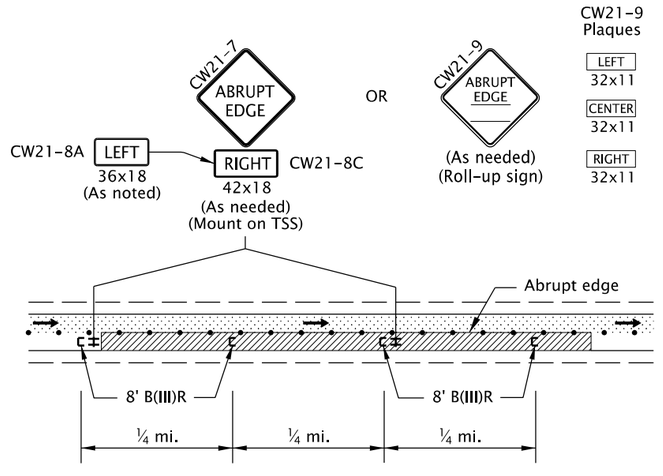
PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) INSTALLATION

NOTES:
- Install Flagger Station Lighting beyond the outside shoulder, where practical.
- Use six tubular markers in shoulder taper on 10' spacing.
- Place cart / generator / power supply off of the shoulder, as far as practical.



FLAGGER STATION LIGHTING DELINEATION

NOTES:
- Abrupt edges may be created by paving, operations, excavations or other roadway work. Use abrupt edge signing for longitudinal abrupt edges of 1 inch or greater.
- If the excavation is located on left side of traffic, replace the 8' B(III)R barricades with 8' B(III)L barricades and replace the "RIGHT" (CW21-8C) riders with "LEFT" (CW21-8A) riders.
- Continue signing and other traffic control devices throughout excavation area at spacings shown.
- If roll-up signs are used, attach the correct (CW21-9) plaques to the sign face using hook and loop fasteners. Place roll-up signs in advance of barricades.



TYPICAL ABRUPT EDGE DELINEATION

GENERAL NOTES FOR ALL TCP DRAWINGS:
- Signs and other Traffic Control Devices (TCD) shown are the minimum required.
- Place a barricade approx. 20' ahead of all sequential arrow boards.
- Arrows shown in roadway are directional arrows to indicate traffic movements.
- All signs are 48" x 48" unless otherwise shown. Use fluorescent orange sheeting for the background of all temporary warning signs.
- All diamond shaped warning signs mounted on barrier sign supports shall be 36" by 36". All other signs mounted on barrier sign supports shall not exceed 12 sq. ft. in total sign area.
- Low speed highways have a pre-construction posted speed of 40 mph or less. High speed highways have a pre-construction posted speed of 45 mph or higher.
- Do not locate sign supports in locations designated for bicycle or pedestrian traffic.
- Combine drawing details to complete temporary traffic control for each work activity.
- Coordinate and control pedestrian movements through a Temporary Accessible Route using Flaggers, Traffic Control Measures, or as directed.
- To be accompanied by Dwg. Nos. TM820 & TM821.

○ ○ ○ Temp. Plastic Drums See TCD Spacing Table for max. spacing.

• • • 28" Tubular Markers See TCD Spacing Table for max. spacing.

UNDER TRAFFIC

UNDER CONSTRUCTION

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

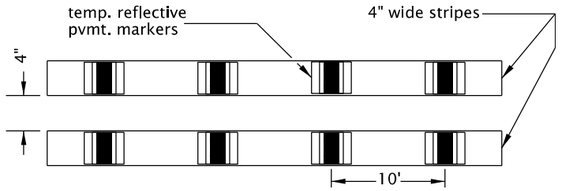
TABLES, ABRUPT EDGE AND PCMS DETAILS

2024

DATE	REVISION DESCRIPTION
07-2022	Added a note for TPARs

CALC. BOOK NO. N/A | SDR DATE 01-JUL-2022 | **TM800**

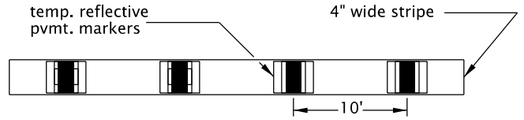
Effective Date: June 1, 2024 – November 30, 2024



LAYOUT "A"
(Supplemented double solid lines)

TYPICAL APPLICATIONS:

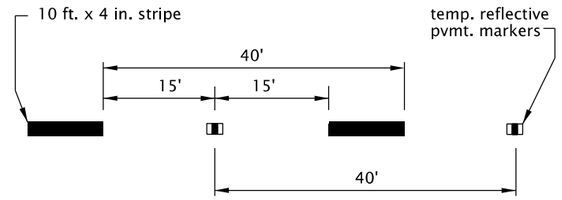
- To prohibit lane changes or passing (include appropriate regulatory signs).
- Freeway or multilane shifts and crossovers.
- For projects in place through winter months.
- Two-lane, two-way centerlines.



LAYOUT "B"
(Supplemented solid line)

TYPICAL APPLICATIONS:

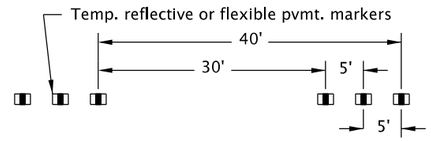
- Alignment shifts or crossovers.
- To discourage lane changes in multilane sections.
- For projects in place through winter months.



LAYOUT "C"
(Supplemented broken lines)

TYPICAL APPLICATIONS:

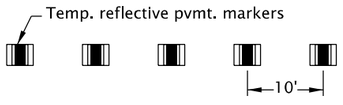
- Freeway and multilane broken lines.
- High ADT 2 lane roads (greater than 10,000).
- For projects in place through winter months.



LAYOUT "D"
(Simulated broken lines)

TYPICAL APPLICATIONS:

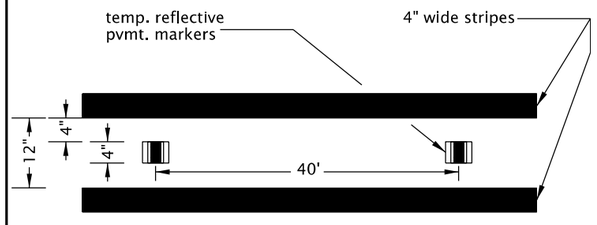
- During staging on finished/existing surfaces.
- HMAC intermediate surfaces.
- Emulsified asphalt surface treatments (chip seals) where permanent pavement markings cannot be placed within two weeks.



LAYOUT "E"
(Simulated Solid Lines)

TYPICAL APPLICATIONS:

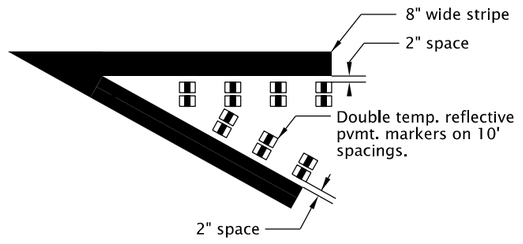
- Alignment shifts or crossovers.
- To discourage lane changes in multilane sections.
- Edge lines for short durations, less than 14 days.



LAYOUT "F"
(Supplemented wide double solid lines)

TYPICAL APPLICATIONS:

- To prohibit lane changes or passing (include appropriate regulatory signs).
- 2 lane, 2 way centerlines.
- 2 lane, 1 way alignments on freeways or multi-lane highways.



LAYOUT "G"
(Supplemented solid 8" line)

TYPICAL APPLICATIONS:

- Gore areas
- Alignment splits (bifurcations)

GENERAL NOTES FOR ALL DETAILS:

- When using Supplemented or Simulated lines:
  1. Yellow Bi-Directional Pavement Markers are required for Two-Way Traffic.
  2. White Mono-Directional Pavement Markers are required for one-way traffic or edge lines.
- Supplemented lines are painted lines enhanced with Reflective Pavement Markers.
- Simulated lines are Reflective Pavement Markers placed in a pattern to substitute for a painted line.
- Pavement marking colors shall conform to the MUTCD.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

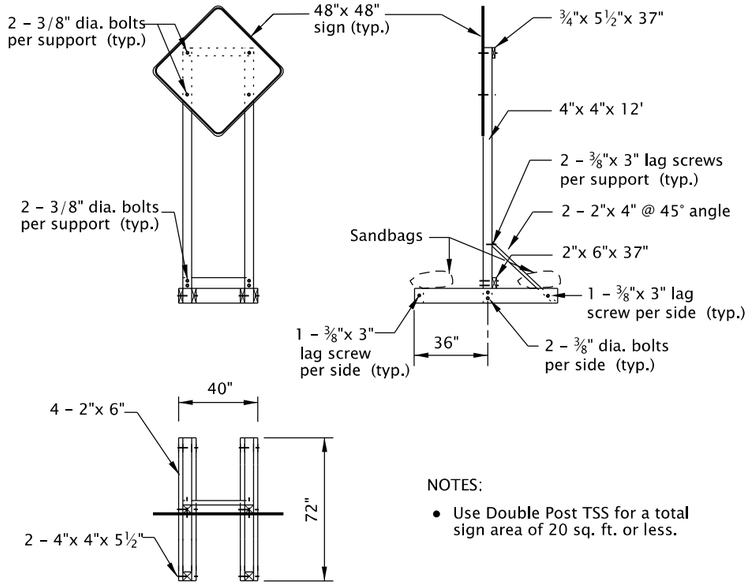
TEMPORARY PAVEMENT MARKINGS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 01-JUL-2020 | **TM810**

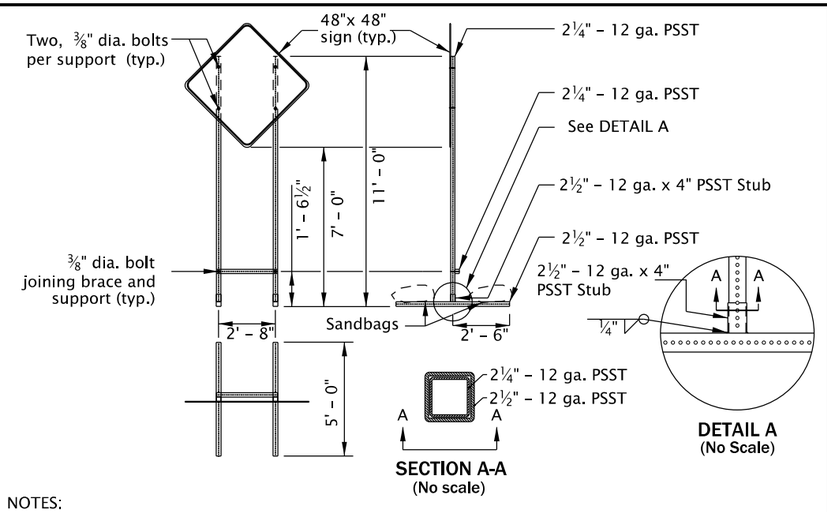
Effective Date: June 1, 2024 - November 30, 2024



NOTES:

- Use Double Post TSS for a total sign area of 20 sq. ft. or less.

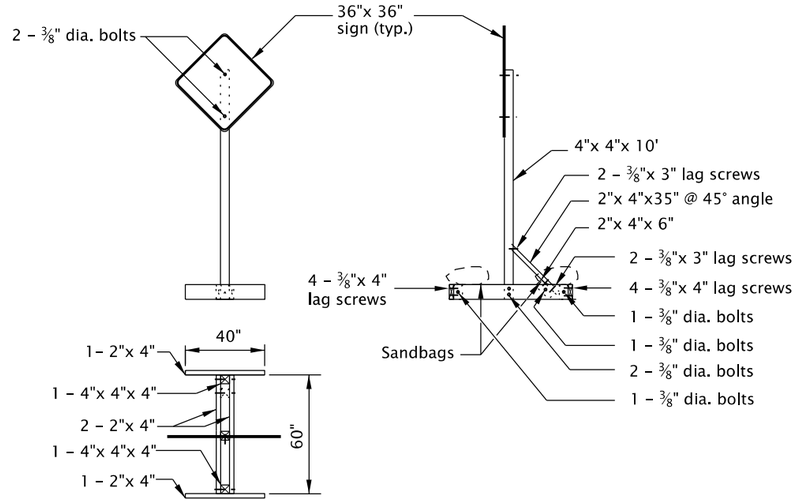
DOUBLE POST DETAIL



NOTES:

- Use PSST TSS's for a total sign area of 16 sq. ft. or less.
- All members shall have a minimum yield stress of 50 ksi.
- Galvanize steel according to ASTM A653 with coating designation G90. Remove Galvanizing from steel before welding. Repair Galvanizing according to ASTM A780.
- Use A325 Bolts or equivalent.
- 2¼" - 12 ga. PSST to extend entire length inside of the 2½" - 12 ga. x 4" PSST Stub.
- Do not use bolt to secure 2¼" PSST inside of the 2½" - 12 ga. x 4" PSST Stub.
- Weld steel according to American Welding Society (AWS) D.1.1.

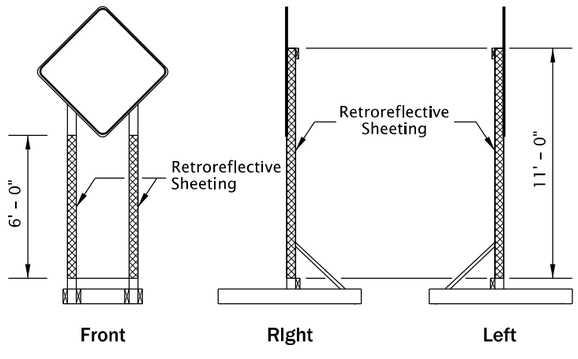
PERFORATED STEEL SQUARE TUBE (PSST) DETAIL



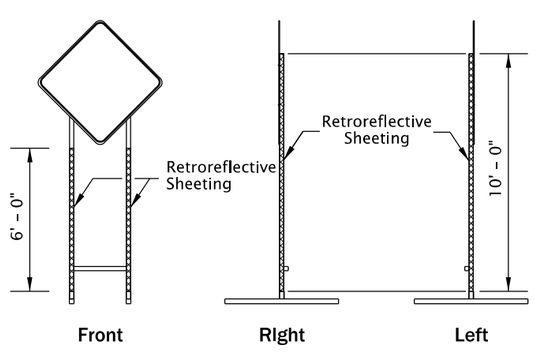
NOTES:

- Use Single Post TSS for a total sign area of 12 sq. ft. or less.
- Use Single Post TSS for mounting "Business Access" (CG20-11) signs. Do not mount signs on Type II or III Barricades.

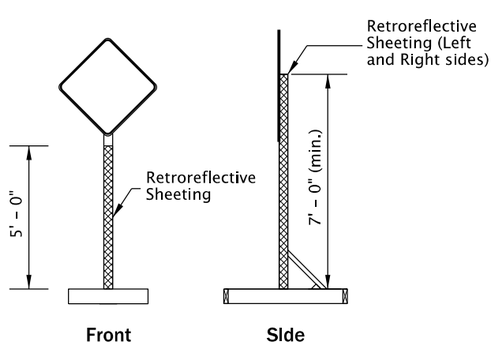
SINGLE POST DETAIL



Double Post



Perforated Steel Square Tube (PSST)



Single Post

NOTES:

- Apply fluorescent orange, ANSI Type VIII or IX retroreflective sheeting to TSS posts, as shown, for all temporary signs, except "STOP" and "DO NOT ENTER". For "STOP" and "DO NOT ENTER" signs, used red ANSI Type III or IV retroreflective sheeting on the TSS posts.
- Apply sign post retroreflectivity to each TSS post facing front; and to the left and right sides of the TSS, as shown. Use 3" wide sheeting for wood post TSS's. Use 2" wide sheeting for PSST TSS's.
- Sheeting may be applied directly to post material; or applied to a rigid, lightweight substrate, then securely attached to the posts.

SIGN POST REFLECTIVE SHEETING PLACEMENT

TEMPORARY SIGN SUPPORT GENERAL NOTES:

- Do not tip over TSS at any time.
- Do not locate TSS's in locations that block pedestrian or bicycle traffic.
- For wooden TSS's, use either Douglas Fir or Hem Fir, which is surfaced four sides (S4S) and free of heart center (FOHC).
- See "Temporary Sign Placement" detail on TM822 for sign installation heights.
- Do not place or stack ballast more than 24" above the ground.
- When not in use, locate TSS as far from Public Traffic as practicable and turn away from traffic, or cover the sign. Do not cover reflective sheeting on the TSS posts.
- Place a minimum of 50 lbs of sandbags on each of the four TSS supports legs. (25 lb. max per bag) (min. 100 lbs per side of each TSS).
- See Dwg. No. TM204 for flag board mounting detail.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TEMPORARY SIGN SUPPORTS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 14-JUL-2023 | TM821

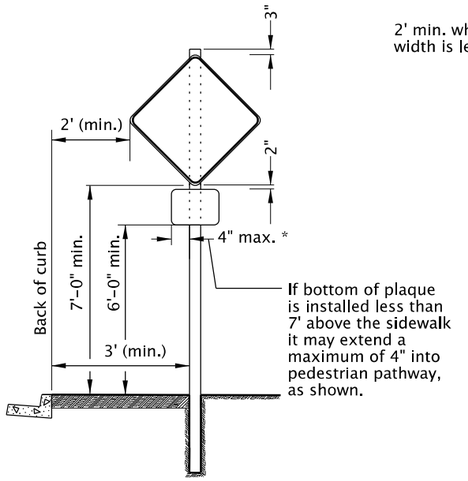
Effective Date: June 1, 2024 – November 30, 2024

14-JUL-2023

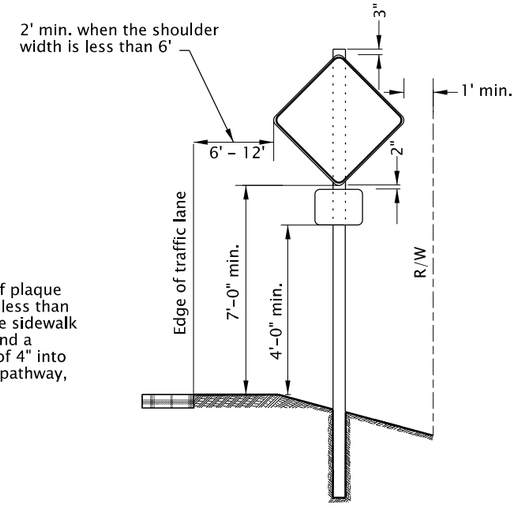
TM821.dgn

NOTES:

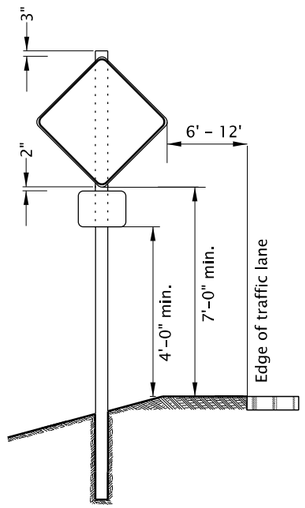
- Do not block bicycle lanes, sidewalks, or TPAR's with sign supports. Maintain minimum widths for these facilities according TCP Design Manual, MUTCD, ADA, or as directed.
- To be accompanied by Dwg. Nos. TM670, TM671, TM687, TM688 & TM689.



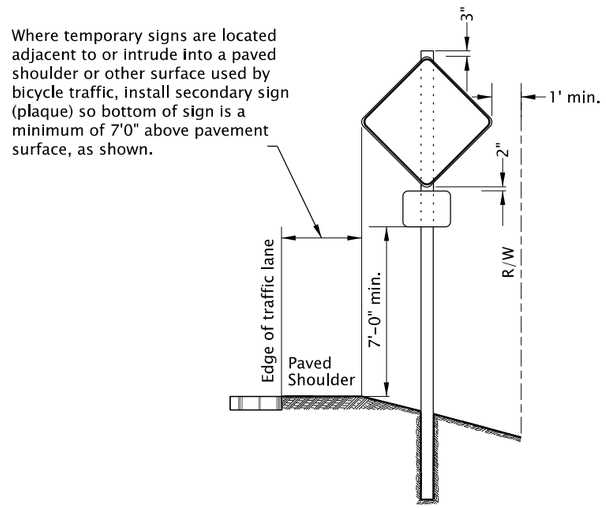
Urban Areas With Curb/Sidewalk



Rural Areas

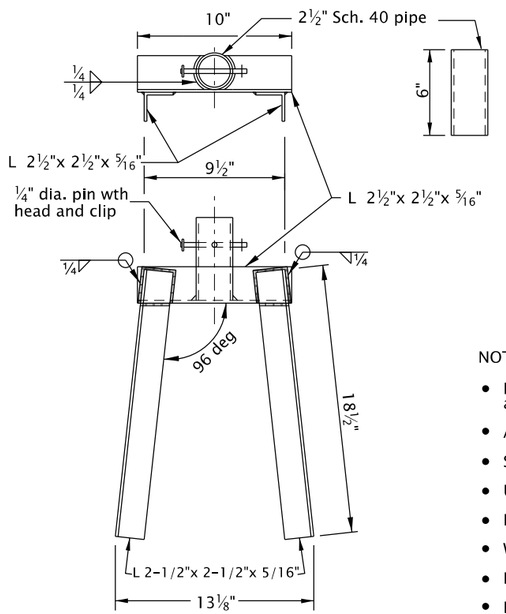


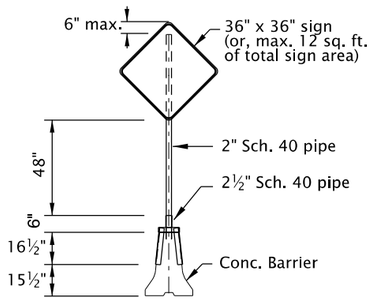
Divided Highway/Freeway Medians
No Curb/Sidewalk



Rural or Urban Areas - Curb or No Curb
Bicycles On Shoulder

TEMPORARY SIGN PLACEMENT





NOTES:

- Drill additional holes so sign can be rotated 90 degrees and pinned when not in use.
- All structural steel shall conform to ASTM A36.
- Support fits both 32" and 42" tall "F" barrier.
- Use for supporting a maximum 12 sq. ft. of total sign area.
- Place support at connection between two concrete barrier sections.
- Weld steel according to American Welding Society (AWS) D.1.1.
- Do not use clipped signs.
- Follow manufacturer recommendation when installing signs on barrier other than concrete.

CONCRETE BARRIER SIGN SUPPORT

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TEMPORARY SIGN SUPPORTS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 01-JUL-2020 | **TM822**

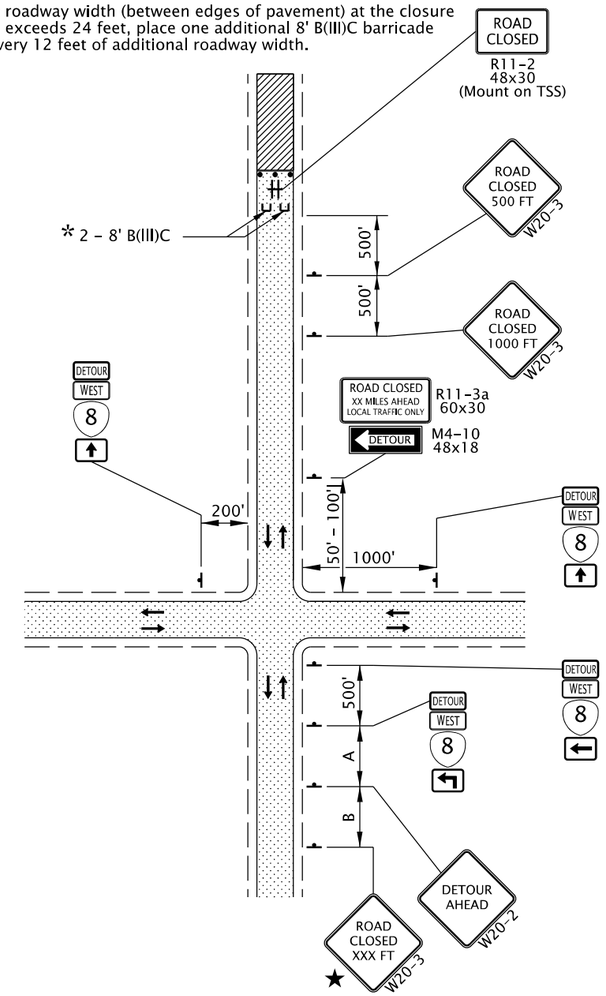
01-JUL-2020

TM822.dgn

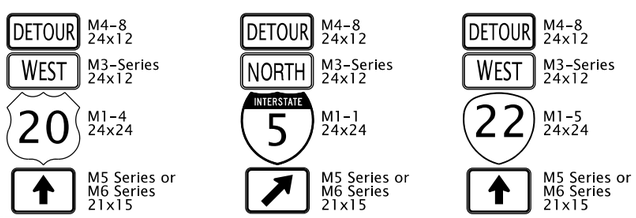
Effective Date: June 1, 2024 - November 30, 2024

NOTES:
If closure point is less than 1500 ft. from nearest intersection, use a "ROAD CLOSED TO THRU TRAFFIC" (R11-4)sign in place of the "ROAD CLOSED XX MILES AHEAD" sign.

* If the roadway width (between edges of pavement) at the closure point exceeds 24 feet, place one additional 8' B(III)C barricade for every 12 feet of additional roadway width.

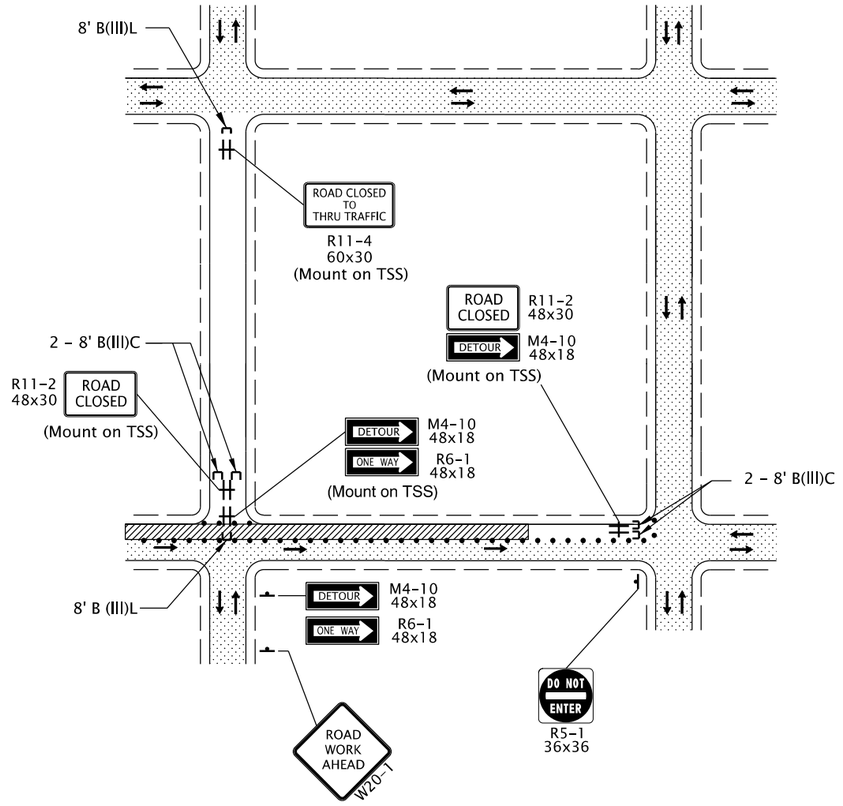


TYPICAL ROAD CLOSURE WITH DETOUR



NOTE:
- When detour routes overlap, each Route Shield will include a seperate cardinal direction, detour, and directional arrow auxiliary sign assembly.

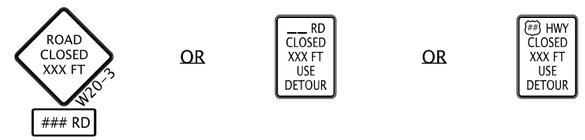
TYPICAL TRAILBLAZER ASSEMBLY



TYPICAL PARTIAL ROAD CLOSURE

GENERAL NOTES FOR ALL DETAILS:

★ A "Street Name" rider may be used to enhance Road Closure signing; or provide a project specific design; or, as shown in the traffic control plan.



##x18 Rider
Rider width to be determined by width of street name.

48 x 60 (nom.)
Project Specific Design

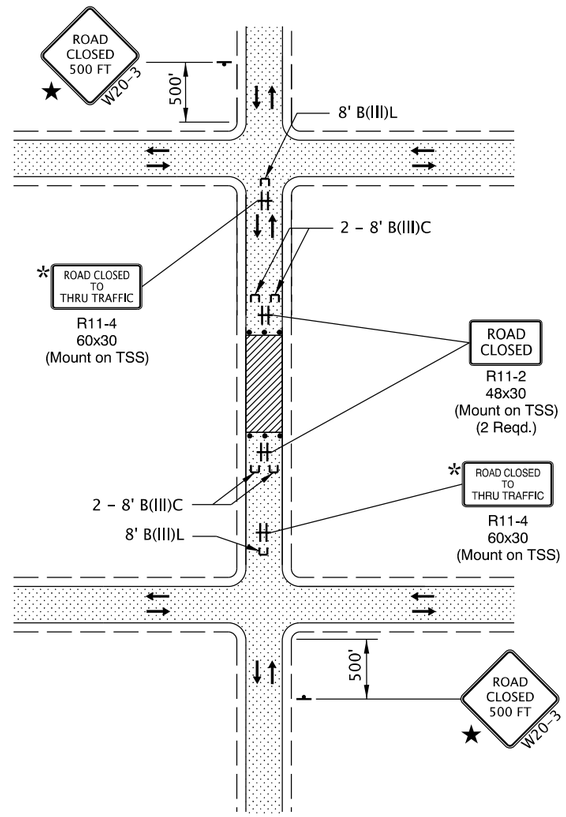
48 x 60 (nom.)
Project Specific Design

- Use a minimum of two Type III barricades for a road closure. For roads ≥ 36' wide between curbs or edge of pavement, use a minimum of three Type III barricades for the closure point.
- For full road closures, the C or LR barricade may be used.
- Place additional signing as directed.
- To determine sign spacing A, B, & C, use the "TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE" on Dwg. TM800.
- To be accompanied by Dwg. Nos.TM820 & TM821.

• • • • • 28" Tubular Markers See TCD Spacing Table on TM800 for max. spacing.

UNDER TRAFFIC

UNDER CONSTRUCTION



NOTE:
* If accesses exist between intersection and point of closure, install "ROAD CLOSED TO THRU TRAFFIC" sign as shown.

TYPICAL ROAD CLOSURE

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

CLOSURE DETAILS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 01-JUL-2020 | **TM840**

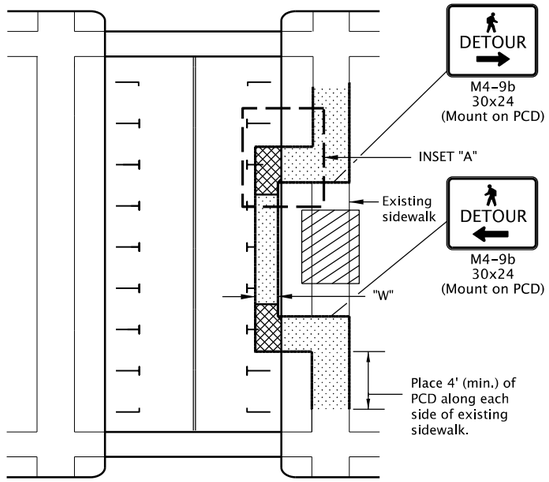
01-JUL-2020

TM840.dgn

Effective Date: June 1, 2024 - November 30, 2024

14-JUL-2023

TM844.dgn



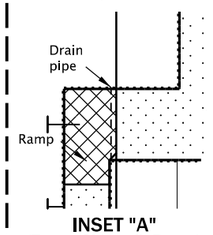
Within Roadway
SIDEWALK DIVERSION

NOTES:

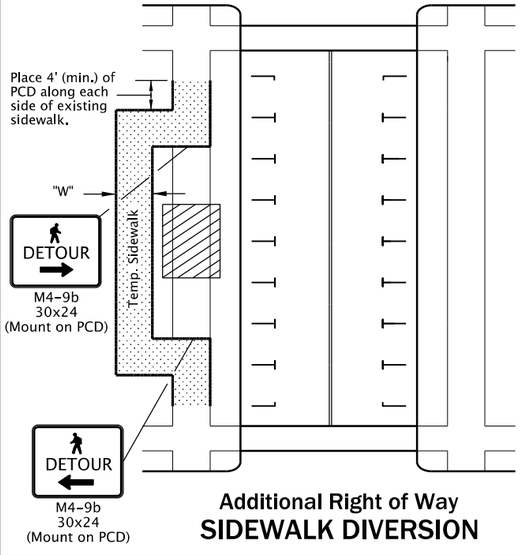
- Place or construct temp. sidewalk ramp, as needed.
- For roadways with a pre-construction posted speed of 40 mph or less.
- See inset "A" for Temp. Sidewalk Ramp details.
- "W" = 60", or, where 60" width cannot be maintained through the entire route, provide 48" min. width with 60" x 60" passing spaces every 200 ft.
- Use temporary ADA compliant surfaces to cross planter strips or other non-traversable surfaces.

NOTES:

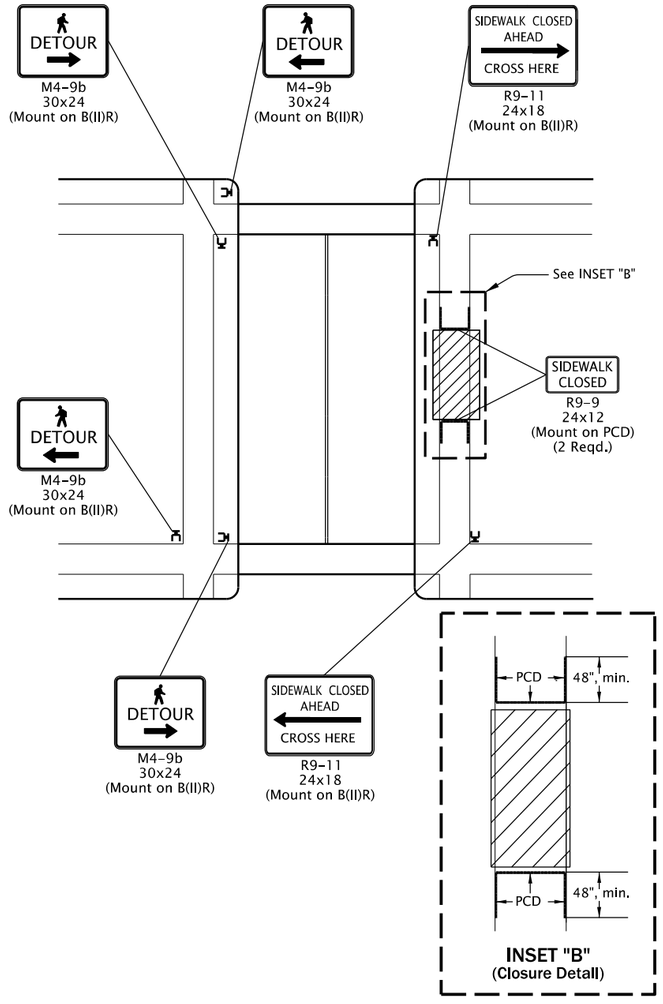
- Ramp size will vary. Ramp must meet ADA requirements incl. max. finished surf. slope of 8.3% and max. finished cross slope of 2.0%.



INSET "A"
(Temp. Sidewalk Ramp)



Additional Right of Way
SIDEWALK DIVERSION

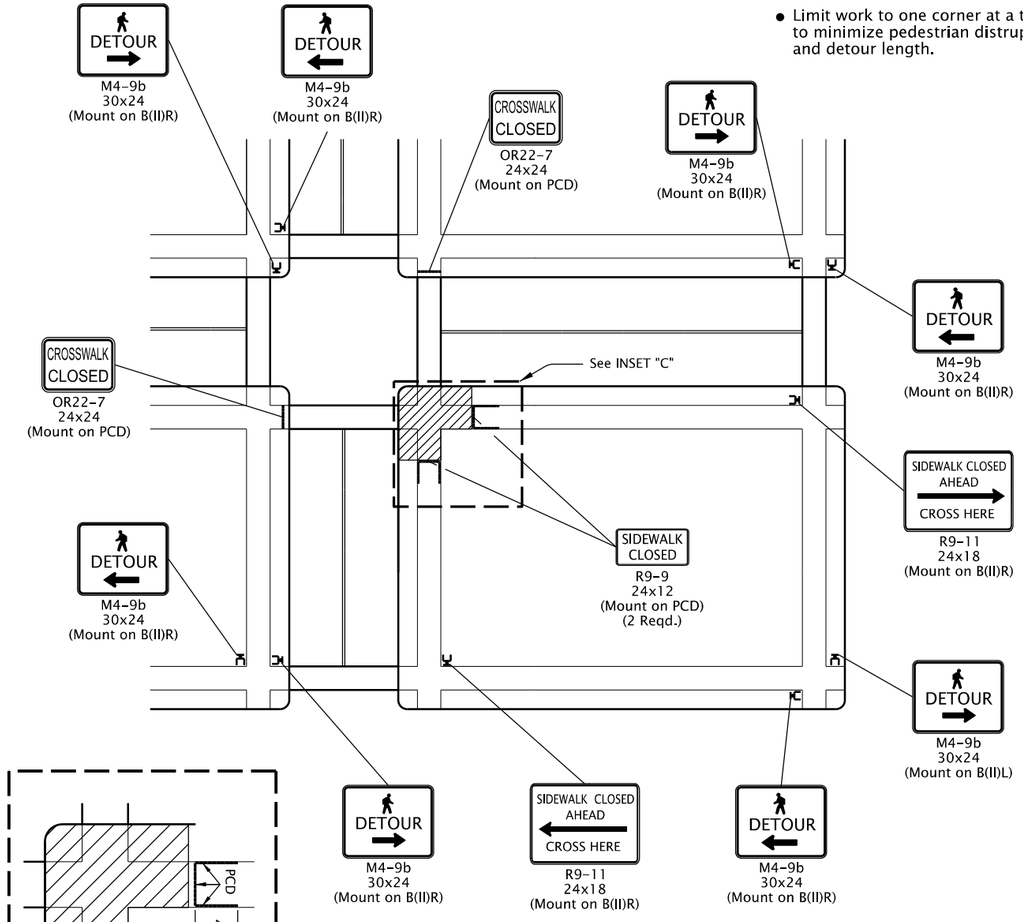


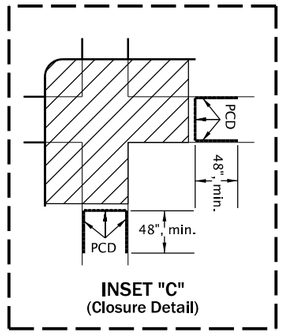
INSET "B"
(Closure Detail)

SIDEWALK CLOSURE, MIDBLOCK

NOTE:

- Limit work to one corner at a time to minimize pedestrian distruption and detour length.





INSET "C"
(Closure Detail)

SIDEWALK CLOSURE, CORNER

GENERAL NOTES FOR ALL DETAILS:

- When closing or relocating crosswalks or other pedestrian facilities provide ADA compliant facilities. Include accessibility features consistent with existing pedestrian facilities by providing adequate slope transitions and surfacing.
- Provide non-slip, 60 inch minimum wide surface through entire pedestrian route. If not possible, provide 48" min. width with 60" x 60" passing spaces every 200 feet along the route.
- Only TCD for pedestrians are shown. Other devices may be necessary to control vehicular traffic.
- Stage work, as necessary, to provide a temporary pedestrian access route at all times. For roadways with no available detours, maintain one open sidewalk at all times.
- Minimize pedestrian out-of-direction travel.
- To be accompanied by Dwg. Nos. TM820 & TM821.

UNDER PEDESTRIAN TRAFFIC

UNDER CONSTRUCTION

PEDESTRIAN CHANNELIZING DEVICE (PCD)

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

TEMPORARY PEDESTRIAN ACCESSIBLE ROUTES

2024

DATE	REVISION DESCRIPTION
DATE	REVISION DESCRIPTION
01-2022	Revised notes for temporary sidewalk ramp.
07-2023	OR22-8 signs were replaced with OR22-7 signs.

CALC. BOOK NO. N/A | SDR DATE 14-JUL-2023 | **TM844**

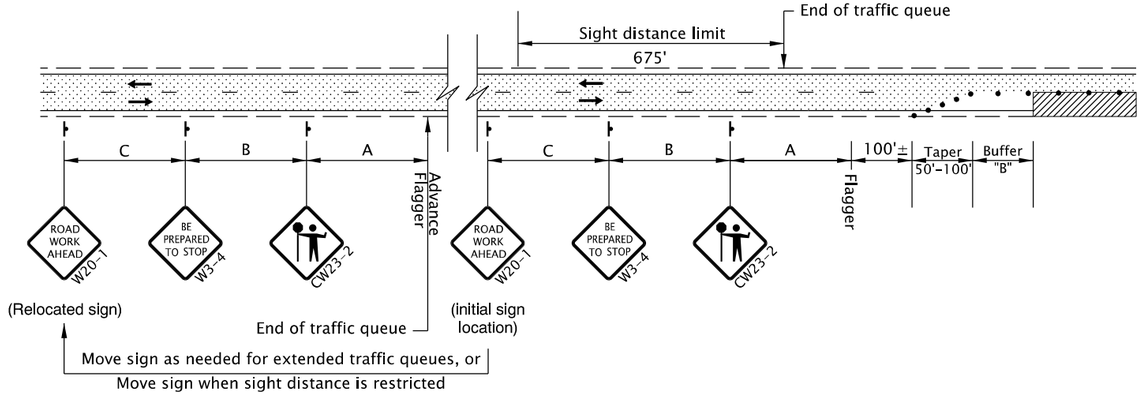
Effective Date: June 1, 2024 - November 30, 2024

13-JAN-2023

TM855.dgn

NOTES:

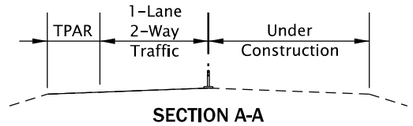
- Place Advance Flagger and additional signing when traffic queues extend beyond initial warning signing OR when sight distance is restricted.
- Relocate initial "ROAD WORK AHEAD" (W20-1) sign in advance of additional "BE PREPARED TO STOP" (W3-4) and Flagger Ahead (CW23-2) signs, as shown.
- Place additional Tubular Markers for Flagger and Advance Flagger Stations according to FLAGGER STATION DELINEATION detail.



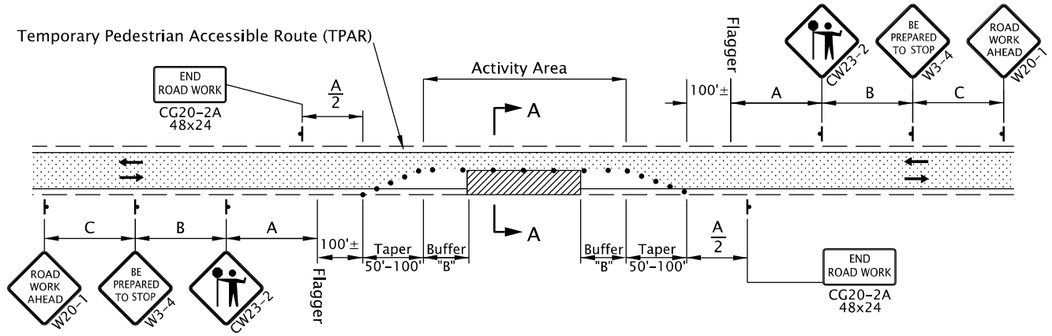
ADVANCE FLAGGER FOR EXTENDED TRAFFIC QUEUES

NOTE:

- When using pilot cars with flaggers to control traffic during paving operations, the Tubular Marker spacing along centerline may be increased to 200' within the Activity Area, as shown or as directed.
- Include "WAIT FOR FLAGGER" (CR4-23) signs mounted on Type II Barricade located approx. 50' before each Flagger.
- Coordinate and control pedestrians movements through the TPAR using Flaggers, other TCM, or as directed. When the existing shoulder is greater than or equal to 4' wide, provide a minimum of 4' of width for the TPAR.



SECTION A-A



2-Lane, 2-Way Roadway
ONE LANE CLOSURE

GENERAL NOTES FOR ALL DETAILS:

- This drawing is only intended to be used where an Automated Flagger Assistance Device (AFAD) cannot be utilized.
- The "FLAGGER" (CW23-2) symbol sign shall be used only in conjunction with the "BE PREPARED TO STOP" (W3-4) sign.
- Cover existing passing zone signing, as directed.
- Install temporary striping as required.
- To determine Taper Length ("L") and Buffer Length ("B"), use the "MINIMUM LENGTHS TABLE" shown on Dwg. No. TM800.
- To determine sign spacing A, B, and C, use "TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE" on Dwg. No. TM800.
- Install a "BICYCLES ON ROADWAY" (CW11-1) sign in advance of the closure when a bike lane is closed, or when the shoulder is closed and bikes are expected.
- At night, flagger stations shall be illuminated according to the FLAGGER STATION LIGHTING DELINEATION detail on Dwg No. TM800.
- To be accompanied by Dwg. Nos. TM820 & TM821.

••••••••• 28" Tubular Markers on 10'max. spacing arround intersection radii.

• • • • • 28" Tubular Markers on 20' max. spacing for flagger tapers and stations

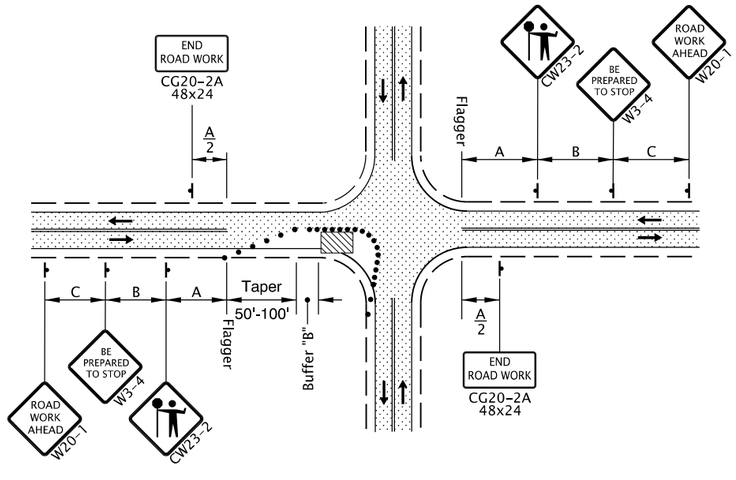
• • • 28" Tubular Markers See TCD Spacing Table on TM800 for max. spacing.

UNDER TRAFFIC

UNDER CONSTRUCTION

NOTE:

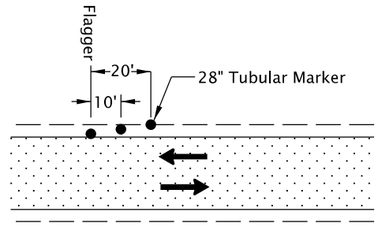
- Additional Traffic Control Measures (TCM) may be required for all legs of the intersection



2-Lane, 2-Way Roadway
ONE LANE CLOSURE, INTERSECTION

NOTE:

- Use a minimum of 3 tubular markers in shoulder taper on 10' spacing for flagger station delineation.



FLAGGER STATION DELINEATION

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

All materials shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

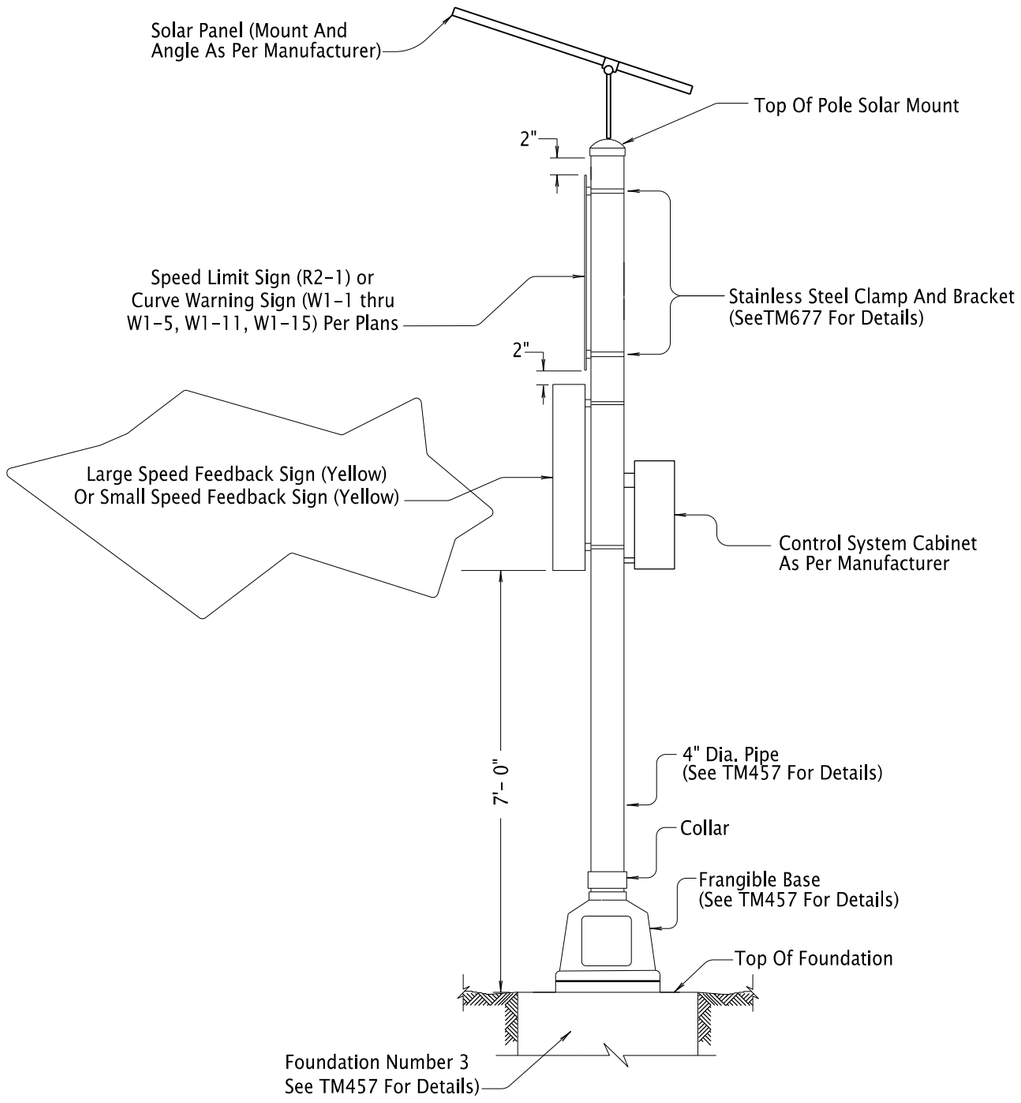
2-LANE, 2-WAY ROADWAYS

2024

DATE	REVISION DESCRIPTION

CALC. BOOK NO. N/A | SDR DATE 13-JAN-2023 | **TM855**

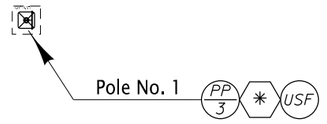
Effective Date: June 1, 2024 - November 30, 2024



UNINTEGRATED SPEED FEEDBACK ASSEMBLY
(Use Green Sheet Listed Items Only)

Designer Notes (DELETE FROM PLAN SHEET):

1. This detail is only applicable to speed limit signs or curve warning signs WITHOUT BEACONS as per the traffic manual and signal design manual.
2. This system is solar power only.
3. There are two sizes of speed feedback signs – small (for <45 mph) and large (for >45 mph). Specify the size needed.
4. Use specification 00991. Note that the speed feedback sign assembly is paid for as an each item (not a flashing beacon lump sum). static sign and attachment are paid for under the signing bid items
5. See examples below of bubble note structure that should be used (Bubble notes are in the signal workspace).



USF — *Install unintegrated speed feedback assembly (See MXXXX for details)*

* — *See signing plans for details on sign and attachment*

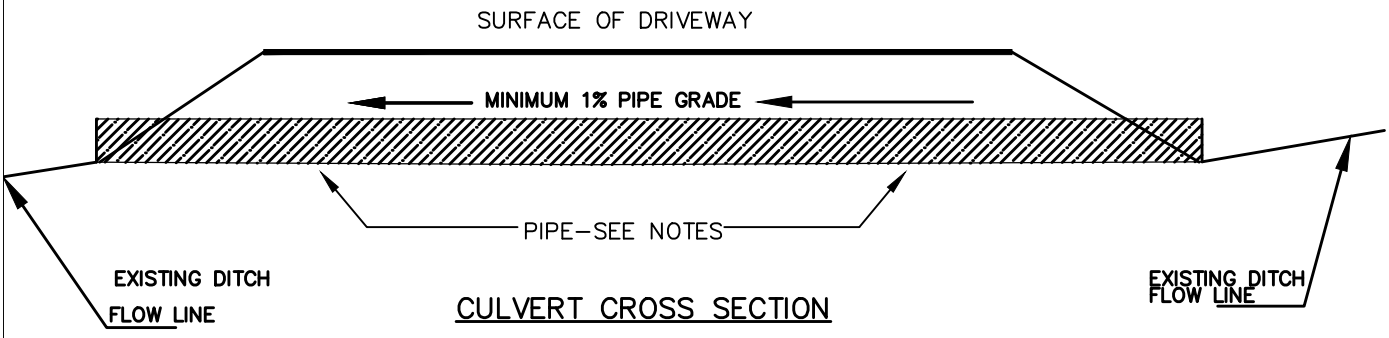
The selection and use of this detail, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without first consulting a Registered Professional Engineer.

OREGON DEPARTMENT OF TRANSPORTATION

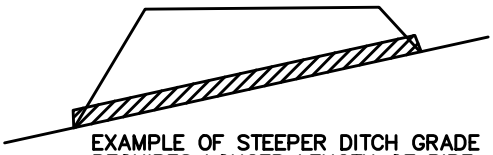
ENGINEERING AND TECHNICAL SERVICES BRANCH

GREEN SHEETS
UNINTEGRATED SPEED FEEDBACK ASSEMBLY (LARGE OR SMALL)

DETAIL NO.
DET4456



CULVERT CROSS SECTION



EXAMPLE OF STEEPER DITCH GRADE REQUIRES LONGER LENGTH OF PIPE AND MORE FILL

NOTES

1. HDPE IS ADEQUATE FOR DITCHES 2' OR DEEPER.
2. DUCTILE IRON OR REINFORCED CONCRETE PIPE SHALL BE USED WHEN DITCHES ARE LESS THAN 2' DEEP.
3. EXCEPT WHEN CONDITIONED FOR LARGER DIAMETER PIPE, THE MINIMUM PIPE SIZE SHALL BE 12" INSIDE DIAMETER AND 20 FEET IN LENGTH.
4. SPECIFICATIONS FOR MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT ODOT/APWA STANDARD SPECIFICATIONS.
5. FILL OVER CULVERTS SHALL NOT BE ALLOWED TO BLOCK OR INHIBIT THE FLOW LINE OF THE DITCH.
6. PIPE SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS TO SUPPORT A 79,000 LB FIRE APPARATUS VEHICLE.
7. REFER TO SECTION 440.1.1 OF THESE ROADWAY STANDARDS FOR ACCEPTABLE PIPE MATERIAL.. PVC IS NOT ALLOWED FOR USE AS A DRIVEWAY OR ROAD CULVERT UNLESS IT HAS A STRUCTURE AT BOTH ENDS, E.G. CATCH BASIN OR MANHOLE. CORRIGATED METAL PIPE IS NOT ALLOWED.
8. PIPES AND DITCHES EXCEEDING 4% FLOW LINES SHALL PROVIDE A 5'x5'x12" DEEP CLASS 50 RIP–RAP PAD AT PIPE OUTLET.
9. PIPES SHALL PROVIDE A MINIMUM 1% POSITIVE FLOW, BE INSTALLED AT THE SAME GRADE AS THE EXISTING DITCH, MAINTAINING THE FLOW LINE OF THE EXISTING DITCH.

REVISION	DATE	BY
REV 1	11/19	BP

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

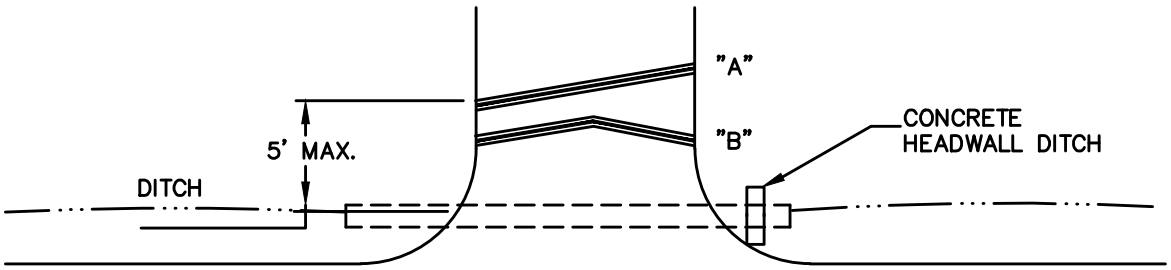
CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

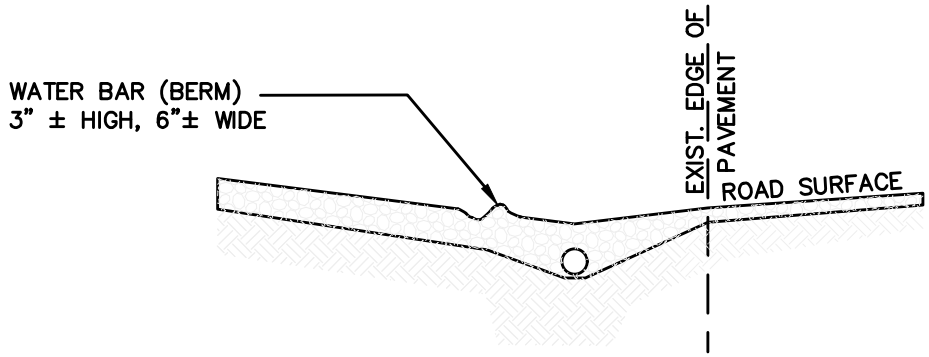
TYPICAL PLAN FOR DRIVEWAY CULVERT INSTALLATION

STANDARD DRAWING

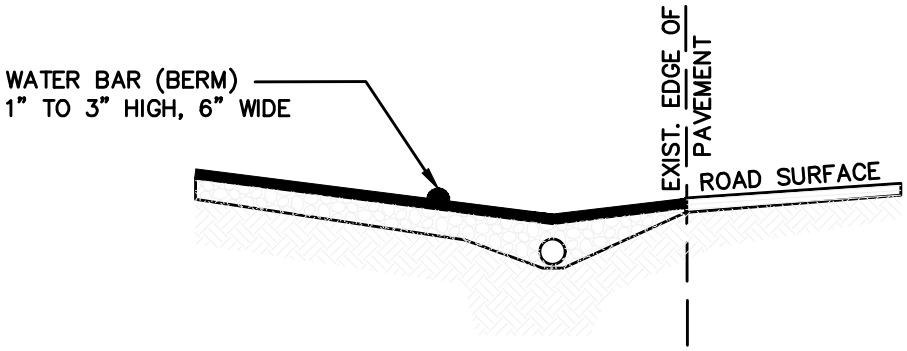
D250



TYPICAL PLAN OF DRIVEWAY WITH WATER BAR



GRAVEL DRIVEWAYS



ASPHALT OR CONCRETE DRIVEWAYS

NOTES

1. ON BOTH PAVED AND GRAVEL DRIVEWAYS, WATER BARS ARE REQUIRED ON SLOPES GREATER THAN 10%. ASPHALT WATER BARS (BERMS) REQUIRE A TACK COAT OF LIQUID ASPHALT TO BE APPLIED BEFORE BUILDING OF THE BERM, SO IT WILL BE STABLE AND ADHERE TO THE DRIVEWAY SURFACE.

2. THE WATER BARS (BERMS) ARE TO BE OF ADEQUATE ELEVATION AND WIDTH TO ENSURE THAT THE WATER RUNOFF WILL NOT FLOW ONTO COUNTY ROAD SHOULDERS OR TRAVELED SURFACE.

3. THE WATER BARS (BERMS) CAN BE CONSTRUCTED IN EITHER THE "A" POSITION OR "B" POSITION SHOWN IN DRAWING, TO DIRECT SURFACE RUNOFF ON EITHER SIDE OF DRIVEWAY TO A CONSTRUCTED DITCH SECTION. CONTROL OF WATER FLOW INTO EXISTING ROADSIDE DITCH IS THE PRIMARY PURPOSE OF THESE BERMS.

4. THE JOINT AT THE INTERSECTION OF THE ASHPALT DRIVEWAY AND EDGE OF PAVEMENT SHALL HAVE A SEAL OF LIQUID ASPHALT AND BE COVERED WITH FINE SAND TO MAKE A SMOOTH JOINT AND TO AVOID BREAKAGE OF THE SEAM.

REVISION	DATE	BY

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

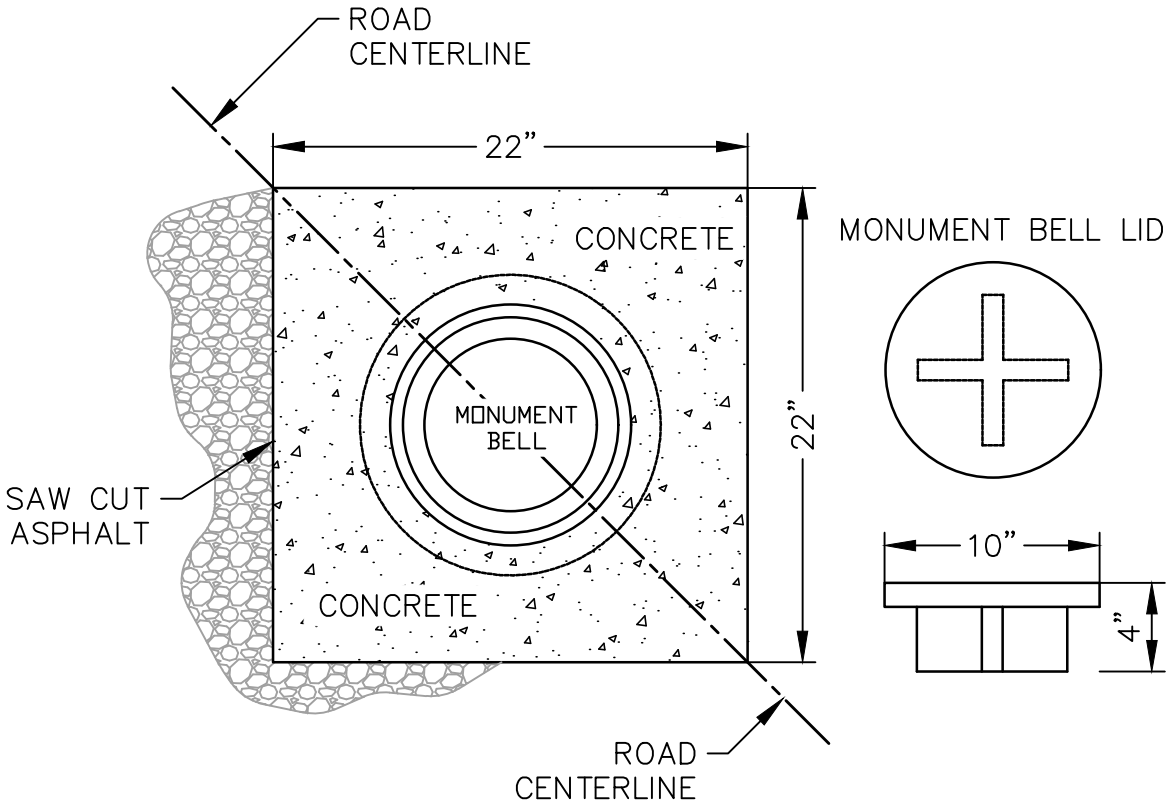
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

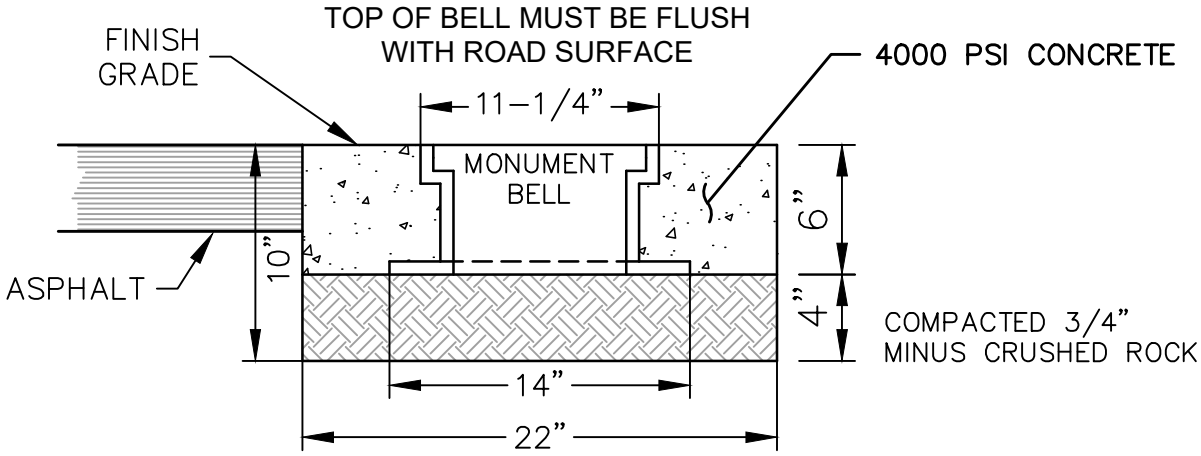
APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

DRIVEWAY WATER BAR (BERM) CONSTRUCTION

STANDARD DRAWING

D700





NOTE:
MONUMENT BOXES TO BE CAST IRON OR ALLOY SUITABLE FOR HEAVY TRAFFIC LOADING. #1036 OR #1033 EAST JORDAN IRON WORKS #3680 OR EQUIVILANT.

REVISION	DATE	BY
REVISION	11/19	RM
REVISION	3/20	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

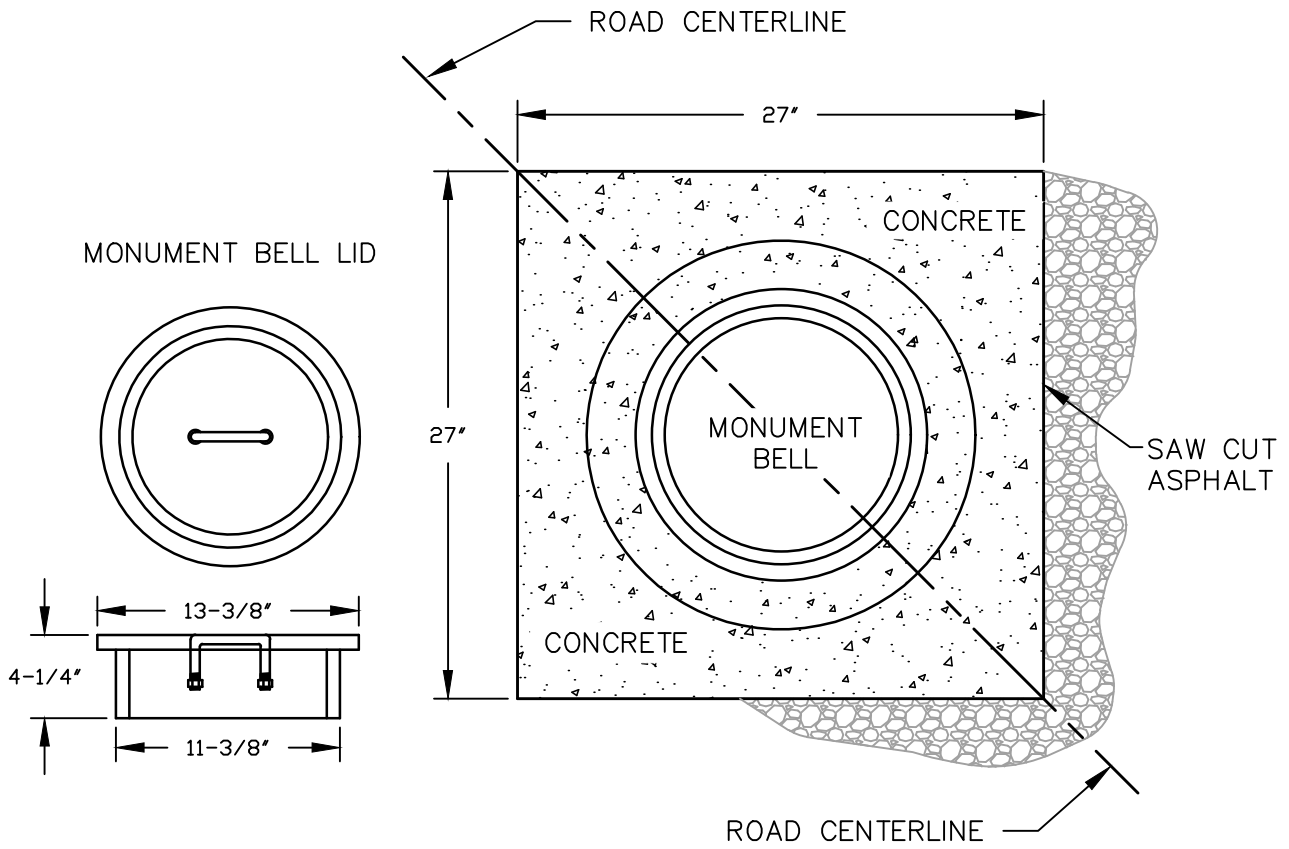
CLACKAMAS COUNTY

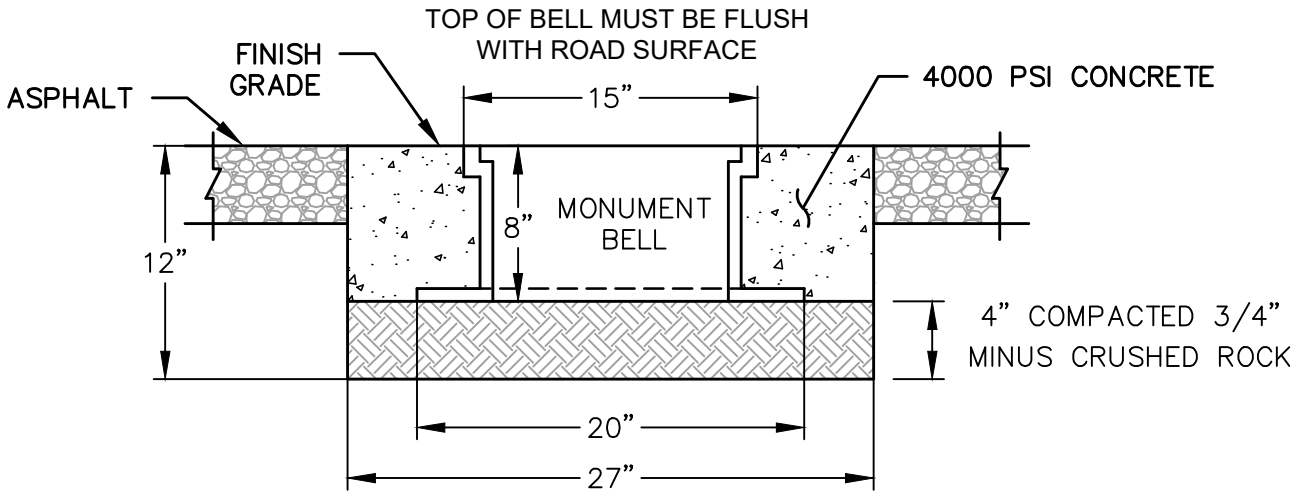
APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

MONUMENT BOX
35 MPH OR LESS

STANDARD DRAWING

M100





NOTE:
MONUMENT BOXES TO BE CAST IRON OR ALLOY SUITABLE FOR HEAVY TRAFFIC LOADING. #1036 OR #1033 EAST JORDAN IRON WORKS #3680 OR EQUIVILANT.

REVISION	DATE	BY
REVISION	11/19	RM
REVISION	3/20	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

MONUMENT BOX GREATER THAN 35 MPH

STANDARD DRAWING

M150

GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL CONFORM TO THESE PLANS AND THE APPLICABLE PROVISIONS OF THE CLACKAMAS COUNTY ROADWAY STANDARDS. IMPROVEMENTS DEPICTED ON THESE PLANS ARE IN CONFORMANCE WITH COUNTY LAND USE ACTION CASEFILE _____. (INSERT PLANNING FILE NUMBER, EXAMPLE– Z0123–03–D).

2. IN ORDER TO PROTECT UNDERGROUND FACILITIES, EXCAVATORS PERFORMING THE WORK SET FORTH ON THESE PLANS MUST COMPLY WITH THE PROVISIONS OF ORS 757.557 (REQUIRES CONTRACTOR TO NOTIFY THE OREGON UTILITY NOTIFICATION CENTER AT LEAST TWO, BUT NO MORE THAN 10 BUSINESS DAYS, PRIOR TO ANY EXCAVATION).

3. THE LOCATION OF EXISTING UTILITIES SHOWN ON THE PLANS IS APPROXIMATE AND SHOWN FOR INFORMATION PURPOSES ONLY. THE CONTRACTOR SHALL HAVE ALL UTILITIES LOCATED PRIOR TO COMMENCING CONSTRUCTION. NOTIFY ENGINEER AND DTD ENGINEERING OF ANY DISCREPANCIES PRIOR TO INITIATING THE CONSTRUCTION OF THE FACILITIES.

4. VERTICAL DATUM: (INSERT A LOCAL BENCH MARK ELEVATION).

5. TOPOGRAPHIC SURVEY BY: (INSERT LICENSED SURVEYOR'S OR ENGINEER'S COMPANY AND NAME).

6. VEGETATION AND TOPSOIL ARE TO BE STRIPPED TO MINERAL EARTH AND APPROVED BY THE PRIMARY INSPECTOR PRIOR TO PLACEMENT OF FILL OR BASE MATERIALS.

7. THE COUNTY REQUIRES A PROOF ROLL TEST WITH A FULLY LOADED 10–YARD DUMP TRUCK (LOAD TICKET TO BE PROVIDED) TO CHECK FOR SOFT SPOTS IN THE SUBGRADE PRIOR TO PLACEMENT OF GEOTEXTILE FABRIC AND GRANULAR BASE ROCK AND AGAIN AT THE COMPLETION OF THE PLACEMENT OF THE BASE ROCK FOLLOWED BY REQUIRED DENSITY TESTING PRIOR TO PAVING THE FIRST LIFT OF ASPHALT CONCRETE.

8. ACP MIX IS TO BE BATCHED FROM A MIX FORMULA APPROVED BY OSHD FOR MATERIAL USED. PAVING CONTRACTOR SHALL PROVIDE A CERTIFICATE OF COMPLIANCE FROM ACP PLANT. MIX DESIGN TO BE APPROVED PRIOR TO PAVING.

9. SUBSEQUENT SETTLEMENT OR CRACKING OF FINISHED SURFACE WITHIN THE WARRANTY PERIOD SHALL BE CONSIDERED TO BE A FAILURE OF THE SUBGRADE AND REPAIRED AT NO COST TO THE COUNTY AND IN A MANNER ACCEPTABLE TO THE COUNTY.

10. THE CONTRACTOR SHALL CONTROL TRAFFIC THROUGH THE PROJECT SITE IN CONFORMANCE WITH THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, AND OREGON SUPPLEMENTS. THE CONTRACTOR SHALL, AT ALL TIMES, MAINTAIN LOCAL ACCESS FOR EMERGENCY VEHICLES, BUSINESSES, BUSES, AND HOMEOWNERS ALONG THE PROJECT SITE.

11. WHEN TRAFFIC DELAYS ARE TO BE EXPECTED, THE CONTRACTOR SHALL NOTIFY THE APPLICABLE AGENCIES, INCLUDING TRIMET, SCHOOL DISTRICT, EMERGENCY SERVICES, AND LOCAL BUSINESSES.

12. THE CONTRACTOR SHALL HAVE A MINIMUM OF ONE (1) SET OF APPROVED CONSTRUCTION PLANS ON THE JOB SITE AT ALL TIMES DURING THE CONSTRUCTION PHASES.

13. CONTRACTOR SHALL REMOVE AND DISPOSE OF TREES, STUMPS, BRUSH, ROOTS, TOPSOIL AND OTHER MATERIAL ENCOUNTERED DURING THE CONSTRUCTION OF THE ROADWAY AND WHERE INDICATED ON THE PLANS. MATERIAL SHALL BE DISPOSED OF IN ACCORDANCE WITH LOCAL, REGIONAL AND STATE REGULATIONS AT FACILITIES AUTHORIZED TO ACCEPT SUCH MATERIAL. FILL SITES SHALL BE LEVELED AND GRADED TO DRAIN. THE CONTRACTOR SHALL CORRECT ANY DEFICIENT FILL OR NON PERMITTED DISPOSAL OF MATERIALS.

14. CONTRACTOR SHALL COORDINATE AND SCHEDULE ALL EARTHWORK, TRENCH BACKFILL AND ROAD CONSTRUCTION COMPACTION TESTS, AND GEOTECHNICAL REVIEWS WITH THE SOILS TESTING LAB AS REQUIRED FOR ACCEPTANCE OF PROJECT WORK BY CLACKAMAS COUNTY. COUNTY SHALL BE PROVIDED WITH ALL TEST RESULTS.

15. PROVIDE A PRE–CONSTRUCTION SURVEY TO CLACKAMAS COUNTY, DTD INDICATING ALL FOUND AND MISSING MONUMENTATION WITHIN THE PROJECT LIMITS PRIOR TO INITIATING CONSTRUCTION ACTIVITIES.

16. CONTRACTOR SHALL CAREFULLY MAINTAIN BENCHMARKS, PROPERTY CORNERS, MONUMENTS, AND OTHER REFERENCE POINTS PURSUANT TO ORS 209.140 AND ORS 209.150. IF SUCH POINTS ARE DISTURBED OR DESTROYED BY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND PAY FOR THEIR REPLACEMENT BY EMPLOYING A PROFESSIONAL LAND SURVEYOR TO RESET PROPERTY CORNERS & OTHER SUCH MONUMENTS.

REVISION	DATE	BY
REVISED	12/12	RN
REVISED	11/19	BP
REVISED	4/21	RM
REVISED	3/22	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

APPROVAL DATE: 4/20/2021 SCALE: N.T.S.

STANDARD NOTES
GENERAL

STANDARD DRAWING
N100

GENERAL NOTES (CONTINUED)

17. AT THE PRECONSTRUCTION MEETING, PRIOR TO BEGINNING WORK, THE CONTRACTOR SHALL PRESENT A LIST OF SUBCONTRACTORS, A PROJECT SCHEDULE, A TRAFFIC CONTROL PLAN AND A LIST OF AT LEAST THREE PEOPLE, WITH PHONE NUMBERS, RESPONSIBLE FOR MAINTAINING TRAFFIC CONTROL DURING NON-WORK PERIODS.

18. FINAL CLEANUP – PRIOR TO FINAL ACCEPTANCE, THE CONTRACTOR SHALL CLEAN THE WORK SITE AND ADJACENT AREAS OF ANY DEBRIS, DISCARDED ACP, CONCRETE OR OTHER ITEMS DEPOSITED BY THE CONTRACTOR'S PERSONNEL DURING THE PERFORMANCE OF THIS CONTRACT.

19. THE LOCATION OF ABOVE GROUND IMPROVEMENTS (EXISTING AND PROPOSED) SHALL NOT CONFLICT WITH THE REQUIRED SIDEWALK WIDTHS, ROADWAY IMPROVEMENTS, AND REQUIRED SIGHT DISTANCE.

(ENGINEER TO ADD ADDITIONAL NOTES SPECIFIC TO THE PROJECT.)

GRADING NOTES

1. ALL FILLS ON PRIVATE PROPERTY MUST BE PLACED CONSISTENT WITH COUNTY CODE TITLE 9.03, EXCAVATION AND GRADING. SITE PREPARATION MUST INCLUDE THE REMOVAL OF VEGETATION, NON-COMPLYING FILL, TOPSOIL, OR OTHER UNSUITABLE MATERIAL PRIOR TO PLACEMENT OF THE FILL. FILL SLOPES SHALL NOT EXCEED A GRADE OF TWO HORIZONTAL TO ONE VERTICAL.

2. ALL CUTS ON PRIVATE PROPERTY SHALL BE MADE CONSISTENT WITH TITLE 9.03, EXCAVATION AND GRADING ORDINANCE. NO CUT SHALL EXCEED A GRADE OF TWO HORIZONTAL TO ONE VERTICAL UNLESS APPROVED BEFOREHAND BY THE PROJECT GEOTECHNICAL ENGINEER AND CLACKAMAS COUNTY.

3. ON PRIVATE PROPERTY, APPROPRIATE BENCHING OF FILLS IS REQUIRED FOR FILLS OVER FIVE FEET IN HEIGHT ON SLOPES IN EXCESS OF FIVE HORIZONTAL TO ONE VERTICAL. BENCHING MUST BE DONE IN ACCORDANCE WITH THE APPROVED PLANS. CLACKAMAS COUNTY SHALL INSPECT BENCHES PRIOR TO FILL PLACEMENT.

4. CUT AND FILL SLOPES AND ALL EXPOSED SOILS SHALL BE PROTECTED FROM EROSION AND BE IN COMPLIANCE WITH THE LOCAL SURFACE WATER AUTHORITY RULES, REGULATIONS, AND STANDARDS. SUCH CONTROL SHALL CONSIST OF TEMPORARY MEASURES DURING CONSTRUCTION AND PERMANENT MEASURES AT THE COMPLETION OF CONSTRUCTION ACTIVITIES; INCLUDING APPROPRIATE REVEGETATION OR OTHER ACCEPTABLE MEANS AND METHODS. TEMPORARY EROSION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO EARTHWORK OR SITE STRIPPING.

5. THE CONTRACTOR SHALL NOTIFY THE PRIMARY INSPECTOR, COUNTY INSPECTOR, AND GEOTECHNICAL ENGINEER 48 HOURS PRIOR, FOR ALL REQUIRED EROSION CONTROL AND STRUCTURAL FILL INSPECTIONS AT THE FOLLOWING STAGES OF CONSTRUCTION:

   A. EROSION CONTROL INSPECTION PRIOR TO INITIATING CONSTRUCTION ACTIVITIES;
   B. PROOF ROLL ON SUBGRADE AND
   C. AT EVERY ONE FOOT OF STRUCTURAL FILL OR 300 CUBIC YARDS AND
   D. AT COMPLETION OF STRUCTURAL FILL BEFORE GEOTEXTILE FABRIC AND BASE AGGREGATE IS PLACED AND
   E. AT COMPLETION OF BASE AGGREGATE COURSE FOLLOWED BY DENSITY TESTING ON THE FINAL BASE COURSE PRIOR TO PAVING.

6. THE CONTRACTOR SHALL BE REQUIRED TO COORDINATE RELOCATION (AS NECESSARY) OF EXISTING UTILITIES DUE TO ANY CUT/FILL OPERATIONS OR ROADWAY IMPROVEMENTS. COORDINATION SHALL TAKE PLACE PRIOR TO INITIATION OF WORK.

REVISION	DATE	BY
REVISED	11/19	BP
REVISED	3/20	RM
REVISED	4/21	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

APPROVAL DATE: 4/20/2021 SCALE: N.T.S.

STANDARD NOTES GENERAL (CONTINUED) & GRADING NOTES

STANDARD DRAWING

N200

STREET & STORM DRAINAGE NOTES

1. STREET AND STORM DRAIN IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CLACKAMAS COUNTY ROADWAY STANDARDS AND THE APPROPRIATE SURFACE WATER DISTRICT. ALL STORM SEWER PIPES SHALL HAVE RUBBER GASKETS, WHICH SHALL PROVIDE A WATER TIGHT CONNECTION.

2. ALL TRENCH EXCAVATION SHALL CONFORM TO THE WATER ENVIRONMENT SERVICE PUBLICATION TITLED *CLACKAMAS COUNTY SERVICE DISTRICT NO. 1 – STANDARD SURFACE WATER SPECIFICATION.*

3. PIPE BEDDING AND PIPE ZONE SHALL CONFORM THE THE EXCAVATION AND BACKFILL DETAILS, AND SHALL BE 3/4"–0" CRUSHED ROCK.

4. COMPACTION SHALL BE PER ODOT/APWA STANDARD SPECIFICATIONS PART 3. CONTRACTOR TO DETERMINE TYPE OF EQUIPMENT AND THE METHOD USED TO ACHIEVE REQUIRED COMPACTION.

5. TRENCH BACKFILL OUTSIDE OF RIGHT–OF–WAYS OR PAVED AREAS MAY BE EXCAVATED TRENCH MATERIAL. TRENCH BACKFILL IN PAVED AREAS SHALL BE AN APPROVED GRANULAR MATERIAL.

6. MATERIAL IN SOFT SPOTS WITHIN THE ROADWAY SHALL BE REMOVED TO THE DEPTH REQUIRED TO PROVIDE A FIRM FOUNDATION AND SHALL BE REPLACED WITH 1 1/2"–0" CRUSHED ROCK. THE ENTIRE SUBGRADE SHALL BE THOROUGHLY COMPACTED TO 95% AASHTO T–99

7. CONTRACTOR SHALL NOTIFY THE ENGINEER WHEN SUBGRADE IS COMPLETE AND 24 HOURS PRIOR TO PLACEMENT OF BASE ROCK MATERIAL. CONTRACTOR SHALL ALSO NOTIFY THE ENGINEER 24 HOURS PRIOR TO FINAL PAVING FOR AN INSPECTION OF THE WORK. CLACKAMAS COUNTY REQUIRES A PROOF ROLL WITH A FULLY OADED 10–YARD DUMP TRUCK TO CHECK SUBGRADE COMPACTION PRIOR TO PLACEMENT OF ROCK SUBBASE AND AGAIN AT THE COMPLETION OF THE PLACEMENT OF THE BASE ROCK PRIOR TO PAVING THE FIRST LIFT OF ASPHALTIC CONCRETE.

8. PRIVATE STORM WATER DETENTION SYSTEMS ARE NOT PERMITTED IN THE PUBLIC RIGHT–OF–WAY

UTILITY NOTES

1. TRENCHES WITHIN THE RIGHTS–OF–WAY SHALL BE BACKFILLED WITH LOW STRENGTH CONTROLLED DENSITY FILL (CDF) WHEN:

   - TRENCHES LESS THAN 100' WITHIN THE ROADWAY OF ALL ARTERIALS AND COLLECTOR CLASSIFIED ROADS;
   - THE AFFECTED ROADWAY SURFACE IS NEWER THAN FIVE (5) YEARS FROM THE TIME OF THE LAST OVERLAY, WITHOUT REGARD TO THE ROADWAY CLASSIFICATION;
   - DEEMED NECESSARY BY THE COUNTY ROAD OFFICIAL.

   WHEN TRENCHES ARE EXEMPT FROM USE OF CDF THE ROADWAY TRENCH SHALL BE BACKFILLED WITH AN APPROVED GRANULAR MATERIAL CONFORMING TO ODOT/APWA CLASS B SPECIFICATIONS AND PER THE COUNTY CODE TITLE 7.03.100 THROUGH 7.03.230 AND SECTION 710 OF THE CLACKAMAS COUNTY ROADWAY STANDARDS.

2. TRENCHES OUTSIDE OF RIGHTS–OF–WAY MAY BE BACKFILLED IN ACCORDANCE WITH NATIVE MATERIAL AND COMPACTION SPECIFICATIONS FOR ODOT/APWA CLASS A BACKFILL.

3. COPIES OF THE CDF MATERIAL DELIVERY SLIPS SHALL BE SUBMITTED FOR COUNTY RECORDS. SUBMIT ____ COPIES TO THE COUNTY INSPECTOR.

REVISION	DATE	BY
REVISED	12/20	RN
REVISED	4/21	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

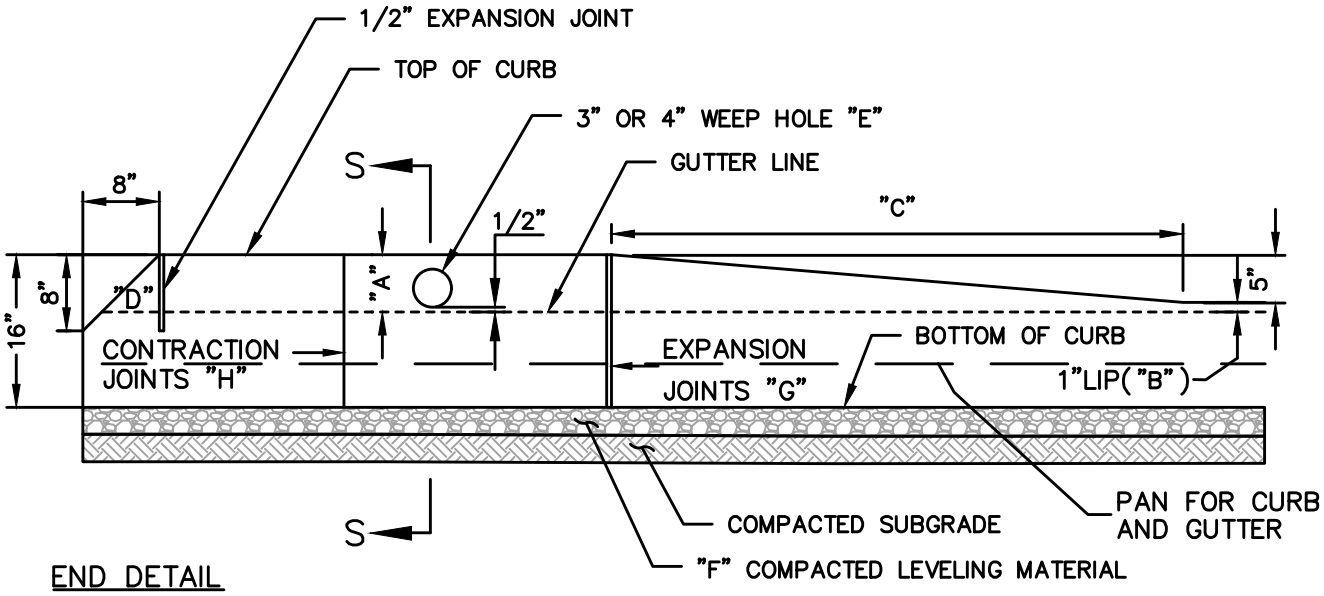
CLACKAMAS COUNTY

APPROVAL DATE: 4/20/2021 *SCALE:* N.T.S.

STANDARD NOTES
STREET, STORM, AND UTILTIY

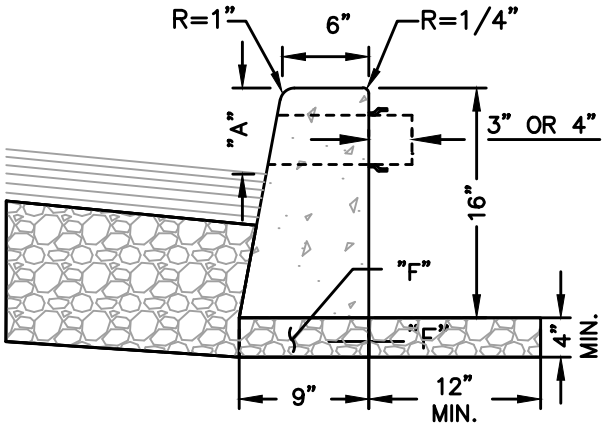
STANDARD DRAWING

N300



END DETAIL

APRON DETAIL



SECTION S–S

NOTES

1. "A" CURB EXPOSURE, STANDARD 6", VARY AS SHOWN ON TYPICAL SECTION, OR AS DIRECTED.
   "B" CURB EXPOSURE ADJACENT TO DRIVEWAY, STANDARD 1", OR AS DIRECTED.
   "C" DRIVEWAY APRON WING, STANDARD RESIDENTIAL & COMMERCIAL 5' MIN, OR AS DIRECTED.
   "D" END CURB SECTION, TOP TO BE REMOVED UPON EXTENSION OF CURB.
   "E" WEEP HOLE, 4" PLASTIC DRAIN PIPE OR APPROVED EQUIVALENT, LOCATED AS INDICATED ON THE PLANS OR AS DIRECTED. DRAIN PIPE SHALL HAVE A BELL OR A 3" EXTENSION, FOR FUTURE HOOK–UP.
   "F" AGGREGATE BASE, 3/4"–0" OR 1/2"–0", 4" MINIMUM
   "G" EXPANSION JOINTS, MAX. 45' SPACING AND AT BEGINNING AND END OF CURVES OR AS DIRECTED.
   "H" CONTRACTION JOINTS, MAX. 15' SPACING AND AT LOCATIONS AS DIRECTED.
2. CURB TO BE CLASS 3300 PORTLAND CEMENT CONCRETE.
3. CONCRETE AND MISC. MATERIALS USED IN CURB CONSTRUCTION SHALL CONFORM TO CURRENT OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION.
4. FROM PC TO PT INSIDE THE UGB AND UNINCORPORATED COMMUNITIES, AND WHEN THE GUTTER SLOPE OR CURB LINE IS LESS THAN 1% STANDARD DWG. S150 SHALL BE USED, AT PUBLIC INTERSECTIONS.

REVISION	DATE	BY
EDIT NOTE 3	12/12	RN
REVISED	11/19	AAR

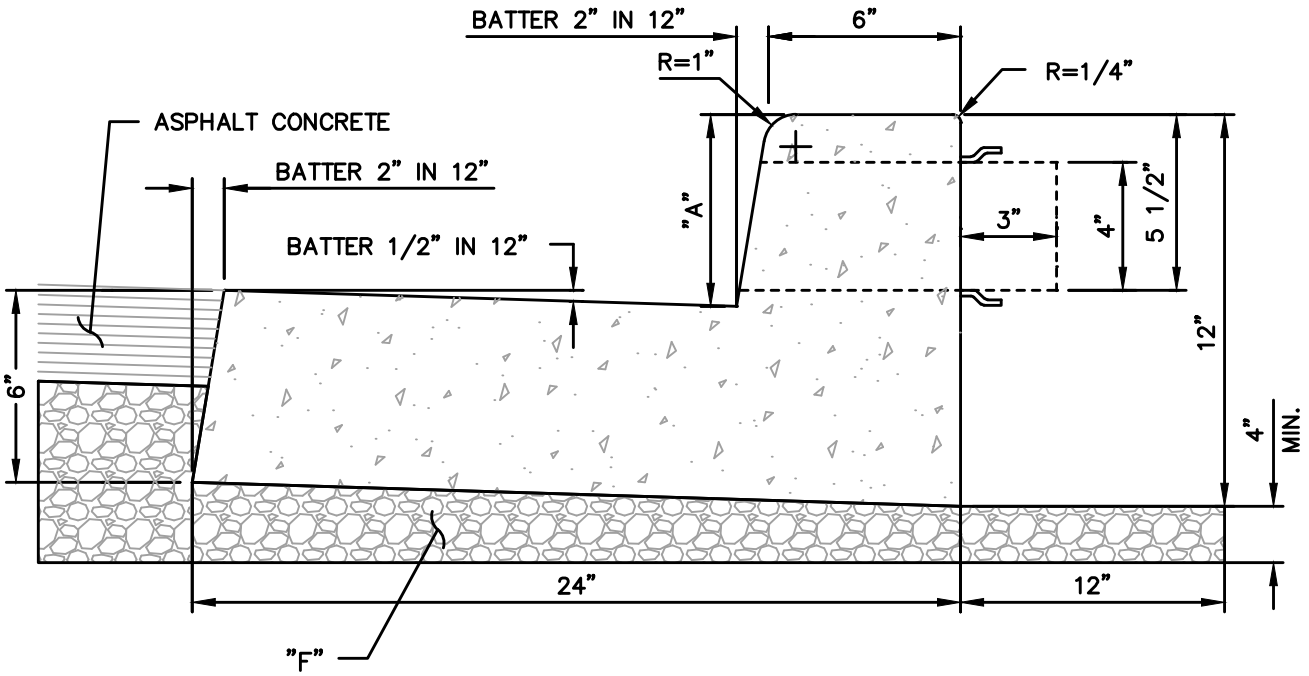
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

STANDARD TYPE 'C' VERTICAL CURB AND CURB DETAILS

STANDARD DRAWING
S100



NOTES

1. SPECIFICATIONS FOR CONCRETE AND MISCELLANEOUS MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3300 PSI IN 28 DAYS, 2" TO 4" SLUMP.
3. 4" PLASTIC PIPE SHALL HAVE A BELL OR A 3" EXTENSION, FOR FUTURE HOOK-UP.
4. EXPANSION JOINTS, MAX. 45' SPACING AND AT BEGINNING AND END OF CURVES OR AS DIRECTED.
5. CONTRACTION JOINTS, MAX. 15' SPACING AND AT LOCATIONS AS DIRECTED.
6. USE FROM PC TO PT AT PUBLIC INTERSECTIONS INSIDE THE UGB AND UNINCORPORATED COMMUNITIES. ALSO USE WHEN THE GUTTER SLOPE OR CURB LINE IS LESS THAN 1% ON ALL PUBLIC ROADS.
7. SEE NOTES ON DETAIL S100.

REVISION	DATE	BY
EDIT NOTE 1	12/12	RN
REVISED	11/19	AAR

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

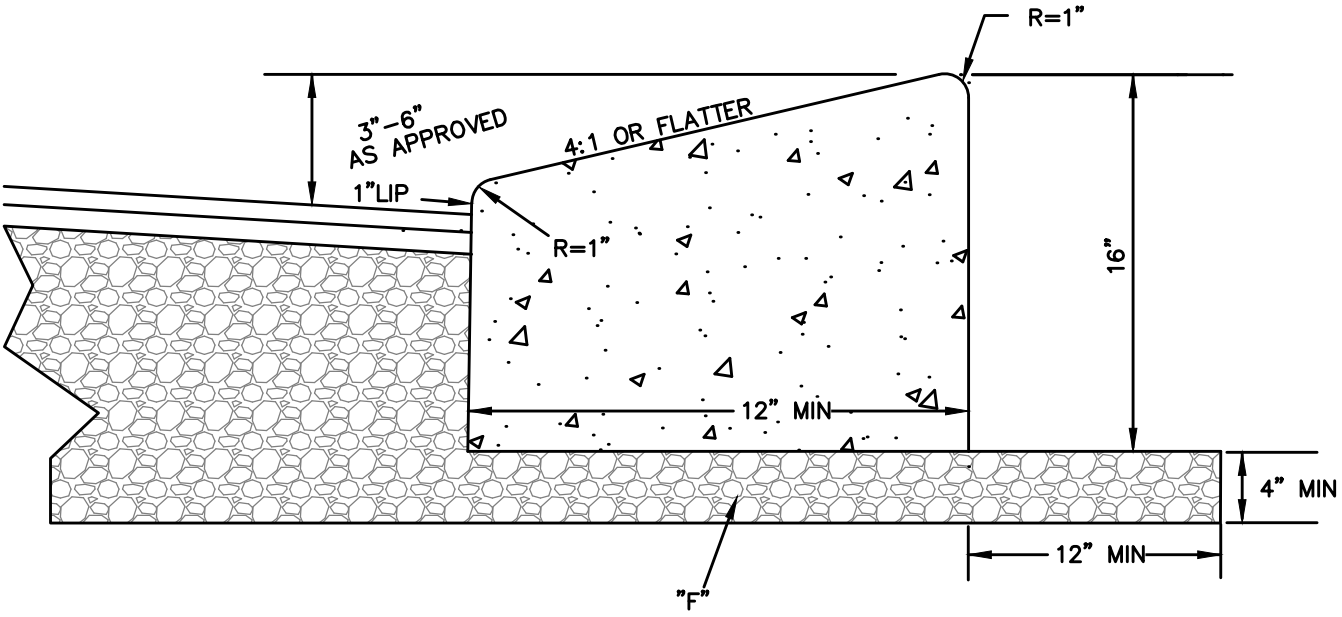
CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

STANDARD CURB AND GUTTER

STANDARD DRAWING

S150



NOTES

1. SPECIFICATIONS FOR CONCRETE AND MISCELLANEOUS MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3300 PSI IN 28 DAYS, 2" TO 4" SLUMP.
3. WEEP HOLES ARE NOT ALLOWED.
4. EXPANSION JOINTS, MAX. 45' SPACING AND AT BEGINNING AND END OF CURVES OR AS DIRECTED.
5. CONTRACTION JOINTS, MAX. 12' SPACING AND AT LOCATIONS AS DIRECTED.
6. SEE NOTES ON DETAIL S100.

REVISION	DATE	BY
EDIT NOTE 1	12/12	RN
	11/19	BP

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

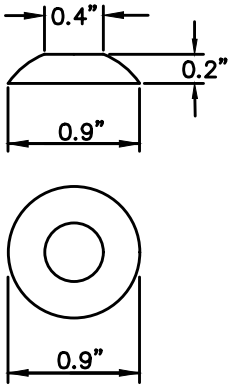
CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

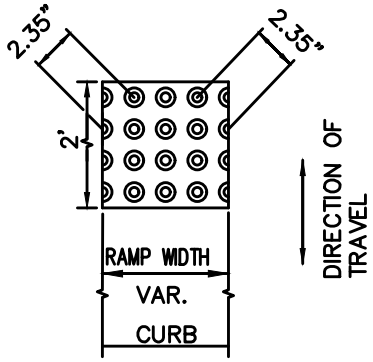
MOUNTABLE CURB

STANDARD DRAWING

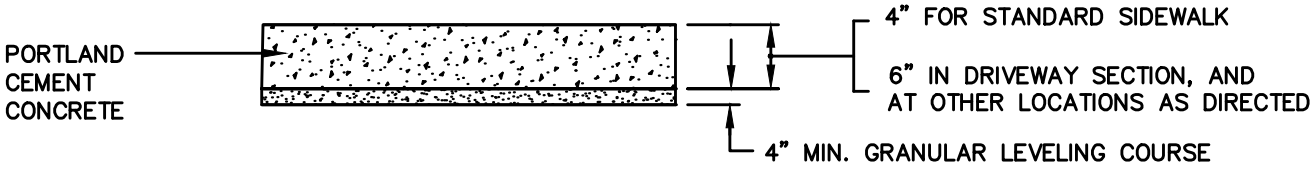
S180



TRUNCATED DOME DETAIL



RAMP TEXTURE PATTERN (TRUNCATED DOMES) DETAIL



SIDEWALK SURFACING DETAIL

NOTES

1. CONCRETE AND MISC. MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION. DETECTABLE WARNINGS ON WALKING SURFACES AS PER ADA REQUIREMENTS.

2. DETECTABLE WARNINGS SHALL CONSIST OF RAISED TRUNCATED DOMES WITH A DIAMETER OF NOMINAL 0.9 in (23 mm) A HEIGHT OF NOMINAL 0.2 in (5 mm) AND A CENTER–TO–CENTER SPACING OF NOMINAL 2.35in (60mm) AND YELLOW IN COLOR. THE MATERIAL USED TO PROVIDE CONTRAST SHALL BE AN INTEGRAL PART OF THE WALKING SURFACE. DETECTABLE WARNINGS USED ON INTERIOR SURFACES SHALL DIFFER FROM ADJOINING WALKING SURFACES IN RESILIENCY OR SOUND–ON–CANE CONTACT.

3. EXPANSION JOINT SPACING EVERY 45' MIN. OR AT EQUAL INTERVALS CORRESPONDING TO CURB LINE. JOINTS SHALL BE PROVIDED PER ODOT STD. DWG. RD722.

4. THE SURFACE FINISH SHALL BE CROSS BROOMED.

5. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3300 PSI IN 28 DAYS.

REVISION	DATE	BY
EDIT NOTE 1	12/12	RN
EDIT NOTE 6	12/12	RN
REVISION	11/19	BP
REVISION	3/20	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

STANDARD SIDEWALK & CURB RAMP NOTES & DETAILS

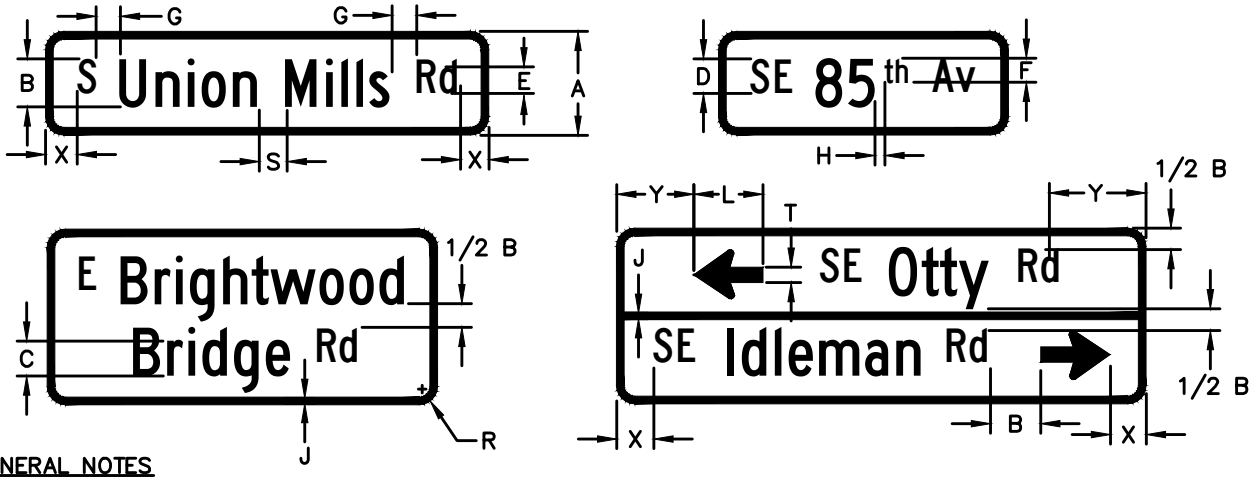
STANDARD DRAWING

S960

LEGEND DIMENSIONING TABLE

LOCATION	STREET CLASSIFICATION	POSTED SPEED (MPH)	PANEL HT.	PRIMARY LETTER HT.	LOWER-CASE LETTER HT.	SUPPLEMENTAL LETTERING SIZE		SUPER-SCRIPT HT.			BORDER/ DIVIDER THICK-NESS	BOR-DER RAD.	ARROW TAIL THICK-NESS	ARROW LENGTH
						UPPER	LOWER							
			A	B	C	D	E	F	G	H	J	R	T	L
GROUND MOUNT	ARTERIAL/COLLECTOR 4+ LANES	> 40	15	8	6	5	3 3/4	4	3 1/8	1	1/2	1 1/2		
	ARTERIAL/COLLECTOR 4+ LANES	≤ 40	12	6	4 1/2	4	3	3	2 1/2	3/4	1/2	1 1/2		
	ARTERIAL/COLLECTOR 2-3 LANES	ALL												
	LOCAL	> 25												
	ALTERNATE *		10	5	4	4	3	2 1/2	2	1/2	1/2	1 1/2		
	STACKED LEGEND	ALL	21	6	4 1/2	4	3	3	2 1/2	3/4	1/2	1 1/2	2 1/4	9
	LOCAL/CONNECTOR	≤ 25	8	5	3 3/4	3	1 7/8	2 1/2	1 1/2	1/2				
	PRIVATE	ALL												
OVERHEAD MAST ARM	ALL	ALL	21	12	9	8	6	6	5	1 3/4	1	3		
	ALTERNATE **		18	10	8	6	4 1/2	5	3 3/4	1 1/4	1	3		
	STACKED LEGEND	ALL	30	8	6	5	3 3/4	4	3 1/8	1	1	3	3	12

NOTES: ALL UNITS IN INCHES UNLESS SHOWN OTHERWISE.
S = SPACE BETWEEN WORDS = 5/8 B.
X, Y = 1/2 OF REMAINING SPACE. SHOULD BE APPROXIMATELY EQUAL TO LETTER HT (B) AND NO LESS THAN 1/2 B.
* GROUND MOUNTED: MAY BE USED IF 6" LETTERS YIELD SIGNS GREATER THAN 60" LENGTH.
** OVERHEAD: MAY BE USED IF 12" LETTERS YIELD SIGNS GREATER THAN 12' LENGTH.



GENERAL NOTES

1. ALL SIGN CORNERS SHALL BE ROUNDED.
2. BORDERS SHALL BE FLUSH WITH EDGE OF SIGN. BORDERS ARE NOT REQUIRED ON 8" PANELS.
3. LEGEND HEIGHT FOR ALL SIGNS AT AN INTERSECTION DICTATED BY THE HIGHEST CLASSIFICATION ROADWAY.
4. SHOP DRAWINGS SHALL BE SUBMITTED TO ENGINEERING FOR REVIEW PRIOR TO INSTALLATION.
5. SEE T130 FRO ADDITIONAL REQUIREMENTS.

SIGN LEGEND

1. ALL LEGENDS ARE SUBJECT TO THE ENGINEER'S APPROVAL PRIOR TO FABRICATION.
2. LETTERING SHALL BE FHWA SERIES C AT 100% WIDTH UNLESS SPECIFIED OTHERWISE.
3. THE PREFIX SHALL BE ABBREVIATED UPPER-CASE LETTERS.
4. THE STREET NAME SHALL CONSIST OF LOWER-CASE LETTERS WITH AN INITIAL UPPER-CASE LETTER.
5. THE SUFFIX SHALL BE ABBREVIATED AND CONSIST OF AN INITIAL UPPER-CASE LETTER FOLLOWED BY LOWER-CASE LETTER(S).
6. THE DESCENDERS OF LOWERCASE LETTERS SHALL NOT BE USED IN THE VERTICAL SPACING OF THE LEGEND.

MATERIALS

1. ALL SIGN MATERIALS SHALL CONFORM TO THE CURRENT MUTCD AND ODOT STANDARD SPECIFICATIONS.
2. GROUND MOUNTED: GREEN TYPE III OR TYPE IV BACKGROUND WITH SILVER-WHITE TYPE III OR TYPE IV PERMANENT LEGEND, OR SILVER-WHITE TYPE III OR TYPE IV SHEETING BACKGROUND OVERLAID WITH GREEN TRANSPARENT PASTE BACKGROUND WITH RETROFLECTIVE SILVER-WHITE SCREENED LEGEND.
3. OVERHEAD MOUNTED: GREEN TYPE III OR TYPE IV SHEETING BACKGROUND WITH WHITE TYPE IX PERMANENT LEGEND.
4. PRIVATE STREETS: SILVER-WHITE TYPE III OR TYPE IV SHEETING BACKGROUND WITH BLACK NONREFLECTIVE SCREENED, CUT-OUT PERMANENT LEGEND.

REVISION	DATE	BY
BORDER THICKNESS	1/13	CLS
suffix ltr. upper/lwr	1/13	CLS
	11/19	BP

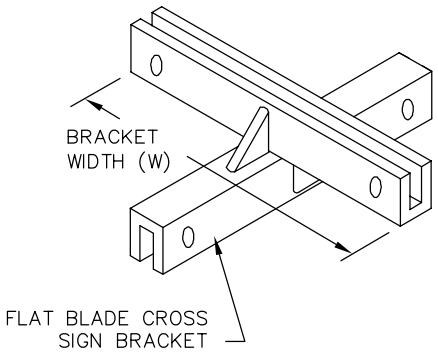
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

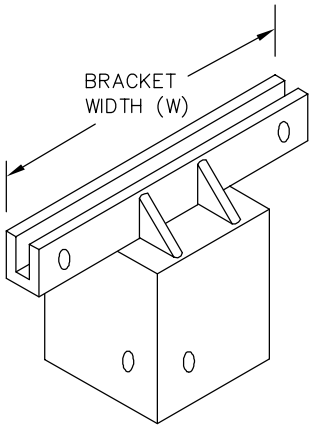
CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

STREET NAME SIGNS & DETAILS

STANDARD DRAWING
T100





FLAT BLADE SIGN BRACKETS

SIGN BRACKET SIZE

SIGN WIDTH (IN.)	MOUNTING
< 30	POST TOP BRACKET, W = 5 ¼"
30 TO 48	POST TOP BRACKET, W = 12"
> 48	RIVET TO POST

OVERHEAD MOUNTING

1. SIGNS TO BE MOUNTED USING REUSABLE BANDING TYPE ADJUSTABLE BRACKET (SKY BRACKET OR APPROVED EQUAL) UNLESS OTHERWISE SPECIFIED.
2. NEW PROJECTS: SIGNAL MAST ARM SIGNS TO BE INCLUDED ON SIGNING PLANS.
3. EXISTING SIGNAL POLES: PERFORM POLE STRUCTURAL ANALYSIS PRIOR TO ADDING OR ENLARGING SIGNS.

ABBREVIATIONS FOR STREET NAME SUFFIXES

AV = Avenue CT = Court LN = Lane PKWY = Parkway RD = Road TER = Terrace
BLVD = Boulevard DR = Drive LP = Loop PL = Place ST = Street WY = Way
CIR = Circle

S:\Engineering\Roadway Standards\2010 Roadway Standards\2010 Standards for Publish\Drawings\DWGs\ T100-T250.dwg

REVISION	DATE	BY

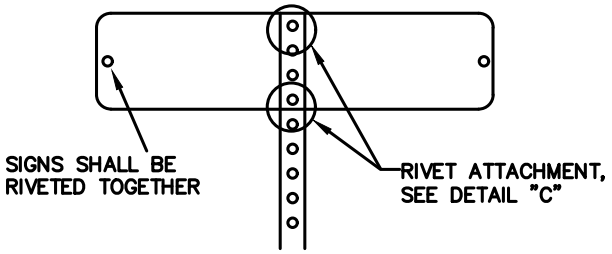
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

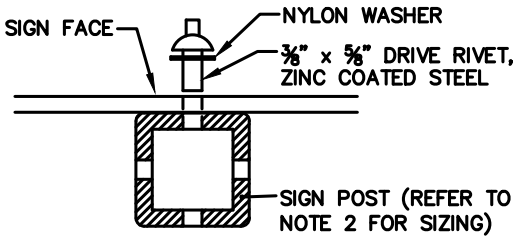
CLACKAMAS COUNTY

APPROVAL DATE: 1/1/10 SCALE: N.T.S.

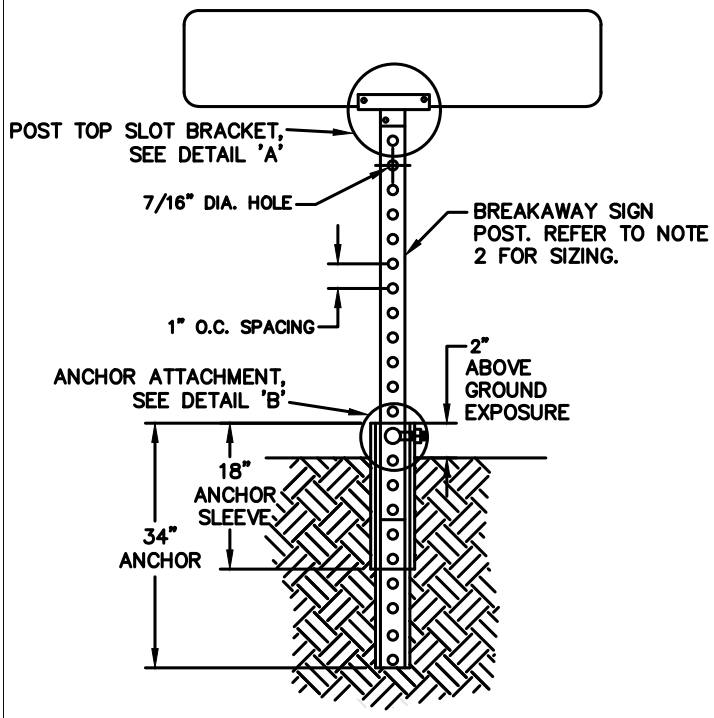
STREET NAME SIGNS & DETAILS (CONTINUED)

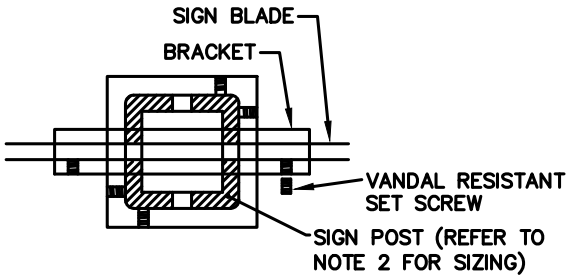
STANDARD DRAWING
T130



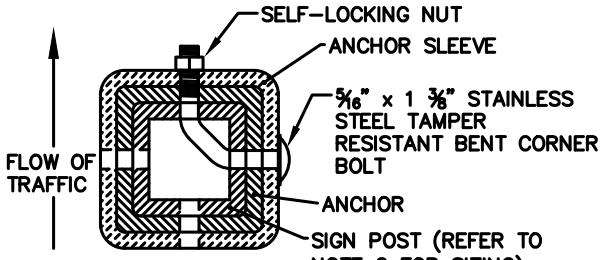


RIVET ATTACHMENT
(DETAIL 'C', TOP VIEW)





POST TOP BRACKET ATTACHMENT
(DETAIL 'A', TOP VIEW)



ANCHOR ATTACHMENT
(DETAIL 'B', TOP VIEW)

NOTES

1. SIGN COMBINATION AND MINIMUM SIGN MOUNTING HEIGHT SHALL DETERMINE POST LENGTH. A 10' (MIN.) POST SHALL BE USED. A COMBINATION OF SIGNS GREATER THAN 36" IN HEIGHT SHALL REQUIRE A 12' (MIN.) POST.
2. SIGN POST SIZING SHALL BE BASED ON OREGON STANDARD DRAWING TM681 (PERMANENT PERFORATED STEEL SQUARE TUBE TABLE – 85 MPH). THE MINIMUM POST SIZE SHALL BE 2" X 2" 12-GA. SQUARE TUBE. IF SIGN PANEL AREA IS GREATER THAN THAT ALLOWED BY A 2.5" X 2.5" 12-GA. SQUARE TUBE, THEN A 2.5" X 2.5" 10-GA. SQUARE TUBE POST SHALL BE USED, WITH A SLIP BASE FOUNDATION PER OREGON STANDARD DRAWING TM688.
3. SIGN POSTS IN CONCRETE AREAS SHALL BE INSTALLED ON SURFACE-MOUNTED BREAKAWAY BASES.
4. NYLON SPACERS SHALL BE USED TO PREVENT CONTACT BETWEEN GALVANIZED STEEL AND ALUMINUM MATERIAL SURFACES.

REVISION	DATE	BY
REV 1	11/19	BP
REVISION	3/20	RM

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

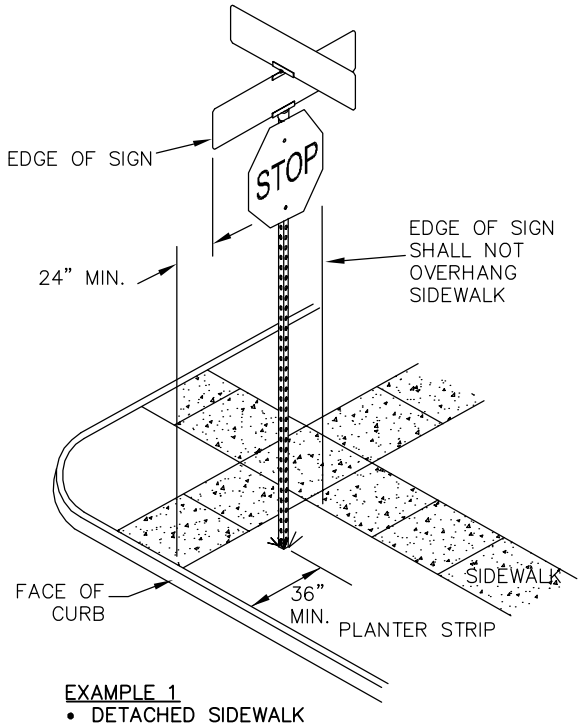
CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

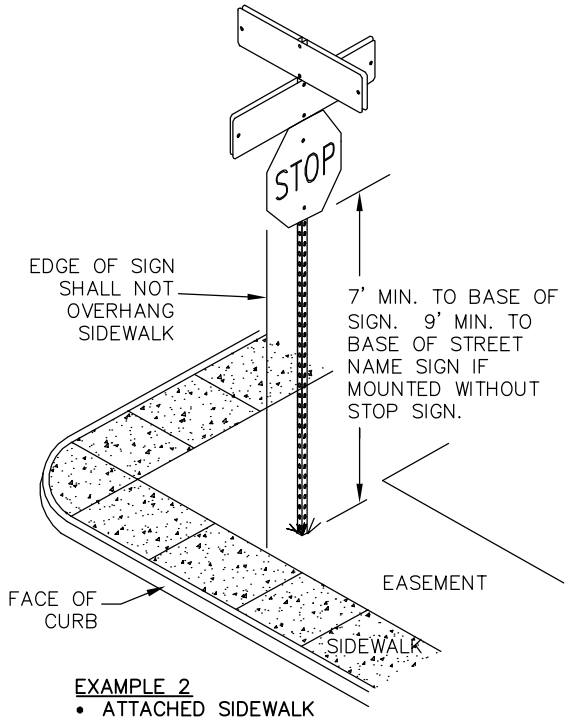
SIGN MOUNTING AND ATTACHMENTS

STANDARD DRAWING

T150

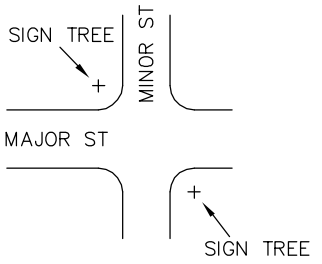


EXAMPLE 1
- DETACHED SIDEWALK
- POST TOP FLAT BLADE BRACKET WITH CROSS BRACKET

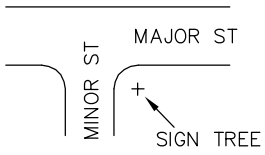


EXAMPLE 2
- ATTACHED SIDEWALK
- DOUBLE SIGNS RIVETED TO POST

TYPICAL SIGN INSTALLATIONS



4–LEG INTERSECTION



T INTERSECTON

TYPICAL STREET NAME SIGN LOCATIONS

S:\Engineering\Roadway Standards\2010 Roadway Standards\2010 Standards for Publish\Drawings\DWGs\ T100-T250.dwg

REVISION	DATE	BY

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

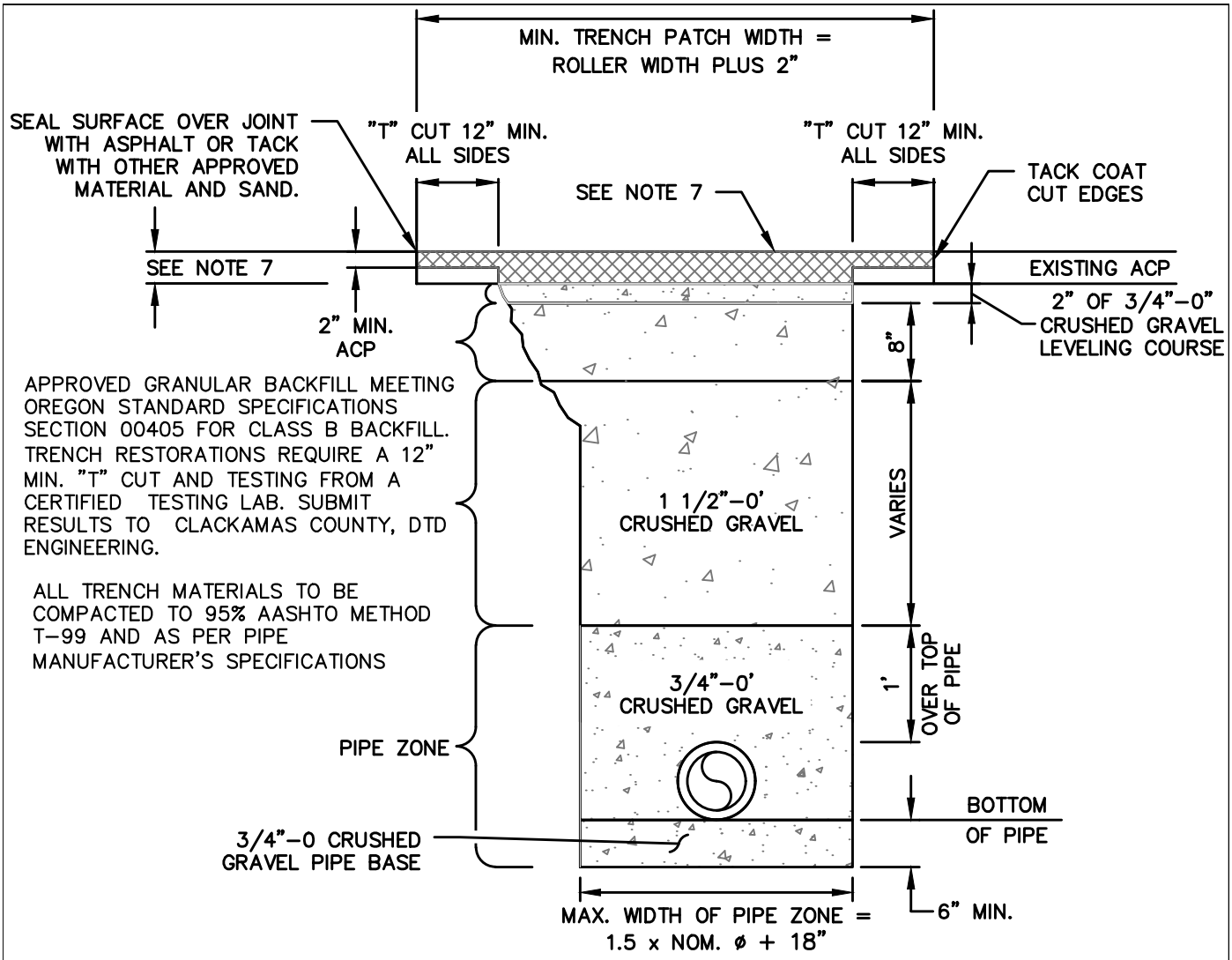
CLACKAMAS COUNTY

APPROVAL DATE: 1/1/10 SCALE: N.T.S.

SIGN INSTALLATIONS

STANDARD DRAWING

T250



1. THE USE OF U200 SHALL BE DETERMINED BY SECTION 710.8. THE USE OF CONTROL DENSITY FILL SHALL BE DETERMINED BY SECTION 710.8. WHEN USED, REFER TO STANDARD DRAWING U250A.
2. THE EXISTING ACP SHALL BE SAWCUT THROUGH ENTIRE ACP SECTION PRIOR TO EXCAVATION.
3. BACKFILL IN PIPE ZONE SHALL BE PLACED IN MAXIMUM 6" LIFTS AND COMPACTED.
4. TRENCH BACKFILL SHALL BE PLACED IN MAXIMUM 12" LIFTS TO 95% DENSITY.
5. SAWCUT EDGES TO BE TACKED WITH HOT LIQUID ASPHALT.
6. WORK RESULTING IN IRREGULAR TRENCH WIDTHS OR INCIDENTAL DAMAGE TO THE ROADWAY SURFACE WILL REQUIRE ANOTHER SAWCUT AND SUBSEQUENT REMOVAL OF ACP. THE SAWCUT LINE SHALL BE APPROVED BY CLACKAMAS COUNTY PRIOR TO THE PERMANENT ACP REPAIR.
7. RESTORE ACP SECTION WITH 4" OF HMAC LEVEL 3, PG 64-22, 1/2" DENSE GRADED AGGREGATE OR AN EQUAL THICKNESS OF THAT REMOVED WHICHEVER IS GREATER. ASPHALTIC CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF OREGON STANDARD SPECIFICATIONS SEC. 00744.40. ACP TO BE PLACED IN LIFTS BETWEEN 2 INCHES AND 3 INCHES IN THICKNESS.
8. ACP JOINTS/SEAMS SHALL BE SEALED WITH HOT LIQUID ASPHALT, OR APPROVED EQUAL, AND SANDED.
9. CLACKAMAS COUNTY SHALL BE NOTIFIED FOR INSPECTION.
10. TRENCHES SHALL BE PROTECTED WITH STEEL PLATING CAPABLE OF CARRYING A MINIMUM OF H-20 LOADING. EACH PLATE SHALL BE SECURED IN PLACE WITH APPROACH RAMPS OF COLD MIX A.C. LIGHTED BARRICADES SHALL BE MOUNTED WITH BUMP AND CONSTRUCTION AHEAD SIGNS. REFLECTIVE SHEETING FOR NIGHT VISION SHALL BE PLACED AHEAD OF AND ADJACENT TO THE PLATING.
11. TRAFFIC SIGNAL DETECTOR LOOPS IN SIGNALIZED INTERSECTIONS, DAMAGED AS A RESULT OF WORK DONE UNDER THE PERMIT, SHALL BE REPLACED IN THEIR ENTIRETY. NO SPLICING OF TRAFFIC LOOPS IS ALLOWED. ANY TRAFFIC LOOP THAT IS TUNNELED UNDER WILL REQUIRE A FULL DEPTH TRENCH BACKFILL WITH FLUID 150 PSI MAXIMUM STRENGTH CDF (CONTROLLED DENSITY FILL) A MINIMUM WIDTH OF 18" ON EACH SIDE OF THE TRAFFIC LOOP WIRE. ANY TRAFFIC LOOP WORK DONE UNDER THIS PERMIT WILL BE WARRANTED FOR A PERIOD OF TWO YEARS FROM THE DATE OF SUCH WORK.
12. COMPLY WITH SMOOTHNESS REQUIREMENTS OF ODOT STANDARD SPECIFICATIONS.

REVISION	DATE	BY
TEE-CUT ADDED	05/18	DC
TEE-CUT MOD.	09/18	RM
REVISED	12/19	AAR

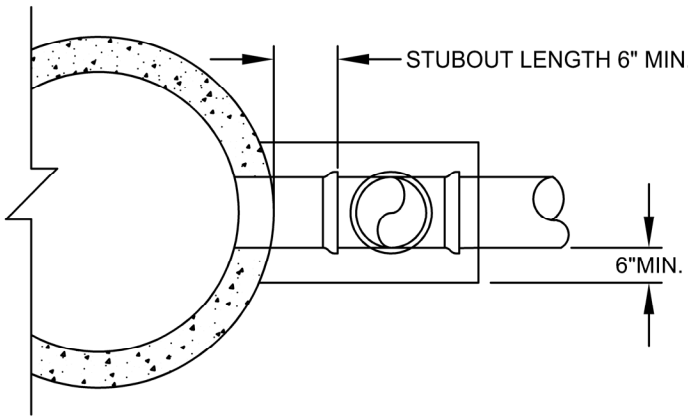
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

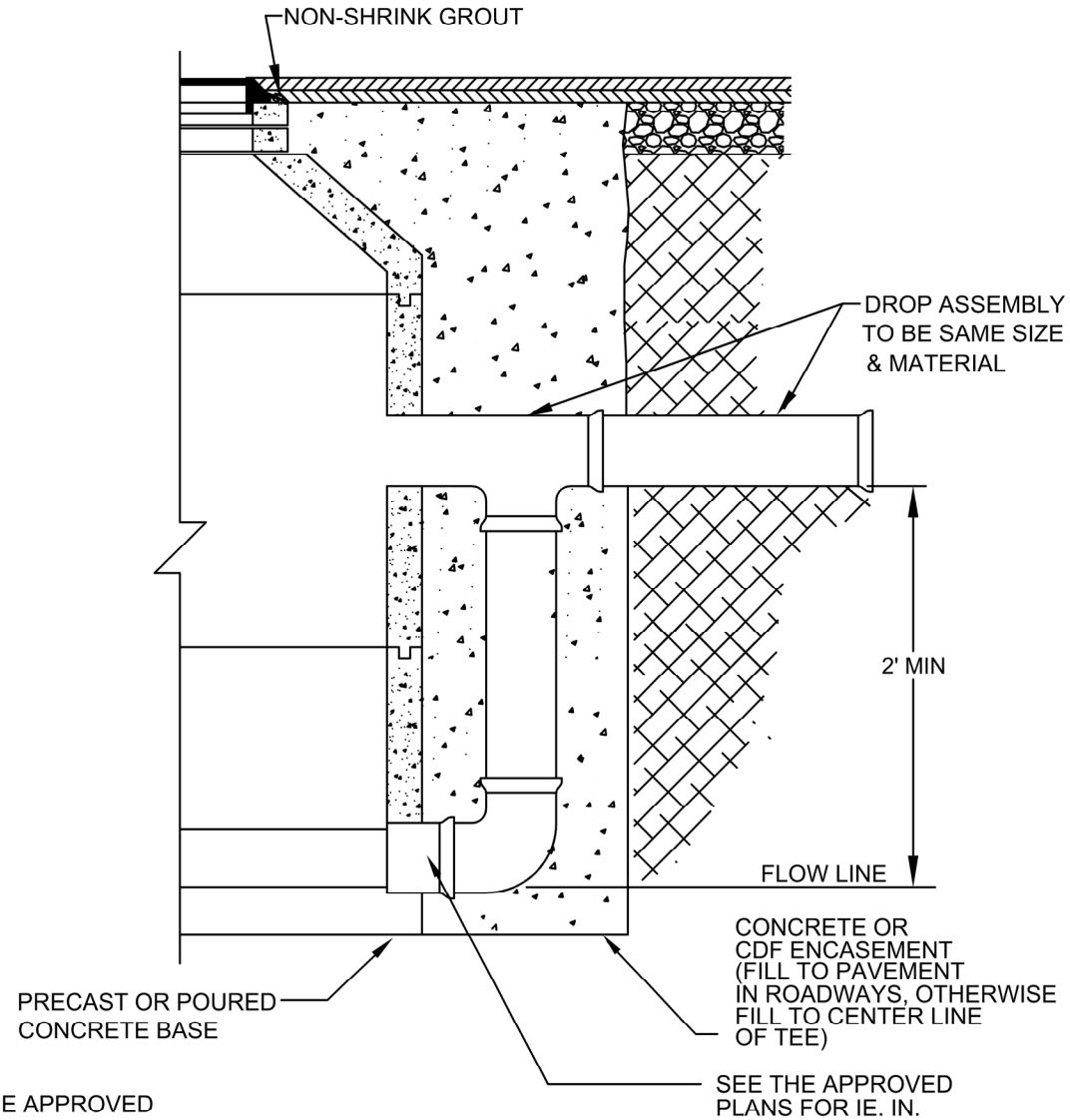
CLACKAMAS COUNTY

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

STANDARD TRENCH AND BACKFILL

STANDARD DRAWING
U200



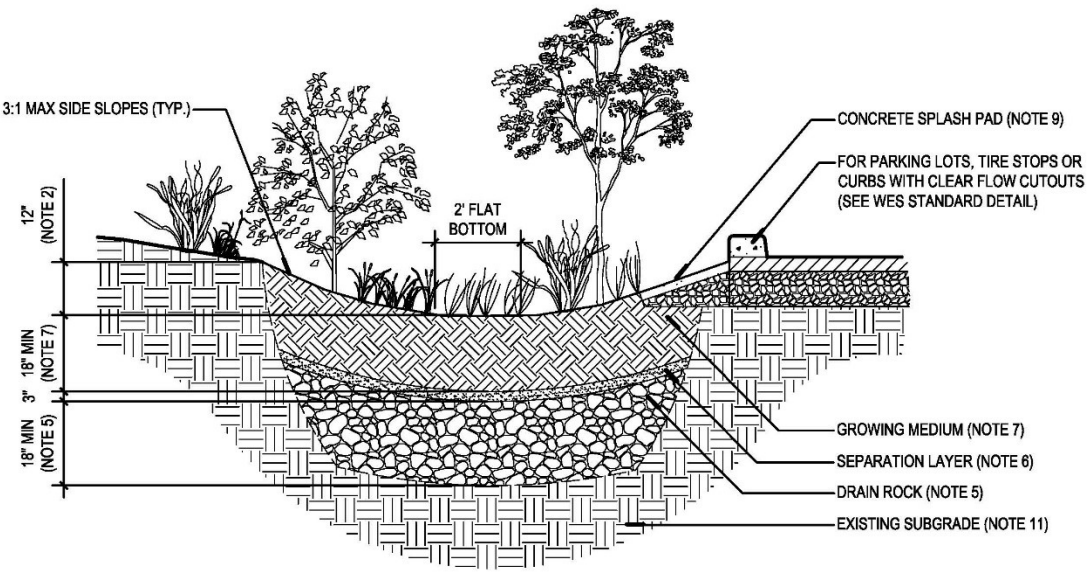


NOTES:

1. SEE THE APPROVED PLANS FOR IE IN & IE OUT ELEVATIONS.
2. NON-SHRINK GROUT SHALL NOT BE FAST OR RAPID SETTING.

MANHOLE-OUTSIDE DROP

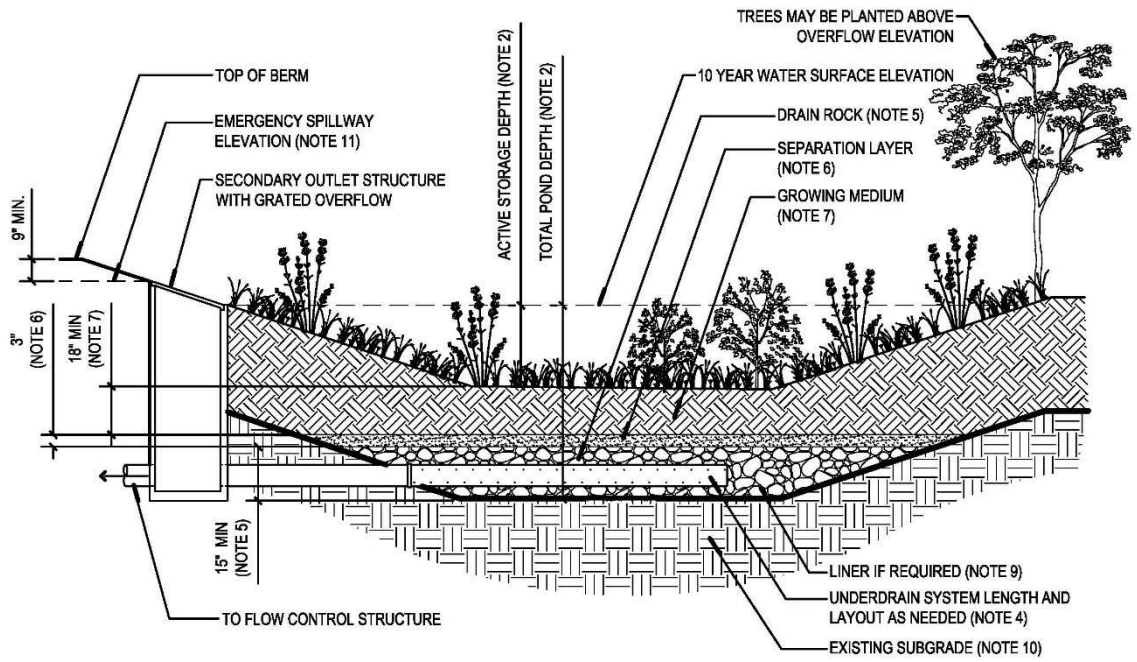
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July. 2022 *SCALE:* N.T.S. MANHOLE-OUTSIDE DROP	*STANDARD DRAWING* SAN-005



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION.
2. DIMENSIONS:
   - DEPTH OF SWALE (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): 12"
   - LONGITUDINAL SLOPE OF SWALE: 6.0% OR LESS
   - FLAT BOTTOM WIDTH: 2'
   - SIDE SLOPES OF SWALE: 3:1 MAXIMUM
3. SETBACKS:
   - INFILTRATION VEGETATED SWALES MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES.
4. OVERFLOW:
   - EMERGENCY OVERFLOW PATH FOR THE 100 YEAR DESIGN STORM SHALL BE IDENTIFIED ON THE STORMWATER MANAGEMENT PLAN.
5. DRAIN ROCK:
   - SIZE: 1 1/2" - 3/4"- WASHED
   - DEPTH: 18"
6. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
7. GROWING MEDIUM:
   - 18" MINIMUM
   - FACILITY SURFACE AREA MAY BE REDUCED BY 20% WHEN GROWING MEDIA DEPTH IS INCREASED TO 30" OR MORE.
8. VEGETATION: FOLLOW LANDSCAPE PLANS OR REFER TO PLANTING REQUIREMENTS IN APPENDIX F.
9. SPLASH PAD TO TRANSITION FROM INLETS TO GROWING MEDIUM.
10. CHECK DAMS: REQUIRED FOR OVER 4% SLOPE, SHALL BE SPACED AT A MAXIMUM 2-FOOT ELEVATION INTERVALS. MAINTAIN 4 - 10 INCH DEEP ROCK CHECK DAMS AT DESIGN INTERVALS.
11. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
12. SEE WES STANDARD DRAWINGS FOR LOCATING PLANTERS IN THE PUBLIC RIGHT-OF-WAY.

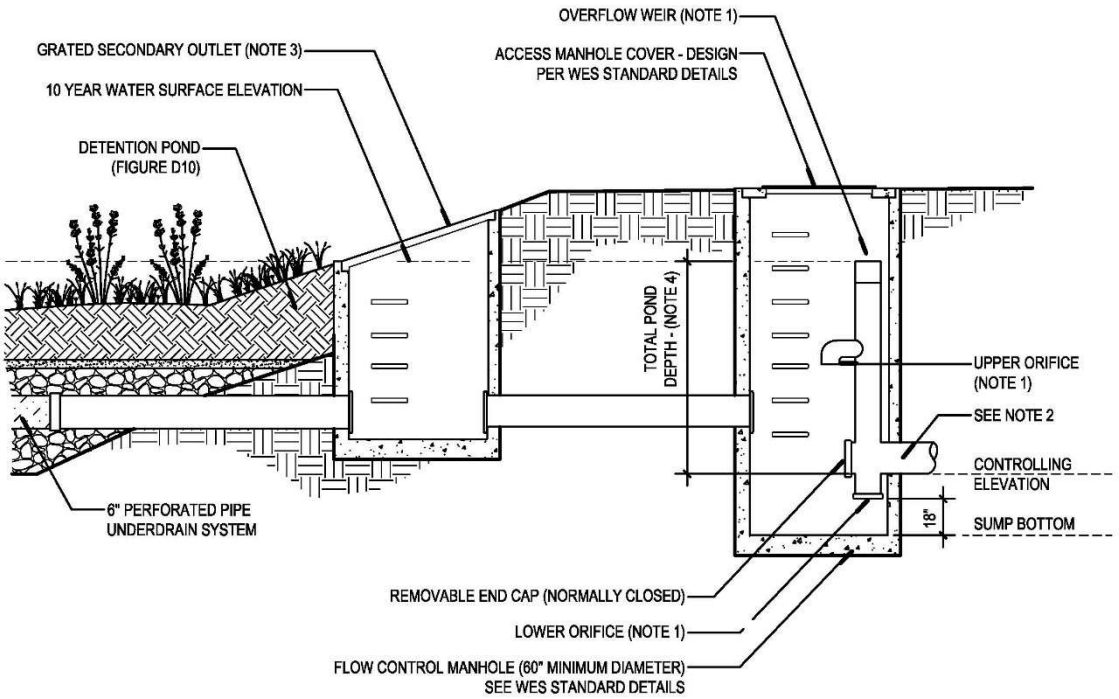
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS VEGETATED SWALE INFILTRATION	STANDARD DRAWING SWM -06



GENERAL NOTES:

1. PROVIDE PROTECTION FROM ALL VEHICLE TRAFFIC, EQUIPMENT STAGING, AND FOOT TRAFFIC IN PROPOSED INFILTRATION AREAS PRIOR TO, DURING AND AFTER CONSTRUCTION. UNLESS REQUIRED BY SITE CONDITIONS, UNLINED PONDS ARE PREFERRED TO ALLOW MAXIMUM INFILTRATION.
2. DIMENSIONS:
   - ACTIVE STORAGE DEPTH (FROM TOP OF GROWING MEDIUM TO OVERFLOW ELEVATION): PER FACILITY SIZING MODEL
   - TOTAL POND DEPTH: 4' MINIMUM, PER FACILITY SIZING MODEL
   - BOTTOM SLOPE: 2.0% OR LESS
   - SIDE SLOPES OF DETENTION POND: 3:1 MAXIMUM
3. SETBACKS:
   - DETENTION POND MUST BE 10' FROM FOUNDATIONS AND 5' FROM PROPERTY LINES UNLESS APPROVED BY BUILDING OFFICIAL.
4. PIPING:
   - PERFORATED UNDERDRAIN PIPING: SHALL BE ABS SCH. 40, DUCTILE IRON OR PVC SCH. 40. 6" MINIMUM DIAMETER. PIPING MUST HAVE 1% GRADE AND FOLLOW THE UNIFORM PLUMBING CODE. PVC NOT ALLOWED ABOVE GROUND.
5. DRAIN ROCK:
   - SIZE: 1 1/2" - 3/4" WASHED
   - DEPTH: 15" MINIMUM
6. SEPARATION BETWEEN DRAIN ROCK AND GROWING MEDIUM: SHALL BE A 3" LAYER OF 3/4" - 1/4" OPEN GRADED AGGREGATE.
7. GROWING MEDIUM:
   - 18" MINIMUM
8. VEGETATION: FOLLOW LANDSCAPE PLANS
9. WATERPROOF LINER (IF REQUIRED): SHALL BE 30 MIL PVC OR EQUIVALENT FOR DETENTION POND.
10. SEASONAL HIGH GROUNDWATER SEPARATION:
    - SEPARATION DISTANCE AS REQUIRED BY WES.
11. EMERGENCY SPILLWAY SIZED TO CONVEY THE 100 - YEAR DESIGN STORM. PROVIDE 6" MINIMUM FREEBOARD ABOVE THE 100 - YEAR DESIGN STORM.

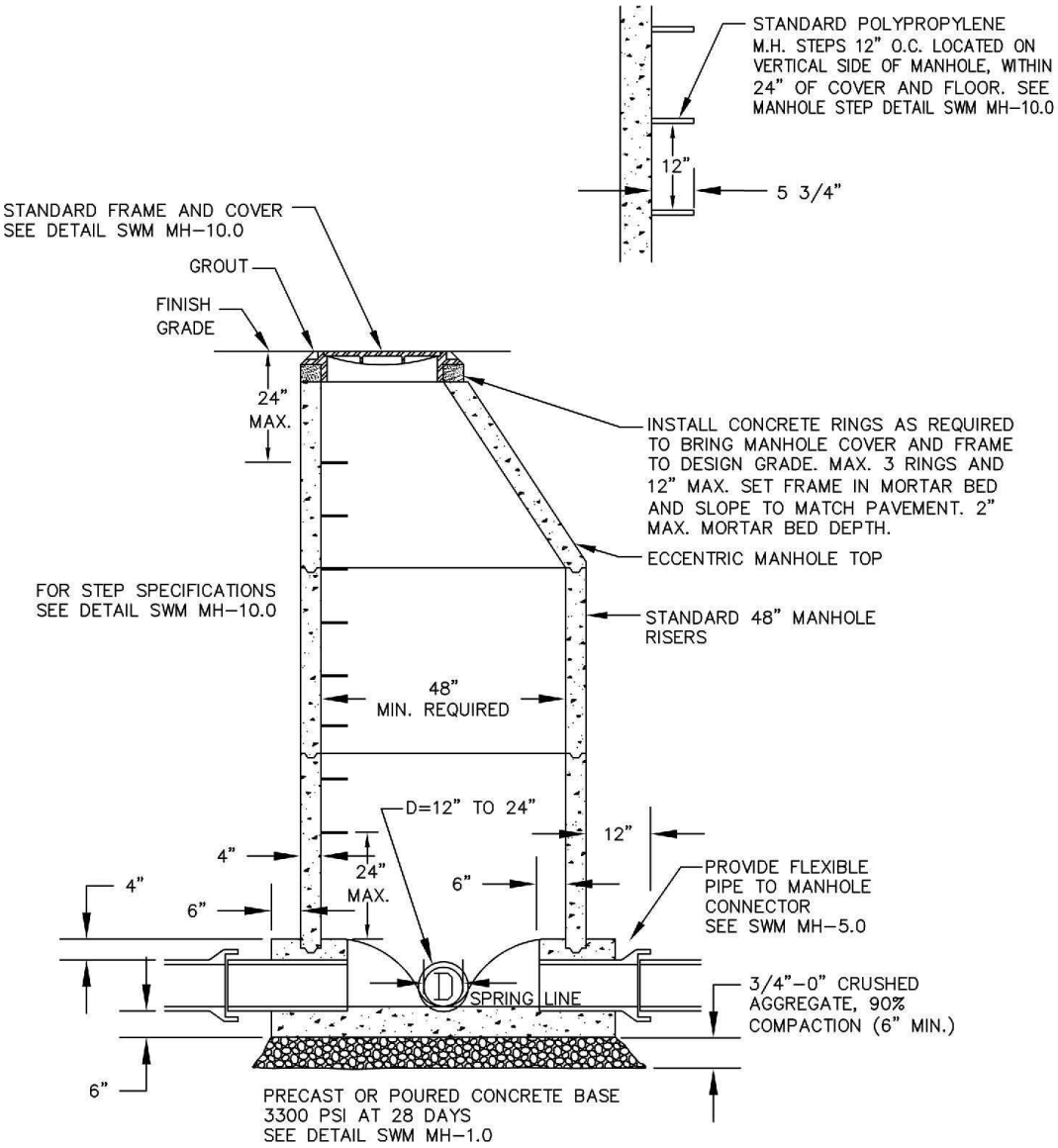
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS **DETENTION POND**	STANDARD DRAWING **SWM -10**



GENERAL NOTES:

1. ORIFICE AND WEIR DIMENSIONS AND ELEVATION DETERMINED THROUGH FACILITY SIZING MODEL.
2. PIPE SIZING DETERMINED BY ENGINEER.
3. SECONDARY OUTLET SIZED FOR PEAK DESIGN STORM.
4. TOTAL POND DEPTH - PER FACILITY SIZING MODEL, INCLUDES GROWING MEDIA, SEPARATION LAYER, AND DRAIN ROCK AS SHOWN ON FIGURE D1.

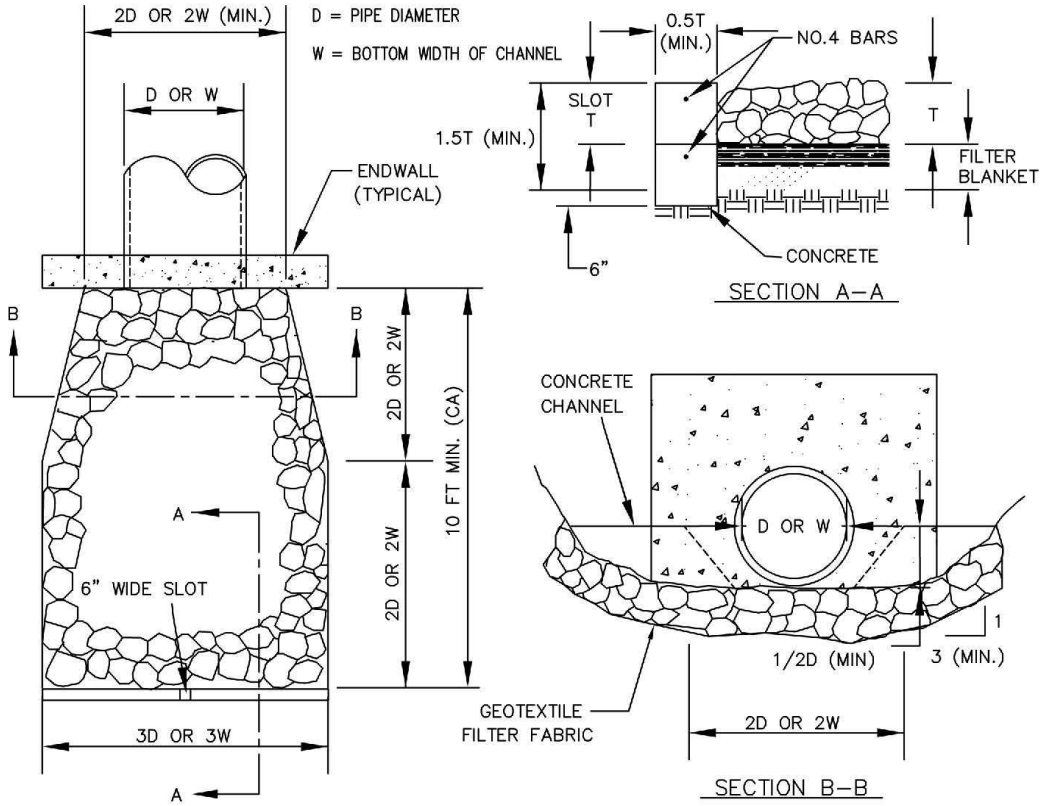
CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	DATE: July, 2022 SCALE: NTS **DETENTION POND FLOW CONTROL STRUCTURE**	STANDARD DRAWING **SWM -11**



NOTE

1. SPECIFICATIONS FOR CONCRETE AND MISCELLANEOUS MATERIALS USED IN CONSTRUCTION SHALL CONFORM TO CURRENT APWA STANDARD SPECIFICATIONS.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2021 *SCALE:* N.T.S. MH STANDARD	*STANDARD DRAWING* SWM -33



NOTES
1. PLANS SHALL SPECIFY:
   A) ROCK CLASS AND THICKNESS (T)
   B) FILTER MATERIAL, NUMBER OF LAYERS AND THICKNESS.
2. RIP RAP SHALL BE EITHER QUARRY STONE OR BROKEN CONCRETE (IF SHOWN ON THE PLANS). COBBLES ARE NOT ACCEPTABLE. SEE DETAIL SWM ST–10.1 FOR SIZING.
3. RAP RAP SHALL BE PLACED OVER FILTER BLANKET WHICH MAY BE EITHER GRANULAR MATERIAL OR PLASTIC FILTER CLOTH.
4. PLACEMENT
   A) MINIMUM DEPTH = 1–1/2 TIMES AVERAGE STONE SIZE.
   B) ROCKS SHALL BE PLACED TO PROVIDE A MINIMUM OF VOIDS.
   C) SURFACE ROCKS SHALL PROTRUDE AT LEAST 1/2 THEIR VERTICAL DIMENSION.
   D) RIPRAP IS TO BE PLACED OVER A GEOTEXTILE FABRIC ON A NATURAL BEDDING, OR IT MAY BE GROUTED OR PLACED OVER A GRAVEL BEDDING AS REQUIRED BY THE DISTRICT.

CLACKAMAS WATER ENVIRONMENT SERVICES	CLACKAMAS WES 150 BEAVERCREEK ROAD OREGON CITY, OR 97045	*APPROVAL DATE:* July, 2021 *SCALE:* N.T.S. OUTFALL RIP RAP	*STANDARD DRAWING* SWM -45

SUBMITTED TO:
Consor
1 SW Columbia, Suite 1700
Portland, Oregon 97204

BY:
Shannon & Wilson, Inc.
3990 Collins Way, Suite 100
Lake Oswego, OR 97035

(503) 210-4750
www.shannonwilson.com

GEOTECHNICAL ENGINEERING REPORT

Stafford Road (Pattulo Way to Rosemont Road) Improvements

CLACKAMAS COUNTY, OREGON

SHANNON & WILSON

May 2024

Shannon & Wilson No: 105483

PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

Submitted To: Consor
1 SW Columbia, Suite 1700
Portland, Oregon 97204
Attn: Mr. Gabriel Crop

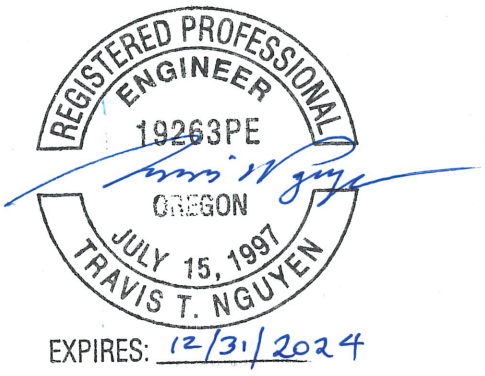
Subject: GEOTECHNICAL ENGINEERING REPORT, STAFFORD ROAD (PATTULO WAY TO ROSEMONT ROAD) IMPROVEMENTS, CLACKAMAS COUNTY, OREGON

Shannon & Wilson, Inc. (Shannon & Wilson), prepared this report and participated in this project as a consultant to Consor. Our scope of services was specified in the Task Order dated November 30, 2020, fully executed on December 15, 2020, under the agreement for services on a continuing basis dated December 16, 2020. This report presents the findings of our geotechnical explorations, the results of our geotechnical analysis, and our recommendations for the geotechnical elements of the project. This report was prepared by the undersigned.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON, INC.



EXPIRES: 12/31/2024

Travis Nguyen, PE, GE
Senior Associate | Geotechnical Engineer

Risheng "Park" Piao, PE, GE
Vice President | Geotechnical Engineer

TTN:SCS:RPP/mmb:aec:myw

CONTENTS

CONTENTS

CONTENTS

CONTENTS

Exhibits

Figures

CONTENTS

Appendices

ACRONYMS

ASTM International	American Society for Testing and Materials International
AASHTO	American Association of State Highway and Transportation Officials
bgs	below ground surface
CSZ	Cascadia Subduction Zone
FHWA	Federal Highway Administration
FWD	Falling Weight Deflectometer
GDM	Geotechnical Design Manual
GDPS	Guide of Design of Pavement Structures
LRFD	Load and Resistance Factor Design
MSE Wall	Mechanical Stabilized Earth Wall
ODOT	Oregon Department of Transportation
PDG	Pavement Design Guide
SPT	Standard Penetration Test
USCS	Unified Soil Classification System

1 INTRODUCTION

This report presents the results of our geotechnical design recommendations for the proposed Stafford Road (Pattulo Way to Rosemont Road) Improvements project (the Project) in Clackamas County, Oregon. As a consultant to Consor, Shannon & Wilson, Inc. (Shannon & Wilson) is providing geotechnical engineering services. The location of the project site is shown on the Vicinity Map, Figure 1.

This is revised to updated final traffic study Appendix F.

1.1 Scope of Services

Shannon & Wilson's services were conducted in accordance with the Task Order dated November 30, 2020, fully executed on December 15, 2020. The completed geotechnical design services for the project consisted of the following tasks:

- Performing a site reconnaissance to determine site conditions, access, potential drilling locations, and safety concerns;
- Preparing an Exploration and Testing Work Plan outlining the drilling and sampling procedures, preliminary laboratory testing plan, and traffic control plans;
- Performing the Field Exploration and Testing Program, including drilling eight borings, five shallow borings with pavement cores and five Dynamic Cone Penetrometer tests, Falling Weight Deflectometer tests, and four in situ infiltration tests;
- Performing laboratory testing;
- Evaluating subsurface conditions;
- Reviewing available existing geotechnical data including geology, soil maps, seismicity, and previous borings;
- Evaluating site-specific seismic hazards including liquefaction potential, lateral spreading, and slope instability;
- Providing design recommendations for cut and fill walls;
- Providing design recommendations for cut and fill slopes;
- Providing pavement rehabilitation design for existing pavement and new pavement design for widening areas;
- Providing earthwork recommendations, including site and subgrade preparation, excavation, backfill, and fill placement and compaction; and
- Preparing this Geotechnical Engineering Report summarizing all tasks listed above.

2 PROJECT UNDERSTANDING

2.1 Site Description

The Stafford Rd Improvements project site is along SW Stafford Road between Pattulo Way to Rosemont Road in Clackamas County, Oregon. The location of the project site is shown on the Vicinity Map, Figure 1. The site and road alignment spans over ¾ of a mile through the hills and rural area south of Lake Oswego and west of West Linn, Oregon. The northern terminus of the alignment is located just south of the roundabout intersection of Stafford Rd. and Rosemont Rd. at an elevation of approximately 432 feet. The southern terminus of the alignment is located at the intersection of Stafford Rd and Crescent Dr at an elevation of approximately 204 feet. The Tualatin River is located approximately ¼ of a mile south of the southern end of the alignment.

The project portion of Stafford Rd traverses through hilly terrain with shallow basalt bedrock underlying most of the area. Stafford Rd is a narrow, two-lane roadway that is heavily traveled throughout daytime hours and the intersections of Childs Rd and Johnson Rd commonly experience traffic congestion. The two-lane road traverses a winding path through narrow and undulating terrain with limited shoulder area. Childs Rd meets Stafford Rd from the west of Lake Oswego and the roadway is built upon an approximately 10 to 15 foot fill embankment at the intersection with Stafford Rd. Exhibit 2-1 shows the intersection of Stafford Rd and Childs Rd. Johnson Rd meets Stafford Rd from the southeast where it curves sharply to the north along an undulating hillside near the intersection as shown in Exhibit 2-2.

Exhibit 2-1: View looking east on Childs Rd showing the intersection of Child Rd and Stafford Rd.

Exhibit 2-2: View looking south on Stafford Rd showing the intersection of Stafford Rd and Johnson Rd.

2.2 Project Description

This project will improve SW Stafford Road between SW Pattulo Way and SW Rosemont Road by adding bike lanes, realigning the intersections of SW Childs Road and SW Johnson Road to reduce or eliminate the existing intersection skews, adding a southbound left-turn lane at SW Johnson Road, and adding a roundabout at SW Childs Road. SW Stafford Road will generally consist of a 2-lane cross section with bike lanes and shoulders. Northbound and southbound turn lanes will also be added at the intersection of SW Childs Road, as needed. Improvements also included are culvert replacement at Pecan Creek on SW Childs Road, a Mechanical Stabilized Earth (MSE) wall to support roadway widening on the south side of the intersection of SW Childs Road and SW Stafford Road, and new asphalt pavement for a roundabout at the intersection of SW Childs Road and SW Stafford Road, and asphalt pavement rehabilitation and new asphalt pavement for widening on Stafford Road.

A traffic signal alternative at the intersection of Stafford Road and Childs Road was previously considered and is no longer being pursued. If a change is made from the roundabout alternative to a signal alternative, additional geotechnical design recommendations for a traffic signal and soldier pile wall will be needed.

3 REGIONAL GEOLOGY AND SEISMIC SETTING

3.1 Regional Geology

The Stafford Road Improvements site is located at the northeastern margin of the Willamette Valley within the Tualatin Basin. The Tualatin Basin is bounded to the southwest by the Gales Creek Fault zone and to the northeast by the Portland Hills and formed after the eruption of the Columbia River Basalts. The Tualatin Basin is thought to be formed by the lateral movement of the bounding fault systems causing a pull-apart effect which down-dropped the Columbia River Basalt and basement rock units within the area of the bounding faults (McPhee and others, 2014).

Basalt flows of the Columbia River Basalt Group (CRBG) make up the basement rock of the Portland and Tualatin basins. The CRBG flows erupted from linear fissures located in eastern Washington and eastern Oregon near the Idaho border. Several large and very fluid individual flows reached western Oregon between approximately 17 million and 6 million years ago (Beeson and others, 1989). The CRBG flows underlie much of the Portland metropolitan area and the Tualatin Valley at depth but occasionally outcrop at the surface or near surface in the form of small hills or buttes, which protrude from the basin sediments (Beeson and others, 1989).

During the late stages of the last great ice age, between about 18,000 and 15,000 years ago, a lobe of the continental ice sheet repeatedly blocked and dammed the Clark Fork River in western Montana, which then formed an immense glacial lake called Lake Missoula. The lake grew until its depth was sufficient to buoyantly lift and rupture the ice dam, which allowed the entire massive lake to empty catastrophically. Once the lake had emptied, the ice sheet again gradually dammed the Clark Fork Valley and the lake refilled, leading to 40 or more repetitive outburst floods at intervals of decades (Allen and others, 2009). During each short-lived episode, floodwaters washed across the Idaho panhandle, through the eastern Washington scablands, and through the Columbia River Gorge. The catastrophic floods deposited extensive gravel bars across east Portland and up to 50 feet of micaceous clay to fine sandy silt in the Tualatin Basin. In mapping by O'Connor and others (2001), these sediments are referred to as Fine-Grained Missoula Flood Deposits.

Colluvium overlying residual soils of the Columbia River Basalt developed over time from weathering and erosion. In more recent times, humans have changed the landscape, grading cuts, and fills for development.

3.2 Seismic Setting

Earthquakes in the Pacific Northwest occur largely because of the region's proximity to an active convergent plate boundary. At this boundary, dense oceanic crust is subducting beneath less dense continental crust. At this subduction plate boundary (known as the Cascadia Subduction Zone, or CSZ), the Explorer, Juan de Fuca, and Gorda Oceanic Plates are subducting beneath the overriding, westward-moving North American Plate. Oblique convergence of these plates not only results in east-west compressive strain, but also results in dextral (right lateral) shear, clockwise rotation, and north-south compression of accreted crustal blocks that form the leading edge of the North American Plate (Wells and others, 1998). The CSZ extends about 750 miles from northern California to southern British Columbia and lies approximately 98 miles west of the project site. Within the present understanding of the regional tectonic framework and historical seismicity, three broad seismogenic sources have been identified:

- A mega-thrust source at the interface between the North American and Juan de Fuca plates in the CSZ;
- A deep intraslab source in the subducted Juan de Fuca Plate, within the CSZ; and
- A shallow crustal source within the North American Plate.

The following sections briefly describe the location, characteristics, and seismicity of each of the sources.

3.2.1 Cascadia Subduction Zone (CSZ); Mega-Thrust Interface Source

CSZ mega-thrust earthquakes originate along the interface between the subducting oceanic plates and the North American plate. Because of the significant uncertainty of the landward extent of a potential rupture surface, estimates of the closest distance between the project and potential rupture surface range from about 80 to 105 horizontal miles. Focal depths for mega-thrust earthquakes are commonly on the order of about 15 to 25 miles. Rupture of the interface could result in earthquakes with moment magnitudes on the order of 8.5 to over 9.0, with strong shaking that lasts for several minutes. No large earthquakes have occurred in this zone during historic times (the last 170 years). However, geologic evidence suggests that coastal estuaries have experienced rapid subsidence at various times within the last 2,000 years (e.g., Atwater, 1987; Atwater and Hemphill-Haley, 1997) due to tectonic movement associated with mega-thrust earthquakes on the CSZ. It appears that ruptures of this zone have occurred at irregular intervals that span from about 100 to more than 1,200 years, with an average recurrence interval of about 300 to 500 years (Atwater and Hemphill-Haley, 1997). Based on historical tsunami records in Japan (Satake and others, 1996) the most recent interplate event on the CSZ was a moment magnitude (Mw) 9 event on January 26, 1700.

3.2.2 Cascadia Subduction Zone: Intraslab Source

CSZ intraslab earthquakes originate from within the subducting oceanic plates due to down-dip tensional forces and bending, caused by mineralogical and density changes in the plates at depth. These earthquakes typically occur 28 to 37 miles beneath the surface. Ludwin and others (1991) estimate that the maximum Mw from this source zone would be about 7.5. Ground shaking produced by intraplate earthquakes would generally be less intense and less prolonged in the project area than ground motions generated by large subduction zone interface earthquake events. Historic seismicity from this source zone includes the 1949 Mw 6.7 Olympia earthquake; the 1965 Mw 6.7 earthquake between Tacoma and Seattle; and the 2001 Mw 6.8 Nisqually earthquake. While intraslab events have occurred frequently in the Puget Sound area, they are historically rare in Oregon.

3.2.3 Shallow Crustal Source

Shallow crustal earthquakes within the North American Plate have historically occurred in a diffuse pattern within the Pacific Northwest, typically within the upper 4 to 19 miles of the continental crust. The largest known crustal earthquake in the Pacific Northwest is the 1872 North Cascades earthquake at approximately Mw 6.5 to 7.0. Other examples include the 1993 Mw 5.6 Scotts Mill earthquake and the 1993 Mw 6.0 Klamath Falls earthquake.

Shallow crustal faults and folds throughout Oregon and Washington have been located and characterized by the United States Geological Survey (USGS). The USGS provides approximate fault locations and a detailed summary of available fault information in the USGS Quaternary Fault and Fold Database (USGS, 2019). The database defines four categories of faults, Class A through D, based on evidence of tectonic movement known or presumed to be associated with large earthquakes during the Quaternary time (within the last 2.6 million years). For Class A faults, geologic evidence demonstrates that a tectonic fault exists and that it has likely been active within the Quaternary period. For Class B faults, there is equivocal geologic evidence of Quaternary tectonic deformation, or the fault may not extend deep enough to be considered a source of significant earthquakes. Class C and D faults lack convincing geologic evidence of Quaternary tectonic deformation or have been studied carefully enough to determine that they are not likely to generate significant earthquakes.

According to the USGS Quaternary Fault and Fold database (USGS, 2019), there are twelve Class A features and one Class B feature within approximately 30 miles of the project site. Their names, general locations relative to the site, and the time since their most recent deformation are summarized in Exhibit 3-1. The CSZ itself is approximately 123 miles west of the site, with an average slip rate of approximately 40 millimeters (1.5 inches) per year

and the most recent deformation occurring about 300 years ago (Personius and Nelson, 2006).

Exhibit 3-1: USGS Class A and B Faults Within a 30-mile Radius of the project site.

Fault Name	USGS Fault Number	USGS Class	Approximate Distance and Direction from Site	Slip Rate	Time Since Last Deformation
Canby-Molalla Fault	716	A	1.1 miles SW	<0.2 mm/yr	<15 ka
Bolton Fault	874	B	1.9 miles NE	<0.2 mm/yr	<1.6 Ma
Oatfield Fault	875	A	3.0 miles NE	<0.2 mm/yr	<1.6 Ma
Portland Hills Fault	877	A	4.6 miles NE	<0.2 mm/yr	<1.6 Ma
Damascus-Tickle Creek Fault Zone	879	A	6.8 miles NE	<0.2 mm/yr	<750 ka
Beaverton Fault Zone	715	A	8.0 miles NW	<0.2 mm/yr	<750 ka
Grant Butte Fault	878	A	8.8 miles NE	<0.2 mm/yr	<750 ka
East Bank Fault	876	A	8.8 miles N	<0.2 mm/yr	<750 ka
Newberg Fault	717	A	14.3 miles SW	<0.2 mm/yr	<1.6 Ma
Helvetia Fault	714	A	15.3 miles NW	< 0.2 mm/yr	< 1.6 Ma
Gales Creek Fault Zone	718	A	19.0 miles NW	<0.2 mm/yr	<1.6 Ma
Mount Angel Fault	873	A	19.4 miles SW	<0.2 mm/yr	<15 ka
Lacamas Lake Fault	880	A	20.2 miles NE	< 0.2 mm/yr	< 750 ka

NOTES:
Approximate distance from site center to nearest extent of fault mapped at the ground surface.
mm = millimeters; yr = year.
Ma = “Mega-annum” or million years ago; ka = “Kilo-annum” or one thousand years ago.

4 FIELD EXPLORATION AND LABORATORY TESTING

4.1 Pavement Assessment

A visual assessment of the pavement surface conditions for the pavement sections within the project limits was performed on February 10, 2021. Results of the pavement condition survey are discussed in Section 4.2. Pavement section stiffness was measured using Falling Weight Deflectometer (FWD) testing. A total of 2 FWD test lines were completed and are summarized in Section 4.2. Detailed results of the FWD testing program performed by RhinoOne Geotechnical are included in Appendix C, Falling Weight Deflectometer Test Data. The approximate locations of the FWD test lines are shown on the Site and Exploration Plan, Figure 2.

Five (5) pavement borings designated P-1 through P-5 were drilled on February 17 and 18, 2021 using a trailer-mounted Simco 2800 drill rig provided and operated by Greg Vandehey Soil Sampling out of Forest Grove, Oregon. The pavement borings ranged in depth from 4.0 to 11.5 feet and included pavement core sampling and Dynamic Cone Penetrometer tests in each boring. The borings were drilled using solid stem auger drilling techniques. The approximate locations of the pavement borings are shown on the Site and Exploration Plan, Figure 2.

4.1.1 Visual Pavement Assessment

SW Stafford Road, between Rosemont Road and SW Pattulo Way, is approximately 4,322 centerline feet and was surveyed for pavement conditions. The pavement surface is constructed with asphalt concrete (AC).

Station 0+00 was selected as the intersection of Stafford Road and Rosemont Road (the "Yield" sign). Station numbers increase towards the south end of the project limit at the intersection of SW Stafford Road and SW Pattulo Way. The fog line on the NB lane was used for station numbering. Pavement conditions are presented below. Stationing for pavement field explorations and design are shown in green color on the Site and Exploration Plan, Figure 2.

4.1.1.1 Pavement Section Between Stations 0+00 and 3+20

This section's cross section seems to be different from the adjacent pavement as there is a transverse crack at station 3+20 that seems to be a construction joint reflected from the bottom layers of the pavement. This section exhibits the following distresses:

- Moderate severity raveling especially in the wheel paths.
- There are moderate severity non-wheel path longitudinal and transverse cracks, and some are interconnected showing patterns of onset of block cracking.
- Moderate to high-severity fatigue cracking is also evident in this section.
- There is a small area (4′ by 4′) exhibiting high-severity fatigue cracking at station 1+15.
- There are 3 instances of small (1′ by 1′) low to moderate-severity potholes in the form of shallow delamination.
- There is a moderate to high severity patch approximately 50′ by 5′ approximately between stations 1+00 and 1+50.

The entire section can generally be rated to be in fair-poor condition.

4.1.1.2 Pavement Sections Approximately Between Stations 3+20 and 40+99

There is a transverse crack at station 40+99 that seems to be a construction joint reflected from the bottom layers of the pavement.

This section exhibits the following distresses:

- Moderate severity raveling especially in the wheel paths.
- An isolated moderate severity non-wheel path longitudinal crack approximately at station 32+28.

The entire section can generally be rated to be in good-fair condition.

4.1.1.3 Pavement Sections Approximately Between Stations 40+99 and 43+22

This section is from station 40+99 to the south end of the project limits and exhibits the following distresses:

- Moderate severity raveling especially in the wheel paths.
- An isolated moderate severity wheel path longitudinal crack (fatigue crack) approximately at station 41+18.
- An isolated low to moderate severity non-wheel path longitudinal crack (close to the edge of the pavement) approximately at station 43+20.

The entire section can generally be rated to be in good-fair condition.

4.1.2 FWD Testing

Non-destructive Falling Weight Deflectometer (FWD) tests were conducted by our subcontractor, Rhino One Geotechnical, in accordance with ASTM D4694 and D4695 using a KUAB FWD. FWD tests were performed in wheel paths along two lines within the project limits. The FWD testing was conducted in the northbound and southbound travel direction across SW Stafford Road.

The FWD testing was performed at an interval of approximately 200 feet. The subcontractor measured and recorded deflections at 0, 8, 12, 18, 24, 36, and 60 inches from the impact location, and all results were normalized to a 9,000-pound load. The approximate locations of the FWD lines are shown on the Site and Exploration Plan, Figure 2.

Information about the pavement sections and subsurface materials gathered in our field explorations was used in the FWD back calculation analysis. The FWD testing data and results are presented in Appendix C, Falling Weight Deflectometer Test Report.

4.2 Geotechnical Explorations

4.2.1 Borings

Subsurface conditions for the geotechnical analysis were explored with eight (8) geotechnical borings designated B-1 through B-8, one hand auger boring designated HA-1, and one infiltration test designated FH-3. The geotechnical borings were drilled from October 12, 2021, to November 3, 2021, using a truck-mounted CME-75 drill rig, a track-mounted Geoprobe 7822DT drill rig, and a CME-55X ATV drill rig, all provided and operated by Western States Soil Conservation, Inc. of Hubbard, Oregon. The borings were advanced to depths ranging from 22.0 to 41.5 feet below the existing ground surface using open-hole mud rotary drilling and HQ-wireline coring techniques. Boring locations were measured relative to objects in the field and handheld GPS, and the approximate boring locations are shown on the Site and Exploration Plan, Figure 2.

4.2.2 In-Situ Infiltration Tests

Four in-situ infiltration tests were proposed and designated as FH-1 through FH-4, but one infiltration test FH-3 was performed. Bedrock was encountered between 3 to 5 feet below ground surface (bgs) at infiltration test FH-1 and FH-4 locations. At the infiltration test FH-2 location, the test was performed during a rainy date and the water level in the infiltration hole rose to the pavement surface and the test was terminated based on our discussion with Consor. The tests were performed in general accordance with the Encased Falling Head Test Procedure described in the Portland Stormwater Management Manual. Detailed infiltration test procedures and infiltration field results are presented in Appendix B. Safety factors should be applied to the design based on the Portland Stormwater Management Manual.

A Shannon & Wilson geologist was on site throughout the exploration program to locate the borings, observe the drilling, collect samples, log the materials encountered, and perform infiltration tests. Details of the exploration program, including descriptions of the techniques used to advance and sample the borings, logs of the materials encountered, rock core photographs, and backfill details are presented in Appendix B, Field Explorations.

4.3 Laboratory Testing

Laboratory tests were performed on selected samples from the field explorations to determine basic index and engineering properties of the soils encountered. The soil testing program included visual soil classification, moisture content tests, Atterberg limits tests, particle-size analyses, consolidation tests, and unconfined compressive strength tests.

Testing was performed by Shannon & Wilson at our in-house laboratory in Lake Oswego, Oregon, and Northwest Testing Inc. out of Wilsonville, Oregon. All tests were performed in accordance with applicable ASTM International (ASTM) standards. The results of the laboratory tests and brief descriptions of the test procedures are presented in Appendix D, Laboratory Testing Results.

5 SUBSURFACE CONDITIONS

We grouped the materials encountered in our field explorations into five geotechnical units, as described below. Our interpretation of the subsurface conditions is based on the explorations and regional geologic information from published sources. The geotechnical units are as follows:

- **Fil**l: soft to very stiff, Silty Clay with varying amounts of sand and gravel (CL); medium stiff to very stiff, Silt with some sand and Sandy Silt with trace gravel (ML); stiff, Clay (CH); medium stiff, Silty Clay to Clay with some sand (CL/CH); dense, Sandy silty Gravel (GM);
- **Colluvium:** medium stiff, Silt with trace sand (ML); medium stiff to stiff, Silty Clay with trace sand (CL);
- **Missoula Flood Deposits – Fine-Grained Facies:** medium stiff, Silty Clay with trace sand (CL); stiff to hard and loose to medium dense, Silt with trace to some sand (ML);
- **Residual Soil:** stiff to very stiff, Clayey Silt with varying amounts of sand and gravel (MH); very stiff, Silty Clay and Silty Clay with some gravel and sand (CL); very dense, Sandy Silty Gravel (GM); medium dense to very dense, Sandy Clayey Gravel (GC); dense to very dense, Silty Sand (SM); cobbles encountered in the unit;
- **Decomposed Columbia River Basalt:** very dense, Sandy Silty Gravel (GM); very dense, Silty Sand with some gravel (SM); cobbles and possible boulders encountered in unit; and
- **Columbia River Basalt:** fresh to highly weathered, very soft to very hard (R2-R5), Basalt.

These geotechnical units were grouped based on their engineering properties, geologic origins, and their distribution in the subsurface. Contacts between the units may be more gradational than shown in the profiles, cross sections, and drill logs in Appendix A. The Standard Penetration Test (SPT) N-values presented in the figures and discussed below are counted in the field (uncorrected). The following sections describe the geotechnical unit characteristics in greater detail.

5.1 Subsurface Soil Units

5.1.1 Fill

Fill is material typically placed during land or roadway development either to bring up low areas or as embankments to create usable ground above floodplains and includes upper pavement sections. Fill was encountered at the surface in borings B-3, B-5, B-6, B-7, and all the pavement borings, and extended to depths ranging from 2.5 to 13 feet bgs. Pavement sections were encountered at the ground surface in all the borings mentioned and included asphalt concrete, base aggregate, and in some places Portland cement concrete. These sections generally consisted of 10 to 17 inches of asphalt concrete over gravelly base aggregate material. In pavement borings P-1, P-3, and P-5, 7- to 8-inch thick sections of Portland cement concrete were encountered below the asphalt concrete. The Fill material underlying the pavement sections generally consisted of soft to very stiff, Silty Clay with varying amounts of sand and gravel (CL); medium stiff to very stiff, Silt with some sand and Sandy Silt with trace gravel (ML); stiff, Clay (CH); medium stiff, Silty Clay to Clay with some sand (CL/CH); dense, Sandy silty Gravel (GM). The Fill material contains varying amounts of fine sand, and the fines constituent is generally low to high plasticity. The unit typically exhibits a disturbed texture and contains trace organics and rootlets. SPT N-values in the Fill unit ranged from 8 to 36 blows per foot (bpf) and averaged 12 bpf. Natural moisture contents of two samples of Fill indicated moisture contents of 26 and 36 percent. A single Atterberg limit test was performed in the Fill which indicated a plasticity index of 26 and a liquid limit of 50, with a Unified Soil Classification System (USCS) designation of CL/CH.

5.1.2 Colluvium

Colluvium was encountered below the Fill in borings B-4, B-8, P-1, and HA-1, and extended to depths ranging from 4.5 to 7 feet bgs. The unit generally consists of medium stiff, Silt with trace sand (ML); medium stiff to stiff, Silty Clay with trace sand (CL). The sand constituent is generally fine to coarse and the fines constituent in the colluvium is generally low to medium plasticity. SPT N-values in the Colluvium unit ranged from 7 to 14 bpf and averaged 10 bpf.

5.1.3 Missoula Flood Deposits – Fine-grained Facies

Missoula Flood Deposits (MFDs) – Fine-grained Facies were encountered in borings B-1, B-2, P-4, and P-5 below the Fill and extended to a depth between 4.5 to 10 feet bgs. Borings P-4 and P-5 were terminated in the unit. The unit generally consisted of medium stiff, Silty Clay with trace sand (CL); stiff to hard, and loose to medium dense, Silt with trace to some sand (ML). The sand constituent is generally fine. The fines were generally low to high

plasticity. Slight to moderate iron oxidation and staining was often and the unit was generally micaceous. SPT N-values in the unit ranged from 6 to 30 bpf and averaged 12 bpf.

5.1.4 Residual Soil

Residual Soil was encountered below MFDs in borings B-1, and B-2, below Fill in borings B-3, B-5, B-6, B-7, and P-3, and below Colluvium in borings B-4, B-8, P-1, and HA-1. The Residual Soil extended to depths ranging from 4 to 17.5 feet bgs and borings P-1, P-2, P-3, and HA-2 were terminated in the unit. The unit generally consisted of soft to very stiff, Silty Clay with varying amounts of sand and gravel (CL); medium stiff to very stiff, Silt with some sand and Sandy Silt with trace gravel (ML); stiff, Clay (CH); medium stiff, Silty Clay to Clay with some sand (CL/CH); dense, Sandy silty Gravel (GM). The Residual Soil material contains varying amounts of fine to coarse sand, and the gravel constituent is fine to coarse and subangular to subrounded. The fines constituent is generally nonplastic to high plasticity. The Residual Soil typically exhibits relict basalt textures, slight to heavy iron oxide staining, and cobbles were commonly encountered. The cobbles are interpreted to be fragments of basalt which are less weathered. SPT N-values in the unit ranged from 12 to 87 bpf and averaged 30 bpf, with four SPTs attempted meeting refusal, where over 50 blows are required to advance the sampler six inches. Natural moisture contents of selected samples ranged from 28 and 53 percent. Atterberg limit tests performed in the unit indicated plasticity indices ranging from 27 to 38 with USCS classifications of CH and MH.

5.1.5 Decomposed Columbia River Basalt

Decomposed Columbia River Basalt was encountered in boring B-3 between 7 and 17.5 feet and consisted of very dense, Sandy Silty Gravel (GM); and very dense, Silty Sand with some gravel (SM). Cobbles and boulders were encountered and interpreted to be fragments and blocks of basalt which are less weathered. The gravel constituent is fine to coarse and subangular to subrounded and the sands were generally fine to coarse. The fines constituent is generally low plasticity. All three SPTs attempted in the unit met refusal.

5.1.6 Columbia River Basalt

Columbia River Basalt was encountered in borings B-1 through B-8 at depths ranging from 9 to 23 feet bgs. The unit is inferred to have been encountered in boring P-2 at a depth of approximately four feet after the solid stem auger met refusal. The Columbia River Basalt within the project area generally consisted of fresh to highly weathered, very soft to very hard (R2-R5), Basalt. Recovery from core sample runs ranged from 0 to 100 percent and averaged 57 percent. Rock quality designation (RQD) from core sample runs ranged from 0 to 100 percent and averaged 37 percent. Uniaxial Compressive Strength tests (UCS)

performed on selected rock core samples indicated UCS values of 9,375 and 32,521 pounds per square inch (psi) indicating relative rock hardness of R4 and R5 respectively.

5.2 Groundwater

The geotechnical borings (borings B-1 through B-8) performed for this study were drilled using mud rotary techniques that make it difficult to discern the depth to groundwater because of the use of drilling fluids in the boreholes. The pavement borings (P-1 through P-5) were drilled using solid stem auger techniques and perched water was encountered in boring P-1 at 3.5 feet. Perched water could also possibly be encountered within the contact zones between soil layers and bedrock within the project area. Surface water is likely to be encountered within the project area near Pecan Creek, existing culvert locations, and other topographic low points.

According to the Oregon Water Resources Department (WRD) Well Report Mapping Tool, wells near the project area encountered groundwater at depths of approximately 150 feet bgs to 300 feet bgs (OR WRD, 2021).

Groundwater levels should be expected to vary with changes in precipitation, time of year, topography, or other factors not observed during our subsurface explorations. Locally, groundwater highs typically occur in the late fall to spring, and groundwater lows typically occur in the late summer and early fall.

6 SEISMIC HAZARD EVALUATION

6.1 Site Class

The Seismic Site Class for this location was developed based on the recommended procedure in the American Association of State Highway and Transportation Officials (AASHTO) Bridge Design Specifications, 2020. Our evaluation, based on the subsurface conditions described in Section 5, indicates that the site is classified as Site Class D. Site Class D corresponds to soft clay with an average shear wave velocity between 600 and 1,200 feet per second (fps), or an average SPT blow count between 15 and 50 bpf in the upper 100 feet of soil.

6.2 Ground Motion Parameters

In general, Clackamas County follows ODOT GDM design requirements and therefore, the project will use ODOT seismic design criteria for the retaining wall. The ODOT GDM requires that all bridge retaining walls and highway retaining walls be designed for 1,000-year return period ground motions under "Life Safety" criteria. Highway retaining walls

(i.e., retaining walls located beyond 100 feet of bridge abutments) must be designed to withstand seismic forces and displacements without failure of any part of the wall.

For engineering design, the ODOT GDM recommends that the peak ground acceleration (PGA), and other seismic ground motions, be based on the 2014 U.S. Geological Survey (USGS) Seismic Hazard Map data for the Pacific Northwest Region. The recommended ground motion parameters corresponding to 1,000-year return periods (Life Safety) are provided in Exhibit 6-1.

Exhibit 6-1: Ground Motion Parameters for 1000yr Return Period (Life Safety) Design Response Spectra

Seismic Parameter	USGS Class
Site Class	D
Site Factor, F_{pga}	1.34
Peak Ground (Bedrock) Acceleration, PGA	0.26g
Peak Ground Surface Acceleration, A_S	0.35g
Site Factor, F_a	1.34
Short Period Acceleration, S_s	0.58g
Site Factor, F_v	2.18
Long Period Acceleration, S_1	0.21g
Seismic Design Category	C

NOTES:
g = gravity acceleration

6.3 Geo-Seismic Hazards

6.3.1 General

The expected seismic hazards at the project site are primarily ground shaking. Other seismic hazards, such as liquefaction, fault rupture, tsunami, and seiche are not considered hazards for this site. The following sections include a discussion of the relevant seismic hazards present at the project site.

6.3.2 Liquefaction

Soil liquefaction is a phenomenon in which excess pore water pressure of loose to medium-dense, saturated, granular soils increases during ground shaking to a level near the initial effective stress. The increased excess pore pressure results in a reduction of soil shear strength. The effects of liquefaction typically include lateral spreading, slope instability, and ground settlement.

Borings B-5 through B-8 for MSE walls were evaluated for potentially liquefiable soil layers. The site is underlain by medium to high plastic clay and dense to very silty sand, sandy gravel, and clayey gravel and groundwater is at a depth greater than 100 feet. Based on our screening analysis and the 2018 ODOT GDM liquefaction susceptibility criterion, we do not expect the soils encountered at the site to be susceptible to liquefaction, and therefore, the risk of liquefaction at the site is low.

7 ENGINEERING DESIGN RECOMMENDATIONS

7.1 General

Design recommendations are based on the data collected in this report, the additional information provided by Consor, and our review of the available existing information. Geotechnical design recommendations are provided for the proposed culvert replacement, MSE wall, and optional soldier pile wall in the following sections. Also, key construction considerations were developed associated with the geotechnical design recommendations. If foundation types or configurations change after this report, Shannon & Wilson should be contacted to provide updated recommendations.

We understand that the retaining wall will be designed considering the following manuals and specifications:

- AASHTO LRFD Bridge Design Specifications (AASHTO, 2020), referred to herein as AASHTO;
- the ODOT GDM (ODOT, 2023a), referred to herein as the ODOT GDM;
- the Oregon Standard Specifications for Construction (ODOT, 2021), referred to herein as OSSC;
- ODOT Soil and Rock Classification Manual, 1987; and
- Applicable FHWA geotechnical guidelines.

We have provided design recommendations for the culvert, culvert headwalls, and MSE wall including service limit state, strength limit state and extreme limit state bearing resistance, estimated settlements, and lateral earth pressures. The following sections present our design evaluation and recommendations. Final drawings for the culvert, headwalls, and MSE wall are included in Appendix E, Design Recommendations for Culvert Replacement.

7.1.1 General

The existing culvert at Pecan Creek is located on SW Childs Road near the intersection with SW Stafford Road. The existing culvert is a 36-inch diameter concrete pipe. We understand that the culvert will be replaced with a steel arch culvert on continuous spread footings. The steel culvert is approximately 13 feet wide (interior span length), 7 feet high (rise), and 193 feet in length. The proposed invert of the inlet is at an approximate elevation of 344 feet. The proposed invert of the outlet is at an approximate elevation of 336 feet. Up to 3 feet of streambed materials will be placed along the bottom of the culvert. The width of the culvert continuous spread footings is approximately 4 feet wide. We understand that the culvert manufacturer will furnish the design.

7.1.2 Culvert Foundation Subgrade Preparation

The proposed steel arch culvert will be located between borings B-5 and B-6, but approximately 10 to 20 feet to the east of boring B-5. Based on boring B-5 and the proposed culvert foundation elevations, we anticipate the culvert footings will be placed in basalt (Columbia River Basalt). The basalt layer present between elevations 338 and 344 feet was drilled and is classified as slightly weathered to moderately weathered, soft (2), joint structure indiscernible in the SPT sample. This basalt layer may require rock excavation. Recommendations for rock excavation are provided in Section 9.3. We recommend a 6-inch-thick leveling pad be placed between the basalt rock subgrade and culvert footing. The leveling pad material should consist of Gravel Leveling Pads Backfill per OSSC Section 00596A.11(a).

Silt and silty clay (Fills from Existing Embankment) and Clay (Residual Soil) are not anticipated to be present at the footing subgrade. However, if silty and clayey soils are present at the footing subgrade, then the silty and clayey soils should be removed and replaced with ODOT Granular Wall Backfill per OSSC Section 00510.12, Granular Structure Backfill per OSSC Section 00510.13, or MSE Granular Wall Backfill per OSSC Section 00596A.11(b).

7.1.3 Culvert Lateral Earth Pressure

Based on the structural design information and the above assumptions, the lateral earth pressures on the culvert walls were developed according to the ODOT GDM and AASHTO LRFD Bridge Design Specifications. The lateral earth pressures on the retaining walls depend on the type of wall (i.e., yielding or non-yielding), the type and method of placement of backfill against the wall, the magnitude of surcharge weight on the ground surface adjacent to the wall, the slope of the backfill, and the design criteria. We recommend the proposed culvert walls be designed with at-rest (non-yielding) lateral earth

pressures. The lateral earth pressure distribution for the culvert walls are shown on Figure 3, Lateral Earth Pressure Distribution on Embedded Culvert Walls. We assume that the culvert walls will be backfilled using ODOT Granular Wall Backfill, Granular Structure Backfill, or MSE Granular Wall Backfill. We have provided lateral earth pressures dependent on the groundwater level and height of roadway embankment fill. The structural engineer should determine the appropriate groundwater level for the culvert design. The earth pressures presented are independent of other structural considerations, including wall stiffness, load factoring, and crack control.

7.1.4 Culvert Bearing Resistance

We performed bearing resistance analysis in accordance with the ODOT GDM and AASHTO LRFD. Based on the explored subsurface conditions and design drawings, we expect that the culvert will be founded on basalt or ODOT granular backfill in according with Section 7.2.2. We recommend nominal bearing resistances of 9,000 pounds per square foot (psf) for continuous spread footings. A resistance factor of 0.45 should be used to calculate factored bearing resistance for the strength limit state. For the service limit state with settlement up to 1 inch, we recommend a nominal bearing resistance of 4,000 psf and a resistance factor of 1.0.

7.1.5 Culvert Settlement

Assuming the recommendations provided in Section 7.2.2 are implemented, we anticipate that the settlement will be less than 1 inch and differential settlements will be limited to less than 0.5 inches.

7.2 Design Recommendations for Culvert CIP Headwalls

7.2.1 General

Culvert headwalls on the upstream side will consist of a cast-in-place (CIP) cantilevered wall. The proposed cantilevered wall has a maximum exposed height and length of approximately 21 feet and approximately 64 feet, respectively. The wall will be tapered to the existing roadway embankment surface at both ends. The wall will have a 2H:1V backslope. The upstream headwall will have an expansion joint approximately 2 to 4 feet to the west of the culvert.

On the downstream side, there will be a small headwall within the MSE wall for widening the roadway. The culvert headwall on the downstream side will consist of a CIP cantilevered wall. The proposed cantilevered wall has a maximum exposed height and length of approximately 8 feet and approximately 15 feet, respectively. Final drawings are included in Appendix E.

7.2.2 CIP Headwall Foundation Subgrade Preparation

Borings B-5 and B-8 were used to provide design recommendations for the proposed upstream headwall, approximately 70 to 80 feet to the west of boring B-8. Based on boring B-5 and the proposed culvert foundation elevations, we anticipate the headwalls will be placed on very dense sandy silty gravel (Residual Soil) or basalt (Columbia River Basalt). The basalt layer present between elevations 343.5 and 346 feet was drilled and is classified as slightly weathered to moderately weathered, soft (2), joint structure indiscernible in the SPT sample. This basalt layer may require rock excavation. Recommendations for rock excavation are provided in Section 9.3.

Silt and silty clay (Fills from Existing Embankment) and Clay (Residual Soil) are not anticipated to be present at footing subgrade. However, if silty and clayey soils are present at the footing subgrade, then the silty and clayey soils should be removed and replaced with ODOT Granular Wall Backfill, Granular Structure Backfill, or MSE Granular Wall Backfill.

7.2.3 CIP Headwall Lateral Earth Pressure

Based on the structural design information and the above assumptions, the lateral earth pressures on the culvert walls were developed according to the ODOT GDM and AASHTO LRFD Bridge Design Specifications. The lateral earth pressures on the retaining walls depend on the type of wall (i.e., yielding or non-yielding), the type and method of placement of backfill against the wall, the magnitude of surcharge weight on the ground surface adjacent to the wall, the slope of the backfill, and the design criteria. We recommend the proposed CIP headwalls be designed with active (yielding) lateral earth pressures, which assume a minimum lateral deformation of approximately 0.001H, where H equals the total height of the CIP headwalls. The lateral earth pressure distribution for the culvert headwall on upstream side are shown on Figure 4, Lateral Earth Pressure on Upstream CIP Headwall. The lateral earth pressure distribution for the culvert headwall on upstream side are shown on Figure 5, Lateral Earth Pressure on Downstream CIP Headwall. We assume that the culvert walls will be backfilled using ODOT Granular Wall Backfill, Granular Structure Backfill, or MSE Granular Wall Backfill. We have provided lateral earth pressures dependent on the groundwater level and height of roadway embankment fill. The structural engineer should determine the appropriate groundwater level for the headwall design. The earth pressures presented are independent of other structural considerations, including wall stiffness, load factoring, and crack control.

7.2.4 CIP Headwall Lateral Resistance

Resistance to lateral movement for a CIP headwall consists primarily of sliding friction. We recommend that the sliding resistance evaluation follow the general requirements for a

conventional retaining wall as described in the ODOT GDM and AASHTO Article 11.6. The nominal friction resistance may be expressed as the vertical load (at the base of the wall) multiplied by the coefficient of friction. We recommend a coefficient of sliding friction equal to 0.67 for cast-in-place concrete sliding on approved crushed rock subgrade. Sliding friction resistance factors of 0.8 and 1.0 should be used in the calculation of overall sliding resistance for the CIP concrete retaining wall for the strength and extreme limit states, respectively.

7.2.5 CIP Headwall Global Stability

Based on the foundation preparation approach described in Section 7.3.2, global stability was not performed.

7.2.6 CIP Headwall Bearing Resistance

Based on the footing preparation approach described in Section 7.3.22, we understand that the culvert footings will typically be bearing on very dense sandy silty gravel (Residual Soil), basalt (Columbia River Basalt), or ODOT granular backfill in accordance with Section 7.3.2. We evaluated bearing resistance for the strength, service, and extreme event limit states for a range of CIP headwall footing widths. A plot of bearing resistance versus footing width is presented in Figure 6, Factored Bearing Resistance Versus CIP Headwall Footing Width. A resistance factor of 0.55, 1.0, and 0.8 was applied for the strength, service, and extreme event limit states, respectively.

7.2.7 CIP Headwall Settlement

Assuming the recommendations provided in Section 7.3.2 are implemented, we anticipate that the settlement will be less than 1 inch and differential settlements will be limited to less than 0.5 inches.

7.2.8 CIP Headwall Subdrainage

The subdrainage should be designed in accordance with ODOT Standard Drawing DET 3710. We anticipate that suitable drainage for the CIP headwalls can be provided by the standard Granular Wall Backfill material per OSSC Section 00510.12 and a wall base subdrain system consisting of a 6-inch-diameter perforated or slotted drainpipe wrapped in an envelope of filter material at least 12-inches thick confined by a separation geotextile. The filter material is specified in OSSC Section 00430.11. The subdrain should be above the typical groundwater level and convey any collected seepage to designated drainage facilities. The drainage system should be designed and evaluated by the wall designer.

7.3 Design Recommendations for MSE Wall

7.3.1 General

In accordance with standard design procedures outlined in the ODOT GDM, we have provided design recommendations for the MSE wall, including nominal bearing resistance, estimated settlements, evaluation of wall global stability, and foundation subgrade preparation.

We understand that final selection of wall types and specific wall design items, including internal wall stability and final wall configuration, will be performed by the wall designer. The following sections present our design evaluations and recommendations.

We understand that the purpose of the proposed MSE wall is to retain fills for the construction of the proposed widening and alignment of the intersection of Childs Road and Stafford Road. The MSE wall will be located on the south side of the intersection. Based on design information provided by Consor, the proposed wall has a maximum height and length of approximately 28 feet and approximately 365 feet, respectively. The MSE wall will be tapered to the existing roadway embankment surface at both ends. The MSE wall will have a level backslope.

7.3.2 MSE Wall Over-Excavation

Based on borings B-5, B-6, and B-7, the MSE wall could be underlain by silt and silty clay (Fill) and clay (Residual Soil), very dense sandy silty gravel (Residual Soil), or basalt (Columbia River Basalt). Boring B-6 consisting of silt and silty clay (Fills from Existing Embankment) and clay (Residual Soil) is considered for MSE Wall design.

The estimated settlement for the MSE wall if placed on clayey soils is up to 8 inches and the MSE wall would need to be constructed in two stages with a settlement monitoring program. Consor prefers to reduce the settlement of the MSE wall and construct the MSE wall in one stage. Therefore, we recommend the clayey soils be over-excavated and replaced with ODOT Granular Wall Backfill, Granular Structure Backfill, or MSE Granular Wall Backfill. We anticipate the clayey soils that would require over-excavation and replacement beneath the MSE wall are present between wall stations 0+50 to 2+00 and approximately 1 to 5 feet thick.

7.3.3 MSE Wall Design Soil Parameters

As recommended in the ODOT GDM, Section 15.6.4, the minimum soil reinforcement length should be at least 70 percent of the wall height (0.7H), but not less than 8 feet, whichever is greater, unless additional reinforcement length is needed to satisfy global stability

requirements (see Section 7.3.4). The reinforced material should meet the requirements of MSE Granular Wall Backfill provided in the OSSC Section 00596A.11(b). Backfill should be placed and compacted in accordance with the OSSC Section 00596A.47. *For the portion of MSE below elevation 344 feet (below water surface), the reinforced materials should meet the requirements provided in the OSSC Section 00512.12, Granular Wall Backfill to reduce fines loss in MSE wall and resulting settlement.* Retained backfill (borrowed material) placed behind the reinforced material should meet the specifications provided in the OSSC Section 00330.12. The estimated soil parameters for MSE wall design are presented in Exhibit 7-1.

Exhibit 7-1: MSE Retaining Walls Geotechnical Design Parameters

Soil Parameter	Material Type		
	Reinforced Material (MSE Granular Wall Backfill)	Retained Fill (Borrow Material)	Foundation Soil
Unit Weight (pcf)	130	110	130
Effective Friction Angle (degrees)	34	30	34
Cohesion (psf)	0	0	0

NOTES:
pcf = pounds per cubic feet
psf = pounds per square feet

The MSE walls should be embedded in accordance with Section 15.6.5 of the ODOT GDM, with a minimum embedment of 2 feet at the face of the wall, or one-tenth the wall's total height as measured from the top of the leveling pad to the roadway grade, whichever is greater. Our analyses show that external stability is satisfied with a reinforcement length equal to 0.7H or 8 feet, whichever is greater.

7.3.4 MSE Wall Lateral Earth Pressures

Lateral pressures on the MSE walls were developed according to AASHTO and the ODOT GDM. We have calculated the lateral earth pressures assuming the retained fill consists of Borrow Material using the soil parameters presented in Exhibit 7-1. If Granular Structure Backfill or MSE Granular Wall Backfill material is used as retained fill material, then the MSE Granular Wall Backfill design parameters provided in Exhibit 7-1 should be used to calculate lateral earth pressures on the MSE wall.

The static lateral earth pressure acting on walls consists of two components: static earth pressure and static surcharge pressure. The seismic lateral earth pressure on walls consists of three components: static earth pressure, static surcharge pressure, and seismic earth pressure. A horizontal seismic coefficient, k_h, equal to one-half of A_s was used to determine the seismic earth pressure for yielding walls, which assumes 1 to 2 inches of lateral deformation is acceptable for the MSE wall during seismic conditions. The seismic lateral

earth pressures for "Life Safety" criteria should be considered in accordance with the guidance provided in the ODOT GDM for highway retaining walls, as discussed in Section 6. Our recommended earth pressure distributions for MSE walls are provided in Figure 7.

7.3.5 MSE Wall Lateral Resistance

Resistance to lateral movement for an MSE wall consists of sliding friction. Per the ODOT GDM, passive soil pressures are neglected when calculating lateral resistance of the MSE wall. We recommend that the sliding resistance evaluation follow the general requirements for an MSE wall as described in the ODOT GDM and AASHTO Section 11. The nominal friction resistance may be expressed as the vertical load (at the base of the wall) multiplied by the coefficient of friction. AASHTO Section 11.10.5.3 recommends the angle of sliding friction be taken as the lesser of the friction angle of the reinforced fill, foundation soil, or the soil-reinforcement interface friction angle. The soil-interface friction angle is defined as two-thirds of the reinforced soil friction angle, or 23 degrees. We calculated the frictional sliding resistance coefficient for the MSE wall assuming the soil-reinforcement interface friction angle controls at the MSE wall location. We recommend a nominal coefficient of friction equal to 0.67 to calculate nominal sliding resistance. For LRFD design, resistance factors of 0.9 and 1.0 should be used to calculate the frictional sliding resistance for the strength and extreme event limit states, respectively.

7.3.6 MSE Wall Global Stability

We conducted global stability analyses for the proposed MSE wall using the computer program SLOPE/W, Version 11 (Geo-Slope International, 2021). The Morgenstern-Price slope stability analysis method was used to evaluate rotational and irregular failure mechanisms. The analysis was performed for both static and seismic conditions. A live load of 250 psf was assumed for a roadway traffic surcharge under static conditions. We evaluated seismic global stability using the pseudo-static procedures described in the ODOT GDM Chapter 6. Our seismic stability analyses assumed a kh equal to one-half of the site-adjusted peak ground acceleration (0.5 x As), we used horizontal seismic coefficient equals to 0.175 for the 1,000-year ground motion level.

The ODOT GDM requires that highway retaining walls be designed with a maximum resistance factor for global stability of 0.65, equivalent to a factor of safety (FS) of 1.5, for static conditions. For seismic analysis, the ODOT GDM specifies a maximum resistance factor of 0.9, or a required FS of 1.1, under seismic conditions.

We developed critical cross sections for global stability of the MSE based on survey data provided by Consor on October 13, 2021. The critical cross sections consider the tallest wall height along the alignment and the subsurface conditions. Cross Section A-A" is located

approximately 64 feet from the north end of the wall. Cross Section B-B" is located approximately 125 feet from the north end of the wall. We assumed the groundwater level is at least 100 feet below ground surface.

In accordance with the ODOT GDM, the initial wall embedment was assumed to be 2 feet at the face of the wall. Per the ODOT GDM, the minimum required MSE wall reinforcement length was assumed as 70 percent of the total wall height (0.7H) as measured from the top of the leveling pad to roadway grade, or 8 feet, whichever was greater. If the stability requirements were not satisfied, we increased the wall embedment or the reinforcement length until the stability requirements were met. Generalized subsurface conditions and soil parameters were evaluated based on the results of the field explorations and laboratory testing and our geologic interpretation presented previously. The results of our global stability analyses for the MSE wall are presented in Figures 8 through 11 and are summarized in Exhibit 7-2.

Exhibit 7-2: Global Stability Analyses Results for MSE Retaining Wall

Cross Section	Analysis Case	Embedment Considered in Analysis	Reinforcement Length Considered in Analysis	Factor of Safety	Minimum Factor of Safety Required by the ODOT GDM
A-A"	Static	2 feet	0.7H	1.8	1.5
	Seismic	2 feet	0.7H	1.4	1.1
B-B"	Static	2 feet	0.7H	1.8	1.5
	Seismic	2 feet	0.7H	1.4	1.1

As indicated in Exhibit 7-2, both cross sections meet the minimum global stability FS requirements for the static and seismic cases with the baseline assumptions listed previously.

7.3.7 MSE Wall Bearing Resistance

Based on the subsurface conditions, we expect that the majority of the proposed MSE walls will be founded on the very dense sandy silty gravel and very stiff clay of Residual Soil. We assumed the foundation subgrade for the MSE wall consists of very stiff clay of Residual Soil. We recommend that the MSE walls have a minimum embedment of 2 feet below the lowest adjacent final grade in front of the wall, or one-tenth the wall's total height as measured from the top of the leveling pad to the roadway grade, whichever is greater. We performed bearing resistance analysis in accordance with the ODOT GDM and AASHTO LRFD Bridge Design Specifications. In LRFD design, the strength and extreme event limit state bearing resistances are obtained by selecting appropriate soil strength parameters and computing a nominal bearing pressure at which shear failure of the bearing soil would likely occur. The nominal bearing resistance multiplied by the appropriate resistance factor

gives the factored bearing resistance. The factored bearing resistances for strength and extreme event limit states, as a function of reinforcement length, are presented on Figure 12. Resistance factors of 0.65 and 0.9 are used for the strength and extreme event limit states, respectively. Service limit state was not evaluated due to the degree of settlement that the retaining walls are estimated to experience; see the following MSE Wall Static Settlement section.

7.3.8 MSE Wall Static Settlement

Assuming the recommendations discussed in Section 7.3.2 are implemented for the MSE retaining wall, we anticipate that the total settlement will be less than 1 inch, and differential settlements will be limited to less than 0.5 inches per 100 feet.

7.3.9 MSE Wall Drainage

Proper drainage is necessary for long-term stability of the MSE walls and to mitigate the risk of shrink-swell damage due to the expansive soils encountered at the site. Backfill placed immediately behind the MSE wall reinforcement zone should be free-draining, granular material in accordance with the OSSC Section 00510.12. Specifically, MSE wall internal drainage design should be in accordance with the ODOT GDM Section 15.6.8. The drainage system should be designed to immediately direct water away from the subsurface soils and prevent ponding or other forms of infiltration into the wall subgrade.

7.3.10 MSE Wall Construction Considerations

7.3.10.1 General

This section contains construction considerations including wall excavation and foundation subgrade preparation. Earthwork should be performed in accordance with the OSSC Section 00300, and its project special provisions. Considerations related to MSE backfill and reinforcement should be provided by the wall designer based on their design assumptions.

7.3.10.2 Excavation and Subgrade Preparation

Retaining wall subgrade preparation will include: (1) clearing and grubbing; and (2) removal of existing structures, pavement, and underground utilities. These construction activities should generally be accomplished in accordance with the OSSC Section 00300.

After site stripping and preparation activities are completed, the exposed subgrade to receive fill should be proof-rolled with heavy rubber-tired construction equipment to identify soft, loose, or unsuitable areas. The proof-roll should be conducted prior to MSE wall construction.

The site stripping and proof-roll should be observed by a qualified geotechnical engineer or representative, who should determine stripping depth, evaluate the suitability of the subgrade, and identify areas of yielding. If loose and/or wet, soft soil zones are identified during proof-rolling, the soils should be removed and replaced with compacted structural fill in accordance with OSSC Section 00331.

The subsurface conditions encountered during our field explorations indicate that the MSE walls will be founded on the very dense sandy silty gravel and very stiff clay of Residual Soil. Clays are sensitive to changes in moisture content and the subgrade should be monitored by the project geotechnical engineer. Disturbance of subgrade soil due to construction equipment and activities could affect the support of the proposed walls and embankment. The contractor should take necessary steps to protect the subgrade from becoming disturbed.

7.3.10.3 MSE Wall Leveling Pad

A 6-inch-thick leveling pad should be placed and compacted beneath the entire MSE wall footprint. The leveling pad material should consist of Gravel Leveling Pads Backfill per OSSC Section 00596A.11(a). The purpose of the leveling pad is to provide a uniform foundation subgrade for the MSE wall.

7.4 Roadway Embankment Settlement

We understand Borrow Material per OSSC Section OSSC 00330.12 will be used as embankment fill between the existing roadway embankment and the proposed MSE wall for roadway widening. The backfill should be placed and keyed into existing slope per OSSC Section 00330.42(a)(7) Foundation Benching.

7.4.1 Roadway Embankment Settlement

We estimated total settlement may be up to 8 inches as discussed in Section 7.4.8. We anticipate that the primary consolidation settlement will cease between 4 to 8 weeks. The differential settlement is estimated up to 8 inches due to the presence of coarse-grained and fine-grained Residual Soil. A settlement monitoring program is recommended to be implemented during construction, to monitor static settlement. Recommendations for settlement monitoring are provided in Section 7.4.2.

7.4.2 Roadway Embankment Settlement Monitoring Program

We have recommended that field instrumentation be implemented to monitor settlement of the proposed embankment fill between the existing roadway embankment. The proposed embankment will act as a surcharge. The monitoring program should be maintained during

and following embankment and wall construction. We estimate that the monitoring program may be required between 4 to 8 weeks after construction. In regard to the embankment construction, we recommend monitoring the settlement to help determine the construction timing of the roadway pavement.

The settlement monitoring program for the embankment should consist of the installation of a settlement plate along the center of the roadway widening embankment. The settlement plate under the embankment should be installed on the subgrade prior to fill placement. Plate should be placed every 100 feet along the length of the embankment.

We recommend periodic level surveying of the plate elevation and fill surface elevation be performed two to three times a week for up to four weeks following wall/embankment construction and then once a week. The results of the wall survey may allow sooner installation of the pavement.

The settlement monitoring data should be provided to Shannon & Wilson for evaluation as the information is collected. Based on our review of the initial monitoring data, the schedule for reading the settlement plates may be revised.

7.5 Cut Slope Recommendations

7.5.1 Cut Slope Design Recommendations

We understand the project requires a cut slope along the north side of SW Johnson Road (Project Station 50+00 to 56+00), the east side of Stafford Road (Project Station 17+00 to 32+00), and the north side of Childs Road (Project Station 50+00 to 56+00). We did not perform field explorations on the proposed cut slope on the north side of Childs Road.

Based on our field explorations, we anticipated that the cut slope will consist of native soils. The proposed cut slope is at 2H:1V and may be up to 15 feet in height.

We recommend establishing vegetation, erosion mats, or other stabilization methods to establish vegetation on all soil cut slopes to prevent long-term erosion.

7.5.2 Cut Slope Construction Considerations

The excavation of the cut slope will include soil excavation. The soil excavation should be performed in accordance with Sections 00320 and 00330 of the ODOT Standard Specification (ODOT, 2021). It is the responsibility of the contractor to evaluate the necessary means and methods for soil slope excavation.

7.6 Sliver Fill Slope

We understand that sliver fill slopes will be required along Stafford Road. We also understand that the proposed sliver fills may be up to 3 feet thick and at a 2H:1V slope. The sliver fill slope may be up to 12 feet high.

We recommend that the fill slope be terraced (bench) the existing slope in accordance with OSSC Section 00330.42 (7). The fill materials should consist of General Borrow and the material should meet the specifications provided in the OSSC Section 00330.12.

8 PAVEMENT DESIGN RECOMMENDATIONS

8.1 General

This section presents the new asphalt concrete pavement design for widening of SW Stafford Road and roundabout in Clackamas County as well as rehabilitation of the existing pavement. For pavement design, Station 0+00 was selected as the intersection of Stafford Road and Rosemont Road (the "Yield" sign). Station numbers increase towards the south end of the project limit at the intersection of SW Stafford Road and SW Pattulo Way. Stationing for pavement field explorations and design are shown in green color on Site and Exploration Plan, Figure 2.

We understand that the pavement will be designed considering the following manuals and specifications:

- AASHTO Guide for Design of Pavement Structures (GDPS), 1993;
- ODOT Pavement Design Guide (PDG), 2019;
- ODOT Oregon Standard Specification for Construction (OSSC), 2021; and
- Clackamas County Roadway Standards (CCRS), 2020 as applicable.

The following sections describe the pavement design procedures, methodology, and input parameters considered in the design and present pavement design recommendations.

The recommended pavement sections meet the minimum structural requirements. However, there may be additional project considerations, such as cost-effectiveness, that may influence final selection of pavement sections. All pavement construction should be performed in accordance with the ODOT OSSC.

8.2 Pavement Design Inputs

This section discusses inputs for new asphalt concrete pavement (ACP) as well as ACP rehabilitation.

8.2.1 Design Life

Clackamas County Roadway Standards June 1, 2020, and Standard Drawing Sheet C100, Street Structural Section do not provide design life for Clackamas County standard pavement section. The ODOT PDG calls for a 30-year design life for the roundabout and new AC pavement (including widening). We considered 20- and 30-year design periods for new AC Pavement widening. The PDG also calls for a 15-year design life for AC pavement rehabilitation.

8.2.2 Traffic Data

A summary of traffic data was provided in a traffic study report prepared by Kittelson & Associates, Inc. and provided to us by Consor. The traffic study report is included in Appendix F. It was assumed that the ADT data represents Annual Average Daily Traffic (AADT). Combined counts for northbound (NB) and southbound (SB) directions were provided. Summary of Traffic Data inputs is presented in Exhibit 8-1.

Exhibit 8-1: Summary of Traffic Data Inputs

Design Section	2021 Two-Way AADT	2040 Two-Way AADT	Truck Percentage	Annual Traffic Growth Rate
SW Stafford Road	13,700	18,873[1]	7.6%	1.70%

NOTES:

1 The 2040 traffic is calculated from the provided annual traffic growth rate.

The AADT, truck classification/percentage, and ODOT truck conversion factors were used to calculate flexible equivalent single-axle (18-kip) loads (ESALs) for SW Stafford Road. A directional distribution factor of 0.55 and a lane distribution factor of 1.00 were used for the design lane traffic calculations. A directional distribution factor of 0.75 and a lane distribution factor of 1.00 were used for the design roundabout traffic calculations. A summary of the calculated flexible ESALs is presented in Exhibit 8-2 for both 15-, 20-, and 30-year designs.

Exhibit 8-2: Summary of Flexible ESALs

Design Section	15-Year Design ESALs (Flexible)	20-Year Design ESALs (Flexible)	30-Year Design ESALs (Flexible)
SW Stafford Road	1,442,829	2,010,733	3,300,757
Roundabout	N/A	2,741,908	4,501,032

8.2.3 Flexible Pavement Design Inputs

Other design input parameters considered in the flexible pavement design based on the ODOT guidelines are presented in Exhibit 8-3. Subgrade characteristics and existing pavement layer coefficients will be discussed separately for each relevant design section.

Exhibit 8-3: Flexible Pavement Design Inputs

Parameter	Design Value
Design Reliability Level, %	90 (Urban Major Arterial)
Initial Serviceability, Po	4.2
Terminal Serviceability, Pt	2.5
Standard Deviation	0.49
New Asphalt Concrete Layer Coefficient	0.42
New Aggregate Base Layer Coefficient	0.10
New Aggregate Base Resilient Modulus, psi	20,000
New Aggregate Base Drainage Coefficient	1.0

8.2.4 Subgrade Resilient Modulus (M_R)

Six Dynamic Cone Penetrometer (DCP) tests were conducted on exiting roadways within the project limits. The subgrade soils at the DCP test and geotechnical soil boring locations were classified as silt and clay. The average corrected resilient modulus values (M_R), based on ODOT's DCP correlation equation and a correction factor of 0.35, are presented in Exhibit 8-4.

Exhibit 8-4: DEP Corrected Subgrade M_R Values

DCP Designation	Corrected M_R (psi)
P-1	7,702
P-2	N/A (Refusal)
P-2-A	10,068
P-3	10,819
P-4	11,697
P-5	8,023

These results and the back-calculated subgrade modulus from FWD testing were used in determining design moduli for rehabilitation and widening.

8.2.4.1 Design Subgrade Resilient Modulus for Rehabilitation

A section of SW Stafford Road between stations 0+00 and 3+20 as described in the pavement visual assessment (represented by boring P-1) is different from its adjacent section and exhibits more distress. Therefore, this section was assigned its own design subgrade M_R. The DCP testing resulted in resilient modulus of 7,702 psi and the FWD testing resulted in a modulus of 11,055 psi for this section. Therefore, a design M_R of 7,702 psi was selected for this section.

The average subgrade M_R for the rest of SW Stafford Road based on DCP testing is 10,152 psi. Subgrade M_R from FWD testing for the same section is 12,877 psi. ODOT PDG cautions against using design subgrade M_R values greater than 8,000 psi, so this value was used in the rehabilitation design for this section.

8.2.4.2 Design Subgrade Resilient Modulus for Widening

The M_R values from the DCP and FWD testing correspond to the subgrade under the existing pavement. For widening sections, assuming the sections will be constructed on compacted backfill and considering the soil characterization from our subsurface explorations, a subgrade M_R of 7,000 psi was selected for the design.

8.3 Pavement Widening Design Recommendations

The required structural number (SN) for the design traffic level was calculated according to the AASHTO GDPS design method. The empirical layered design method described in AASHTO GDPS was employed to calculate layer thicknesses. AC and aggregate base thickness values were obtained following the design guidelines in AASHTO GDPS and AC thicknesses were rounded up to the nearest 1/2 inch. The minimum AC thickness for the 20-year design life results in 6.5" of AC over 14.0" of aggregate base. The 30-year design results in 7.5" for minimum AC thickness and 13.0" of aggregate base. Considering "Urban Major Arterial" functional classification in the Standard Drawing C100 of the CCRS, we recommend a pavement with 7.5" of AC over 14.0" and an alternative pavement section with 9.5" of AC over 6.0" of aggregate base for widened sections as shown in Exhibit 8-5.

Exhibit 8-5: Recommended Pavement Widening Design

Pavement Design Section	Design Life	Required Structural Number	Layer	Layer Thickness (Inches)	Total Thickness (Inches)
Widening of Stafford Rd.	30	4.39	AC	7.5	21.5
			Aggregate Base	14.0	
			AC	9.5	15.5
			Aggregate Base	6.0	
Roundabout	30	4.60	AC	8.0	22.0
			Aggregate Base	14.0	

The AC layer material is recommended to be Level 3, 1/2" Dense PG 64-22. Aggregate base material shall conform to OSSC section 02630.

ODOT PDG states that roadway widening must provide adequate drainage from underneath the existing pavement and this may require constructing the top of subgrade for the widening at the same elevation as the existing subgrade which is not feasible for this project. Alternatively, it proposes providing an underdrain at the edge of the existing pavement which outlets beyond the new pavement structure (widening section).

8.4 Pavement Rehabilitation Design Recommendations

This section presents the rehabilitation design and recommendations for SW Stafford Road's existing pavement. We evaluated the existing pavement based on results of field explorations, including pavement visual survey, pavement core data (pavement and aggregate base thicknesses), DCP test results, and FWD testing results. Structural layer coefficients were estimated for each existing layer. Required structural number (SN) was calculated for the expected traffic volume (15-year traffic), and we developed mill and inlay scenarios satisfying the SN requirements.

8.4.1 Rehabilitation Design Inputs

Six pavement cores were extracted from the existing pavement. Exhibit 8-6 presents the pavement layer composition and thicknesses.

Exhibit 8-6: Pavement Layer Composition and Thicknesses

Core Number	Approximate Station[1]	Lane Direction	Distance to Fog Line (ft)[2]	AC Thickness (in)	PCC Thickness (in)[3]	Base Thickness (in)[4]
P-1	2+20	NB	4.00	9.25	7.75	19.00
P-2	10+70	SB	6.00	15.00	N/A	12.00
P-2-A	10+90	SB	8.00	13.25	N/A	16.75
P-3	16+36	NB	5.75	12.00	8.50	6.50
P-4	22+60	SB	4.45	15.00	N/A	15.00
P-5	39+42	NB	4.75	9.50	6.50	14.00

NOTES:

1 Station 0+00 is the Yield sign at SW Stafford Rd and Rosemont Rd, stations increase from north to south.

2 Each lane is 12 feet wide. Distance from center of the core to inner edge of the fog line.

3 PCC: Portland Cement Concrete

4 This thickness is the difference between depth to top of subgrade as estimated by the drillers and core thickness.

As was mentioned in the pavement visual survey and subgrade input sections, the pavement between stations 0+00 and 3+20 is different from the adjacent section evident by a pavement change at station 3+20 and it exhibited more distress in terms of extent and severity. Therefore, this section was investigated separately. Core P-1 represents this section and its data was used for the design. The core was extracted from a cracked area and the crack extended from the surface to 2.5 inches which is the depth of the top lift. This section's structural layer coefficient for the existing AC based on the visual survey and core data was estimated to be 0.30. The Portland cement concrete (PCC) layer under the AC layer was considered a base with 0.37 for the structural layer coefficient. We estimated the aggregate base structural layer coefficient to be 0.06.

The rest of the SW Stafford Road exhibited similar pavement conditions and was treated as one section for rehabilitation design. This section's structural layer coefficient for the existing AC based on the visual survey and core data was estimated to be 0.37. The Portland cement concrete (PCC) layer under the AC layer—where present—was considered a base with 0.37 for the structural layer coefficient. We estimated the aggregate base structural layer coefficient to be 0.06.

Existing Portland Cement Concrete pavement was encountered below the existing AC layer in Cores P-1, P-3, and P-5 along the northbound lane. These pavement core locations were located approximately 4 to 6 feet from the fog line along the northbound lane.

8.4.2 Rehabilitation Design Recommendations

Exhibit 8-7 presents recommendations for rehabilitation sections.

Exhibit 8-7: Recommended Pavement Rehabilitation Designs

Pavement Rehabilitation Section [1]	Design Life	Structural Number	Rehabilitation Method	
			Mill and Inlay	Overlay
Station 0+00 to 3+20	15 Years	3.67	4.0"	N/A
Station 3+20 to 43+22	15 Years	3.67	2.0" (Additional 4.0", as needed)	2.0"

NOTES:

1 Station 0+00 is the Yield sign at SW Stafford Rd and Rosemont Rd, stations increase from north to south.

Due to severity fatigue cracking and delamination between Station 0+00 to 3+20, we do not recommend overlay for this section. Between Station 3+20 and 43+22, we recommend 2 inches of inlay or overlay. In addition, we recommend additional mill and inlay up to 4 inches due to delamination.

The AC layer material for this section is recommended to be Level 3, ½" Dense-graded ACP with PG 64-22 binder.

Existing pavement surfaces should be prepared before placement of an overlay or inlay. Areas of localized distress should undergo pre-overlay repairs depending on distress severities. Examples of pre-overlay repairs include repairing non-structural conditions such as surface cracking, delamination, shoving, etc., repairing localized areas of structural failure, leveling rutting deeper than ½ inch, and leveling cross section or profile inconsistencies among other potential repairs. Of particular interest are localized areas exhibiting fatigue cracking (alligator cracking) and longitudinal cracking in wheel paths. Excavation and repair of these areas should be conducted as part of the preparation for overlay/inlay rehabilitation.

8.5 AC Overlay for Superelevation

We understand that at some locations AC overlay will be required to change the superelevation of the roadway surface. The AC overlay thickness may be up to 18 inches. We recommend that the AC layer material for these areas is Level 3, ½" Dense-graded ACP with PG 64-22 binders.

Existing pavement surfaces should be prepared before placement of an overlay. Pavement surface preparation is provided in Section 8.4.2.

8.6 Subgrade Preparation and Stabilization

Subgrade preparation should follow our recommendations provided in Section 9 below. It is recommended that a non-woven subgrade separation geotextile meeting the requirements

of ODOT OSSC Section 02320 be placed between the aggregate base course and subgrade to reduce the potential for fines to migrate into the aggregate base.

It is also recommended that the exposed subgrade be inspected to identify any soft or weak spots prior to the placement of pavement material. The subgrade inspection should, at a minimum, consist of proof-rolling the subgrade with a fully loaded dump truck. For fine-grained soil that is wet and sensitive to disturbance, proof-rolling the subgrade is not recommended. Instead, the subgrade should be evaluated by probing. Soft or weak spots should be over-excavated and replaced with compacted granular material. Soft or weak spots should be over-excavated and replaced with compacted aggregate base in accordance with OSSC Section 00331, Subgrade Stabilization. Provisions should be made under this contract for a quantity of subgrade stabilization equivalent to 10 percent of the total area of new pavement areas during dry weather. During wet weather, provisions should be made under this contract for a quantity of subgrade stabilization equivalent to 20 percent of the total area of new pavement construction. We anticipated that Subgrade Stabilization depth may be up to 18 inches.

9 GENERAL CONSTRUCTION CONSIDERATIONS

9.1 Site Preparation and Earthwork

Bridge, retaining walls, and roadway subgrade preparation will include: (1) clearing and grubbing; and (2) removal of existing structures, pavement, and underground utilities. These construction activities should generally be accomplished in accordance with ODOT OSSC, Part 00300. We expect that site excavation could be accomplished using conventional excavating equipment.

After site stripping and preparation activities are completed, the exposed subgrade receiving fill should be proof-rolled with a fully loaded, 10- to 12-yard dump truck or similar heavy rubber-tired construction equipment to identify soft, loose, or unsuitable areas.

The site stripping and proof-roll should be observed by a qualified geotechnical engineer or representative, who should determine stripping depth, evaluate the suitability of the subgrade, and identify areas of yielding. If loose and/or wet, soft soil zones are identified during proof-rolling, the soils should be removed and replaced with compacted structural fill in accordance with ODOT OSSC, Part 00331, Subgrade Stabilization.

Disturbance of subgrade soil due to construction equipment and activities could affect support of the proposed walls and embankment. The contractor should take necessary steps to protect the subgrade from becoming disturbed.

9.2 Wet Weather Earthwork

Wet weather generally begins about mid-October and continues through about May, although rainy periods may occur at any time of year. Some of the near-surface soils at the site contain sufficient silts and fines to produce an unstable mixture when wet. Fine-grained soils are generally sensitive to changes in water content and tend to become unstable and difficult, or impossible, to compact if their moisture content significantly exceeds the optimum. If earthwork at the site continues into the wet season, or if wet conditions are encountered, we recommend the following:

- The ground surface in and surrounding the construction area should be sloped as much as possible to promote runoff of precipitation away from work areas and to prevent ponding of water.
- Earthwork should be accomplished in small sections to minimize exposure to wet conditions: that is, each section should be small enough so that the removal of unsuitable soils and placement and compaction of clean structural fill can be accomplished on the same day.
- The size of construction equipment may have to be limited to prevent soil disturbance. It may be necessary to excavate soils with a backhoe, or equivalent, located so that equipment does not traffic over the excavated area. Thus, subgrade disturbance caused by equipment traffic will be minimized.
- No excavated soil should be left uncompacted and exposed to moisture. A smooth drum vibratory roller, or equivalent, should roll the surface to seal out as much water as possible.
- In-place soils or fills that become wet and unstable and/or too wet to suitably compact should be removed and replaced with clean, granular structural fill.
- Excavation and placement of structural fill material should be observed on a full-time basis by a geotechnical engineer (or representative) experienced in earthwork to determine that all work is being accomplished in accordance with the project specifications and our recommendations.
- Grading and earthwork should not be accomplished during periods of heavy, continuous rainfall.

9.3 Rock and Boulder Excavation

A boulder was encountered in boring B-03 between approximate depths 7 and 13.5 feet below ground surface. Basalt bedrock was encountered in most of the borings. The bedrock

surface is highly irregular and variable. Bedrock surfaces within the project area could change significantly over a short distance. Estimating the volume of boulder and bedrock excavation is not possible due to the limited number of completed borings for the project. We understand that the volumes of boulders and bedrock excavation are estimated based on interviews with residents around the project area by the project team and County. Boulders and bedrock excavation and removal will be encountered during the excavation and potentially general excavation activities on this project.

Rock excavation will be required to adequately embed the MSE wall and, culvert headwalls, and culvert continuous spread footings into the Basalt bedrock. The basalt layer present between elevations 335 and 350 feet was drilled and is classified as slightly weathered to moderately weathered, weak to strong, joint structure indiscernible in SPT sample. The basalt rock is classified as R2 to R4 which the unconfined compressive strength could range between 1,000 and 14,500 pounds per inch (psi). Rock excavation may not be practical with conventional excavating equipment, and pneumatic rock breakers or hammers will likely be required to excavate the rock to the required depth. The pneumatic rock breaker method can be a slow and very noisy process. Based on the vesicular and broken nature of the rock, we anticipate this will be the best method of excavation. Rock excavation using explosives is an option. Explosive blasting near the existing homes risks damaging the existing structures and is not recommended. We believe that the chemical rock-breaking method is typically very expensive and used to split boulders; and demolition, where there is a free face, may not be suitable for this application.

We recommend that the rock excavation for the footings be observed by a Geotechnical Engineer of Record to confirm the quality and conditions of the basalt rock to meet design requirements.

9.4 Temporary Cut Slopes

Temporary cut slopes should be the responsibility of the Contractor who is continually at the site; is able to observe the nature and conditions of the subsurface materials encountered, including groundwater; and has responsibility for the methods, sequence, and schedule of construction. Any excavations deeper than 4 feet bgs and that involve on-site personnel entering the excavation should be adequately sloped or shored in accordance with Oregon OSHA requirements.

For planning purposes, we recommend that temporary, unsupported, open-cut slopes up to 10 feet bgs be no steeper than 1.5H:1.0V in fill or loose/soft surficial soils. When caving or sloughing soil is encountered, the slope should be made at 2.0H:1.0V or flatter, depending on the conditions.

These recommendations are applicable to slopes in areas where groundwater and/or groundwater seepage is not present. Temporary cuts that encounter groundwater should be shored and adequately braced, or provisions made for dewatering of the excavations. We recommend that all exposed slopes be protected with a waterproof covering during periods of wet weather to reduce sloughing and erosion.

9.5 Over-Excavation of Clay

Excavation to remove clay below the MSE wall could encounter groundwater depending on the season. Temporary water control and dewatering is the responsibility of the contractor. The contractor should perform the temporary water control and dewatering follwing our recommendations in Section 9.6.

9.6 Temporary Water Control and Dewatering

To control water in the creeks, the water should be diverted around the excavation to downstream of the excavation using a pipe or channel. Groundwater should be expected to be encountered in the excavation for the culverts.

We recommend that the contractor be made responsible for the actual means and methods to dewater the temporary trench during culvert construction. Typical dewatering techniques include well points, wells, eductors, and sump pumps. In addition, treatment and disposal of water from dewatering may require significant management and permitting.

9.7 Existing PCC Pavement/Cement Treated Base (CTB)

We understand there is an old market road consisting of PCC pavement underneath the existing Stafford Road. Existing Portland Cement Concrete pavement was encountered below the existing AC layer in Cores P-1, P-3, and P-5 along the northbound lane. It appears the PCC is intact and structurally sound from the cores.

We also understand that CTB was used in the reconstruction of Johnson Road which occurred back in 2002. According to the County, 4" of AC was placed over 8"-18" of in-place CTB (6% cement and 700-1,200 PSI). Documentation and/or pavement cores that confirm the presence and exact location of this CTB were not made available.

9.8 Groundwater Spring at Station 14+00

There is a groundwater spring seeping from the existing embankment of Stafford Road at approximate Station 14+00, right. Consor has incorporated a subdrain system consisting of a perforated drain pipe and subsurface drain outlet within the proposed design to manage

this water. The related flow rate appears low during the summer months, but likely fluctuates throughout each season.

10 LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they presently exist, and further assume that the explorations are representative of the subsurface conditions throughout the site; that is, the subsurface conditions everywhere are not significantly different from those disclosed by the explorations. If subsurface conditions different from those encountered in the explorations are encountered or appear to be present during construction, we should be advised at once so that we can review these conditions and reconsider our recommendations, where necessary. If there is a substantial lapse of time between the submission of this report and the start of construction at the site, or if conditions have changed because of natural forces or construction operations at or adjacent to the site, we recommend that we review our report to determine the applicability of the conclusions and recommendations.

Within the limitations of scope, schedule, and budget, the analyses, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional geotechnical engineering principles and practice in this area at the time this report was prepared. We make no other warranty, either express or implied. These conclusions and recommendations were based on our understanding of the project as described in this report and the site conditions as observed at the time of our explorations.

Unanticipated soil conditions are commonly encountered and cannot be fully determined by merely taking soil samples from test borings. Such unexpected conditions frequently require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

This report was prepared for the exclusive use of Clackamas County and Consor in the design of the Stafford Road: Pattulo Way to Rosemont Road Improvements Project. The data and report should be provided to the contractors for their information, but our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions included in this report.

The scope of our present work did not include environmental assessments or evaluations regarding the presence or absence of wetlands, or hazardous or toxic substances in the soil, surface water, groundwater, or air, on or below or around this site, or for the evaluation or disposal of contaminated soils or groundwater should any be encountered.

Shannon & Wilson, Inc., has prepared "Important Information About Your Geotechnical/Environmental Report," to assist you and others in understanding the use and limitations of our reports.

11 REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 1993, AASHTO Guide for Design of Pavement Structures.

American Association of State Highway and Transportation Officials (AASHTO), 1998, Supplement to the AASHTO Guide for Design of Pavement Structures, Part II, - Rigid Pavement Design & Rigid Pavement Joint Design.

American Association of State Highway and Transportation Officials (AASHTO), 2020, AASHTO LRFD Bridge Design Specifications: customary U.S. units, (9th ed): Washington, D.C., AASHTO, 2 v.

Allen, J.E., Burns, M., and Burns, S., 2009, Cataclysms on the Columbia: The Great Missoula Floods (2d ed.): Portland, Ore., Ooligan Press, 204 p.

Atwater, B.F., 1987, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, p. 942-944.

Atwater, B.F., and Hemphill-Haley, E., 1997, Recurrence intervals for great earthquakes of the past 3500 years at Northeastern Willapa Bay, Washington: U.S. Geological

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1989, Geologic Map of the Lake Oswego Quadrangle, Multnomah and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries, Geological Map Series GMS-59, scale 1:24,000.

Clackamas County Roadway Standards (CCRS), 2020, Sheets C100 to C140.

Geo-Slope International, 2021, GeoStudio 2021 SLOPE/W, version 11.2.0.22838: Calgary, Alberta. Ludwin, R.S., Weaver, C.S., and Crosson, R.S., 1991, Seismicity of Washington and Oregon in Slemmons, D.B., E.R. Engdahl, M.D. Zoback, and D.D. Blackwell (eds.), Neotectonics of North America, p. 77-98.

McPhee, D.K., Langenheim, V.E., Wells, R.E., Blakely, R.J, 2014, Tectonic Evolution of the Tualatin Basin, northwest Oregon, as revealed by inversion of gravity data: Geosphere, v. 10 no. 2. p 264-275.

O'Connor, J.E., Sarna-Wojcicki, A., Wozniak, K.C., Polette, D.J., and Fleck, R.J., 2001, Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon: U.S. Geological Survey Professional Paper 1620.

Oregon Water Resources Department, 2021, Well Report Mapping Tool, https://apps.wrd.state.or.us/apps/gw/wl_well_report_map/Default.aspx, accessed 12/17/2021.

ODOT, 1987, Soil and Rock Classification Manual: Salem, Oregon, available: ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Geotech/Manuals/Soil_Rock_Classification_Manual.pdf.

ODOT, 2023, Geotechnical Design Manual: Salem, Oregon, available: https://www.oregon.gov/ODOT/GeoEnvironmental/Pages/Geotech-Manual.aspx.

ODOT, 2021, Standard specifications for construction: Salem, Oregon, available: https://www.oregon.gov/ODOT/Business/Pages/Standard_Specifications.aspx.

Personius, S.F., compiler, 2002, Fault number 714, Helvetia fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 10:06 AM.

Personius, S.F., compiler, 2002, Fault number 715, Beaverton fault zone, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:46 AM.

Personius, S.F., compiler, 2002, Fault number 716, Canby-Molalla fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:44 AM.

Personius, S.F., compiler, 2002, Fault number 717, Newberg fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:50 AM.

Personius, S.F., compiler, 2002, Fault number 718, Gales Creek fault zone, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 10:02 AM.

Personius, S.F., compiler, 2012, Fault number 873, Mount Angel fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 10:11 AM.

Personius, S.F., compiler, 2002, Fault number 874, Bolton fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/08/2021 12:36 PM

Personius, S.F., compiler, 2002, Fault number 875, Oatfield fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:49 AM.

Personius, S.F., compiler, 2002, Fault number 876, East Bank fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:59 AM.

Personius, S.F., compiler, 2012, Fault number 877, Portland Hills fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:54 AM.

Personius, S.F., compiler, 2002, Fault number 878, Grant Butte fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 10:08 AM.

Personius, S.F., compiler, 2002, Fault number 879, Damascus-Tickle Creek fault zone, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 09:56 AM.

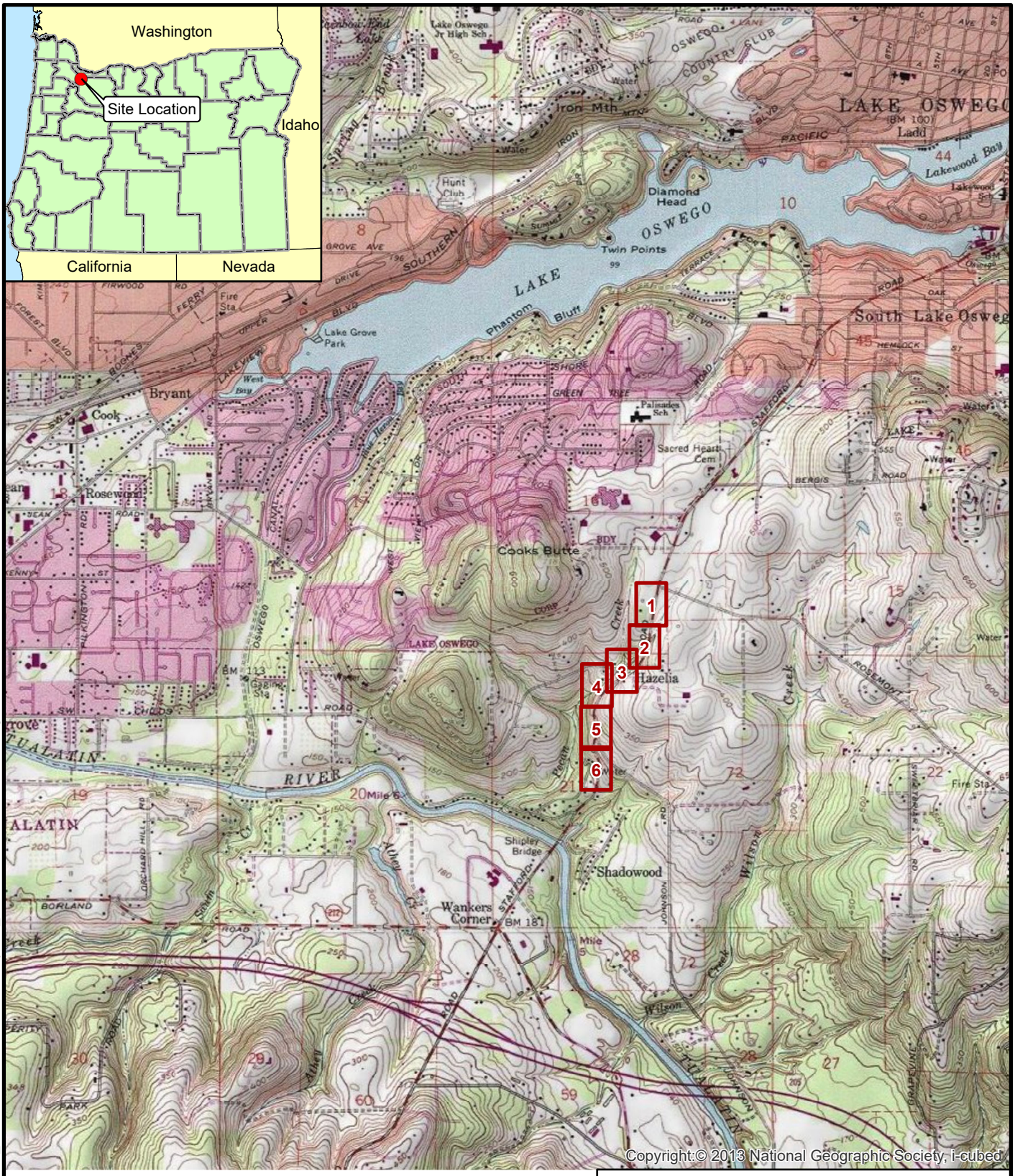
Personius, S.F., compiler, 2002, Fault number 880, Lacamas Lake fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 10:14 AM.

Personius, S.F., and Nelson, A.R., compilers, 2006, Fault number 781, Cascadia subduction zone, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/8/2021 12:18 PM.

Satake, K., Shimazaki, K., Tsuji, Y., and Ueda, K., 1996, Time and size of a giant earthquake in Cascadia inferred from Japanese tsunami records of January 1700, Nature, 379, p. 246-249.

United States Geological Survey, 2019, Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquake.usgs.gov/hazards/qfaults/map/#qfaults, accessed 12/8/2021.

Wells, R.E., Weaver, C.S., and Blakeley, R.J., 1998, Fore-arc migration in Cascadia and its neotectonic significance: Geology, v. 26, p. 759-762.



0 0.25 0.5 1

Scale in Miles

N

LEGEND

Figure 2 Sheet

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

VICINITY MAP

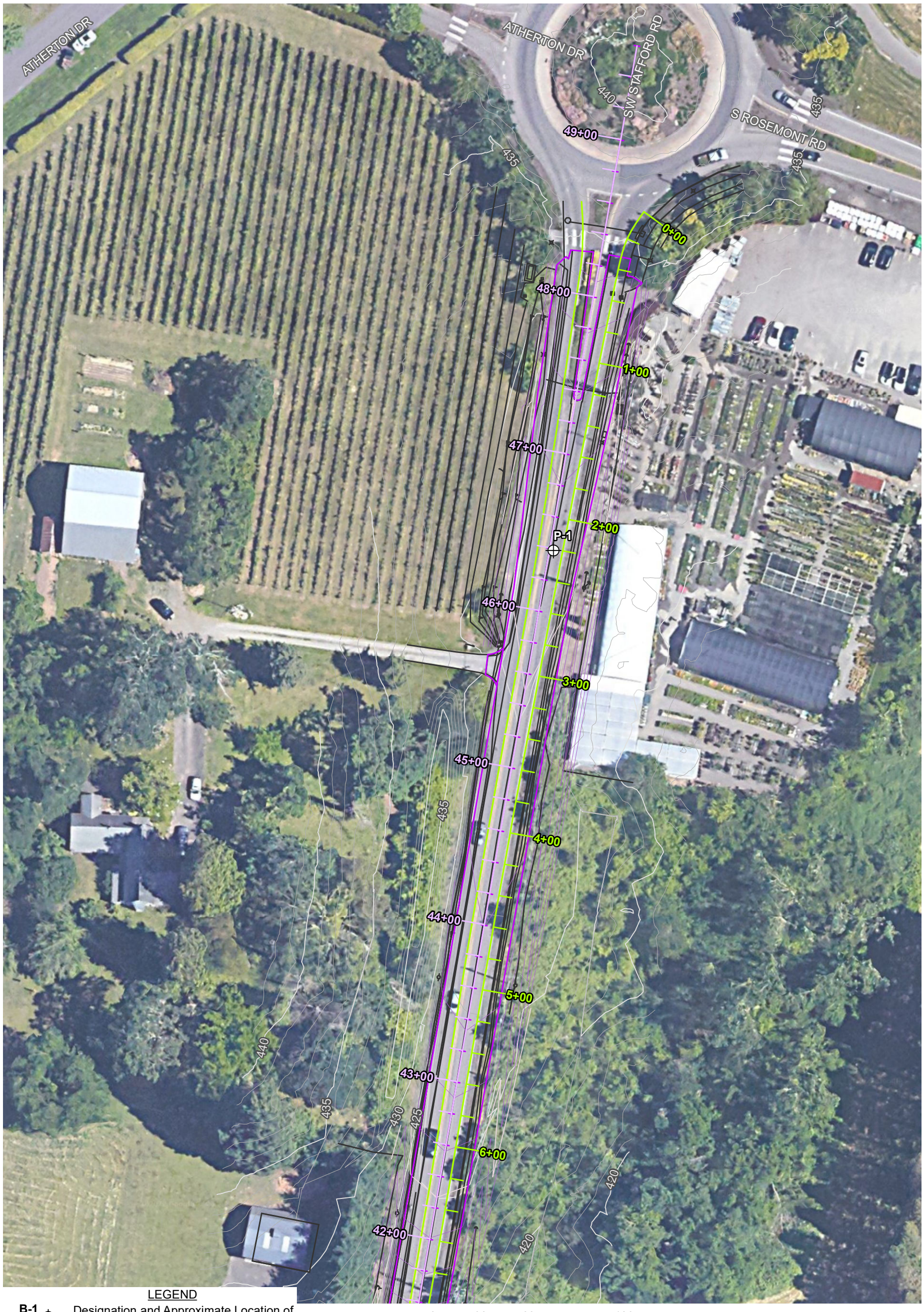
February 2024 105483

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\VicinityGeo_10.7.mxd Date: 2/7/2022 Login: AEH

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\SitePlanGeo_10.7.mxd Date: 2/7/2022 Login: AEH



LEGEND

- B-1 — Designation and Approximate Location of Geotechnical Boring
- P-1 — Designation and Approximate Location of Pavement Boring
- HA-1 — Designation and Approximate Location of Hand Auger
- FH-1 — Designation and Approximate Location of Infiltration Test
- Falling Weight Deflectometer (FWD) Testing
- Proposed Retaining Wall
- A A' — Designation and Location of Stability Analysis Model

0 30 60 120

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Existing contours from file Ex Surf Cad File for SW 10-13-2021.dwg, provided by Murraysmith on October 13, 2021.
3. Existing features from files provided by Murraysmith on January 6, 2022.
4. Proposed contours and features from files provided by Murraysmith on February 4, 2022.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

Februaary 2024 105483

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 1 of 6

FIG. 2
Sheet 1 of 6

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\SitePlanGeo_10.7.mxd Date: 2/7/2022 Login: AEH

LEGEND

- B-1 — Designation and Approximate Location of Geotechnical Boring
- P-1 — Designation and Approximate Location of Pavement Boring
- HA-1 — Designation and Approximate Location of Hand Auger
- FH-1 — Designation and Approximate Location of Infiltration Test
- Falling Weight Deflectometer (FWD) Testing
- Proposed Retaining Wall
- A A' — Designation and Location of Stability Analysis Model

0 30 60 120

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Existing contours from file Ex Surf Cad File for SW 10-13-2021.dwg, provided by Murraysmith on October 13, 2021.
3. Existing features from files provided by Murraysmith on January 6, 2022.
4. Proposed contours and features from files provided by Murraysmith on February 4, 2022.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

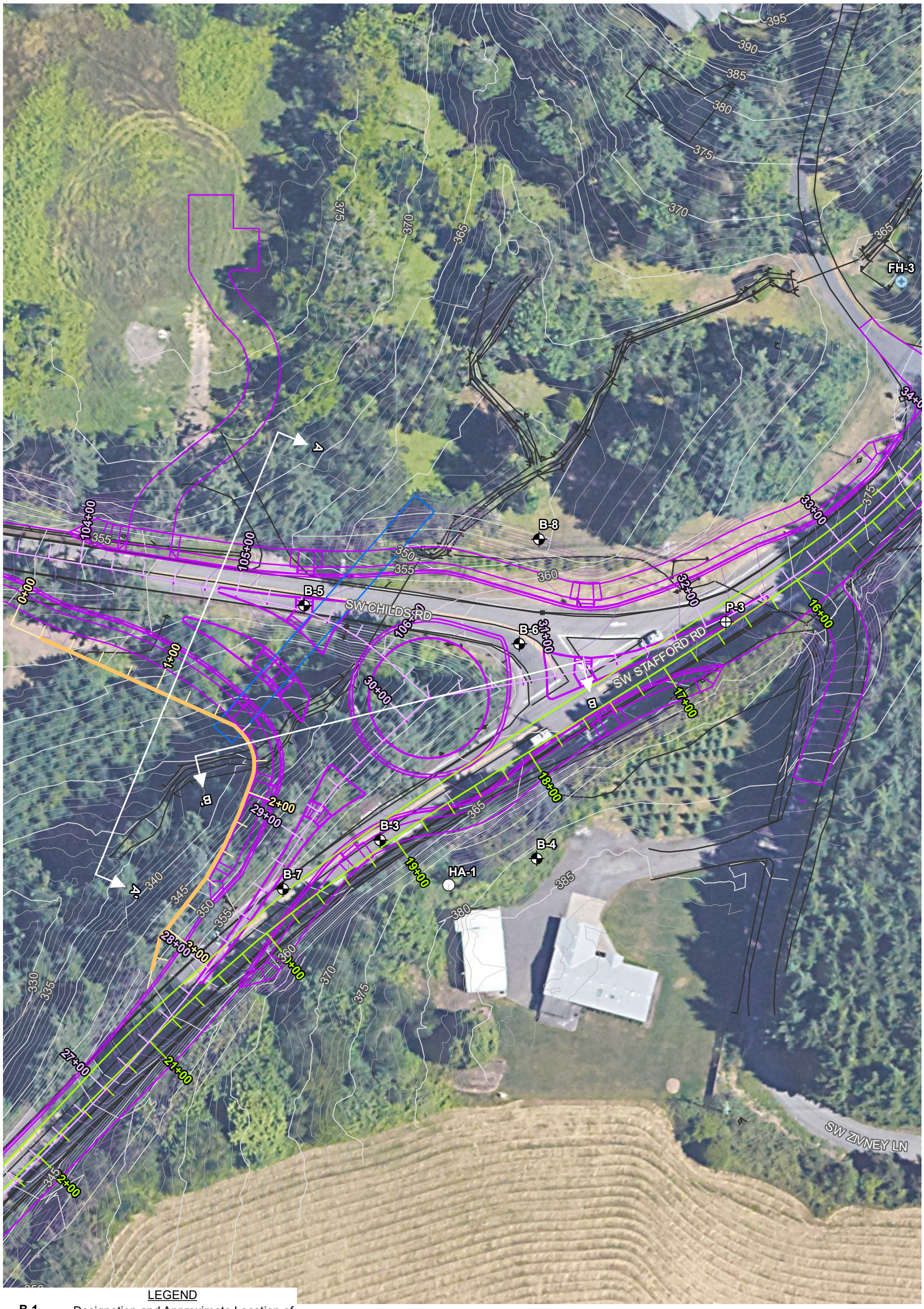
February 2024 105483

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2 Sheet 2 of 6

FIG. 2 Sheet 2 of 6

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\SitePlanGeo_10.7.mxd Date: 2/7/2022 Login: AEH



LEGEND

- B-1 — Designation and Approximate Location of Geotechnical Boring
- P-1 — Designation and Approximate Location of Pavement Boring
- HA-1 — Designation and Approximate Location of Hand Auger
- FH-1 — Designation and Approximate Location of Infiltration Test
- Falling Weight Deflectometer (FWD) Testing
- Proposed Retaining Wall
- A A' — Designation and Location of Stability Analysis Model

0 30 60 120

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Existing contours from file Ex Surf Cad File for SW 10-13-2021.dwg, provided by Murraysmith on October 13, 2021.
3. Existing features from files provided by Murraysmith on January 6, 2022.
4. Proposed contours and features from files provided by Murraysmith on February 4, 2022.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

February 2024 105483

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 3 of 6

FIG. 2
Sheet 3 of 6

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\SitePlanGeo_10.7.mxd Date: 2/7/2022 Login: AEH

LEGEND

- B-1 — Designation and Approximate Location of Geotechnical Boring
- P-1 — Designation and Approximate Location of Pavement Boring
- HA-1 — Designation and Approximate Location of Hand Auger
- FH-1 — Designation and Approximate Location of Infiltration Test
- Falling Weight Deflectometer (FWD) Testing
- Proposed Retaining Wall
- A A' — Designation and Location of Stability Analysis Model

0 30 60 120

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Existing contours from file Ex Surf Cad File for SW 10-13-2021.dwg, provided by Murraysmith on October 13, 2021.
3. Existing features from files provided by Murraysmith on January 6, 2022.
4. Proposed contours and features from files provided by Murraysmith on February 4, 2022.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

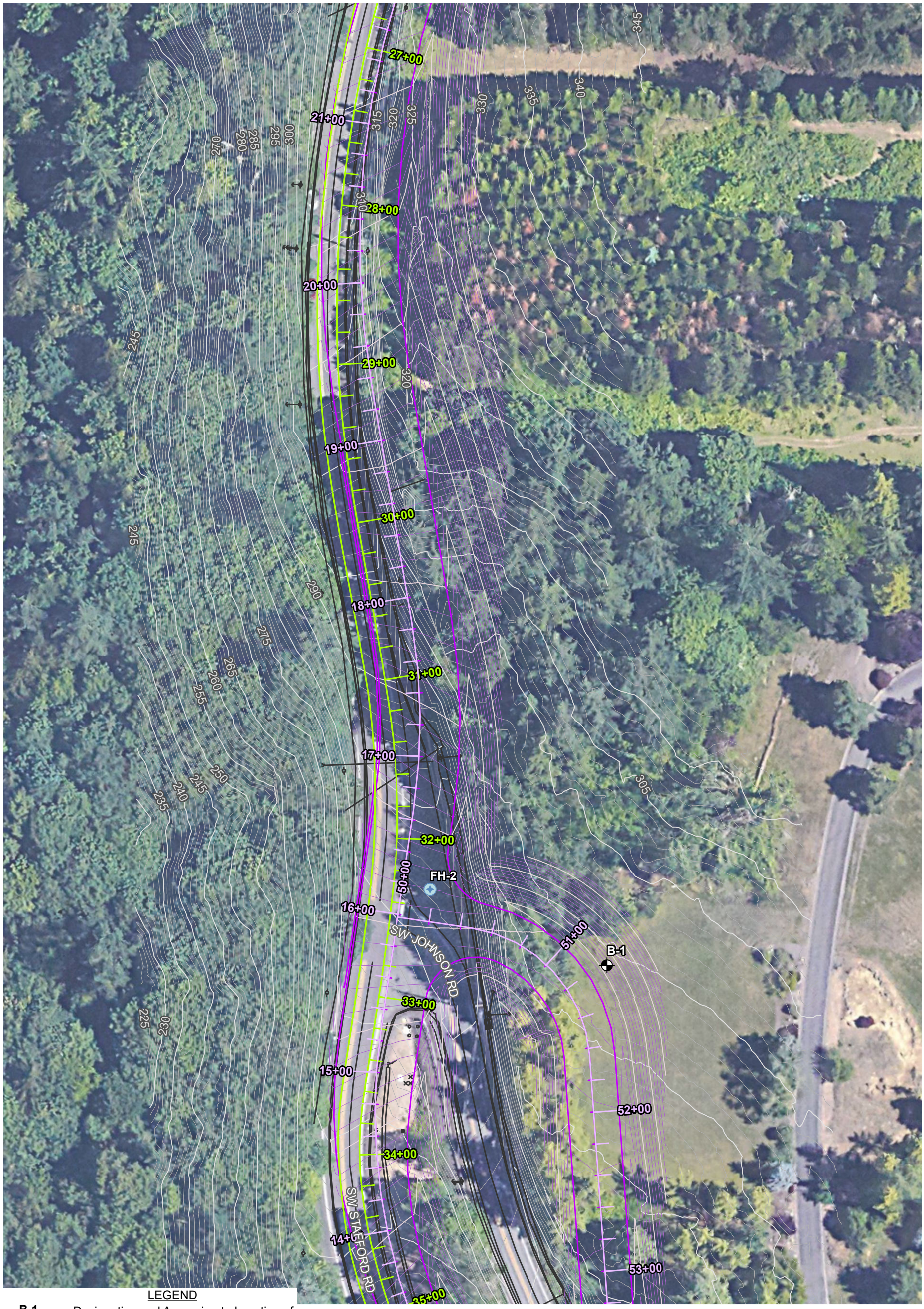
February 2024 105483

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2 Sheet 4 of 6

FIG. 2 Sheet 4 of 6

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\SitePlanGeo_10.7.mxd Date: 2/7/2022 Login: AEH



LEGEND

- B-1 — Designation and Approximate Location of Geotechnical Boring
- P-1 — Designation and Approximate Location of Pavement Boring
- HA-1 — Designation and Approximate Location of Hand Auger
- FH-1 — Designation and Approximate Location of Infiltration Test
- Falling Weight Deflectometer (FWD) Testing
- Proposed Retaining Wall
- A A' — Designation and Location of Stability Analysis Model

0 30 60 120

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Existing contours from file Ex Surf Cad File for SW 10-13-2021.dwg, provided by Murraysmith on October 13, 2021.
3. Existing features from files provided by Murraysmith on January 6, 2022.
4. Proposed contours and features from files provided by Murraysmith on February 4, 2022.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

February 2024 105483

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 5 of 6

FIG. 2
Sheet 5 of 6

Filename: T:\Projects\PDX\105000s\105483_Clackamas Co. S\Avmxd\SitePlanGeo_10.7.mxd Date: 2/7/2022 Login: AEH

LEGEND

- B-1 — Designation and Approximate Location of Geotechnical Boring
- P-1 — Designation and Approximate Location of Pavement Boring
- HA-1 — Designation and Approximate Location of Hand Auger
- FH-1 — Designation and Approximate Location of Infiltration Test
- Falling Weight Deflectometer (FWD) Testing
- Proposed Retaining Wall
- A A' — Designation and Location of Stability Analysis Model

0 30 60 120

Scale in Feet

NOTES

1. Aerial imagery obtained through Google Maps Satellite.
2. Existing contours from file Ex Surf Cad File for SW 10-13-2021.dwg, provided by Murraysmith on October 13, 2021.
3. Existing features from files provided by Murraysmith on January 6, 2022.
4. Proposed contours and features from files provided by Murraysmith on February 4, 2022.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

SITE AND EXPLORATION PLAN

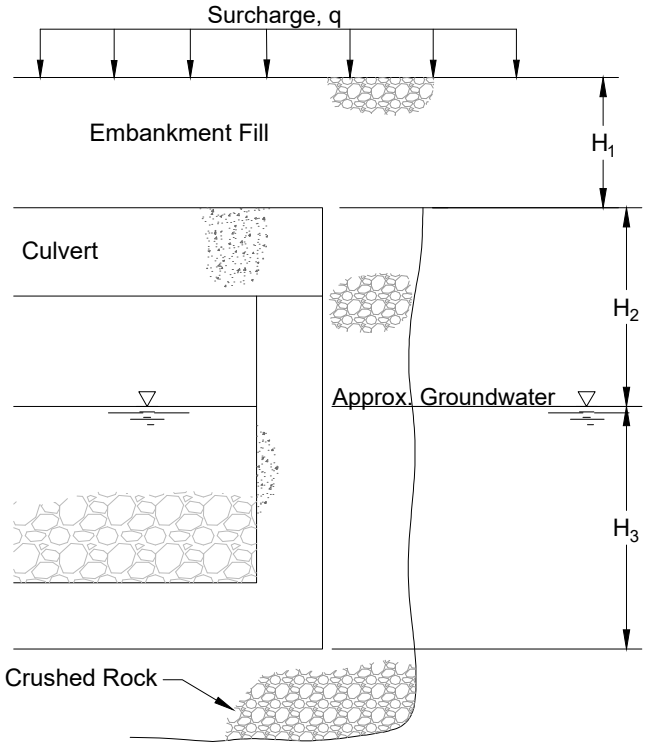
February 2024 105483

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2
Sheet 6 of 6

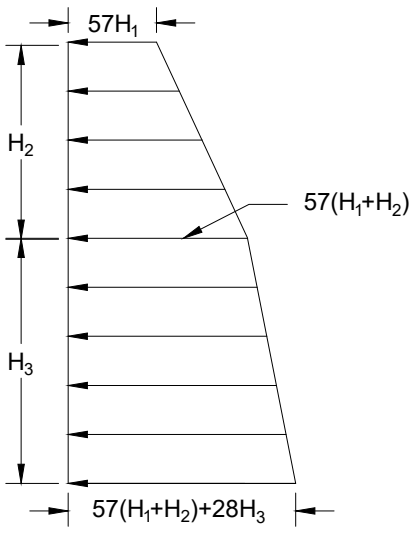
FIG. 2
Sheet 6 of 6

CULVERT EXCAVATION SCHEMATIC

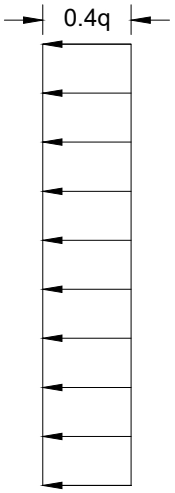


LATERAL EARTH PRESSURE CONDITIONS

AT-REST EARTH PRESSURE



SURCHARGE



NOTES

1. All pressure values are given in pounds per square foot (psf) per lineal foot width of culvert.
2. Earth pressures are based on a friction angle of 34 degrees and a unit weight of 130 pcf.
3. Surcharge due to live load shall include 250 psf as specified in ODOT GDM Section 15.3.12.

Stafford Road (Pattulo Way to Rosemont Road) Improvements Project
Clackamas County, Oregon

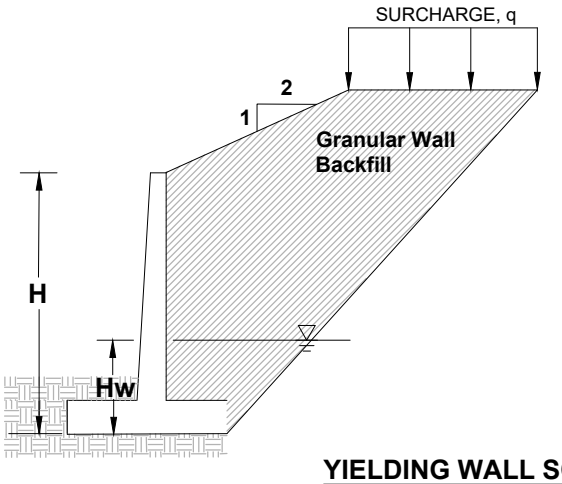
LATERAL EARTH PRESSURE DISTRIBUTION ON EMBEDDED CULVERT WALLS

February 2024 105483

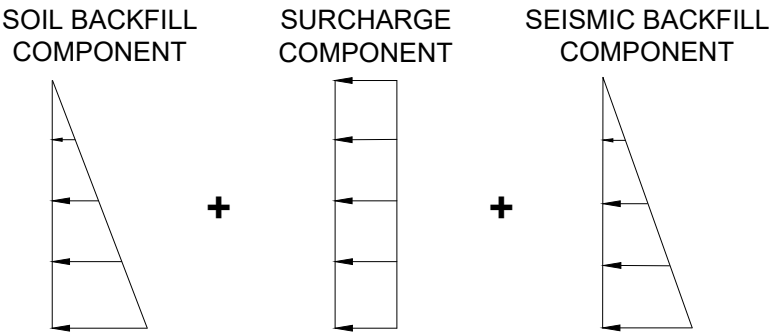
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

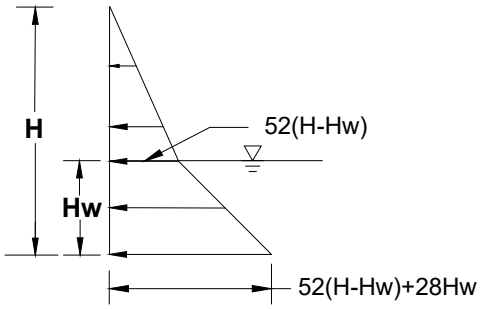
File: I:\EF\PDX\105000s\105483 Clackamas Co. S\DRAFTING\Culvert_LEP.dwg Date: 01-27-2022 Author: AEH



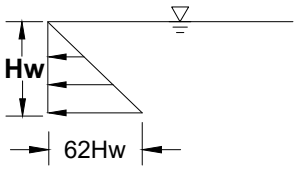
TOTAL LATERAL EQUIVALENT FLUID PRESSURES



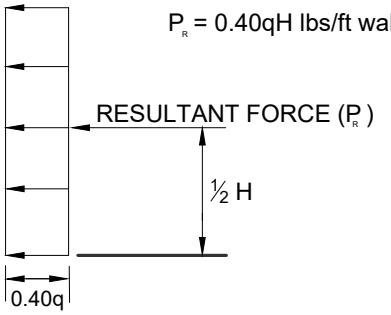
YIELDING WALL SOIL COMPONENT



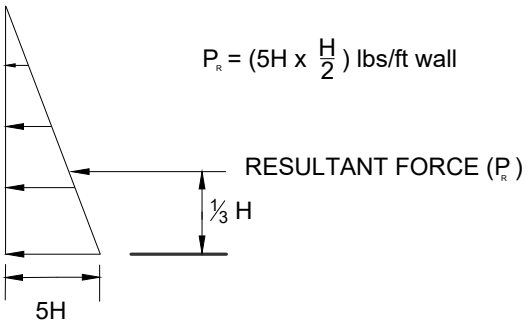
HYDROSTATIC COMPONENT



YIELDING WALL SURCHARGE COMPONENT



SEISMIC BACKFILL COMPONENT



NOTES

1. Units are pounds per square foot (psf).
2. Backfill unit weight of 130 pcf.
3. Backfill friction angle is estimated as 34 deg.
4. Retained wall backfill is assumed to be granular wall backfill material.
5. Wall design will be performed by others.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

LATERAL EARTH PRESSURE DISTRIBUTION ON UPSTREAM CIP HEADWALLS

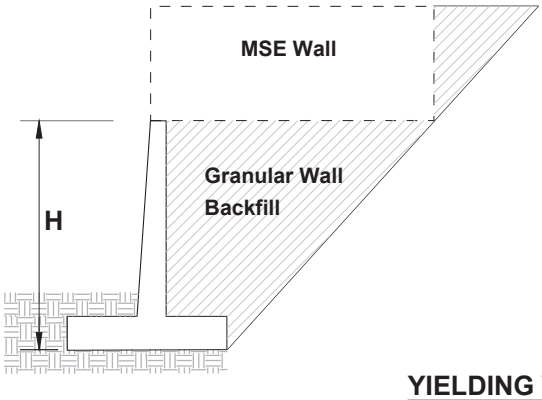
February 2024 105483

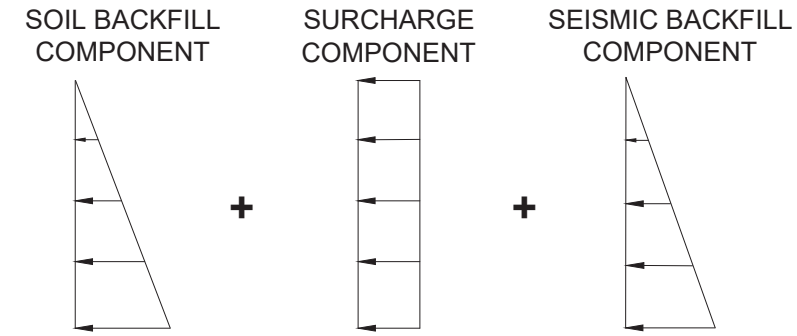
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 4

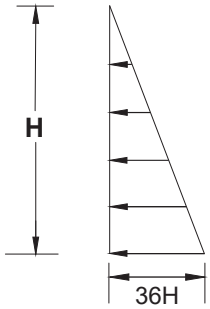
File: P:\PDX\105000s\105483 Clackamas Co. SIDRAFTING\CIP Headwall_LEP.dwg Date: 10-05-2023 Author: AEH

TOTAL LATERAL EQUIVALENT FLUID PRESSURES

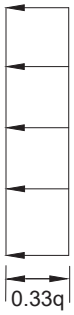




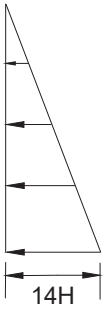
YIELDING WALL SOIL COMPONENT



YIELDING WALL SURCHARGE COMPONENT



SEISMIC BACKFILL COMPONENT



NOTES
1. Units are pounds per square foot (psf).
2. Backfill unit weight of 130 pcf.
3. Backfill friction angle is estimated as 34 deg.
4. Retained wall backfill is assumed to be granular wall backfill material.
5. Wall design will be performed by others.
6. Should include MSE wall and traffic live load.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

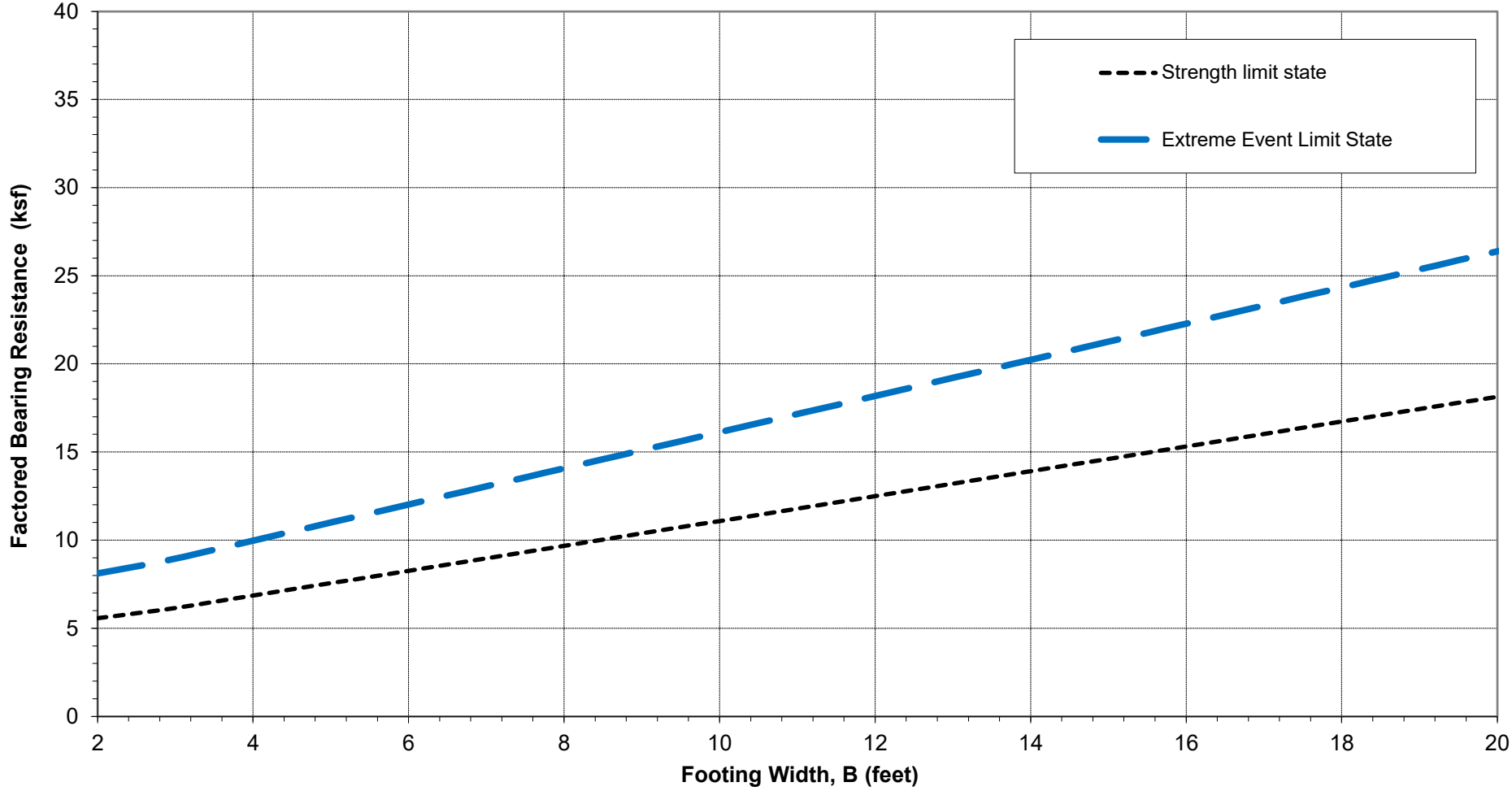
LATERAL EARTH PRESSURE DISTRIBUTION ON UPSTREAM CIP HEADWALL

February 2024 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 5

File: P:\PDX\105000s\105483 Clackamas Co. SIDRAFTING\CIP Headwall_LEP.dwg Date: 09-29-2023 Author: KTR



NOTES

1. We recommend using the following resistance factors for footing LRFD design; the plotted bearing capacities use the bearing capacity resistance factors.

Limit State	Sliding Shear	Passive Press.	Bearing Capacity
Service	N/A	Ignore Passive	1.0
Strength	1.0	Ignore Passive	0.55
Extreme Event	1.0	Ignore Passive	0.8

2. The factored bearing capacities are based on a soil friction angle of 34 degrees, a soil cohesion of 0 psf, a total unit weight of 130 pcf, a Poisson's ratio of 0.3, and a soil elastic modulus of 1000 ksf. We assumed that the bottom of the footing was 3 feet below the ground surface.
3. **psf** - pounds per square foot; **pcf** - pounds per cubic foot; **ksf** - kips per square foot (1 kip = 1000 pounds)

FIG. 6

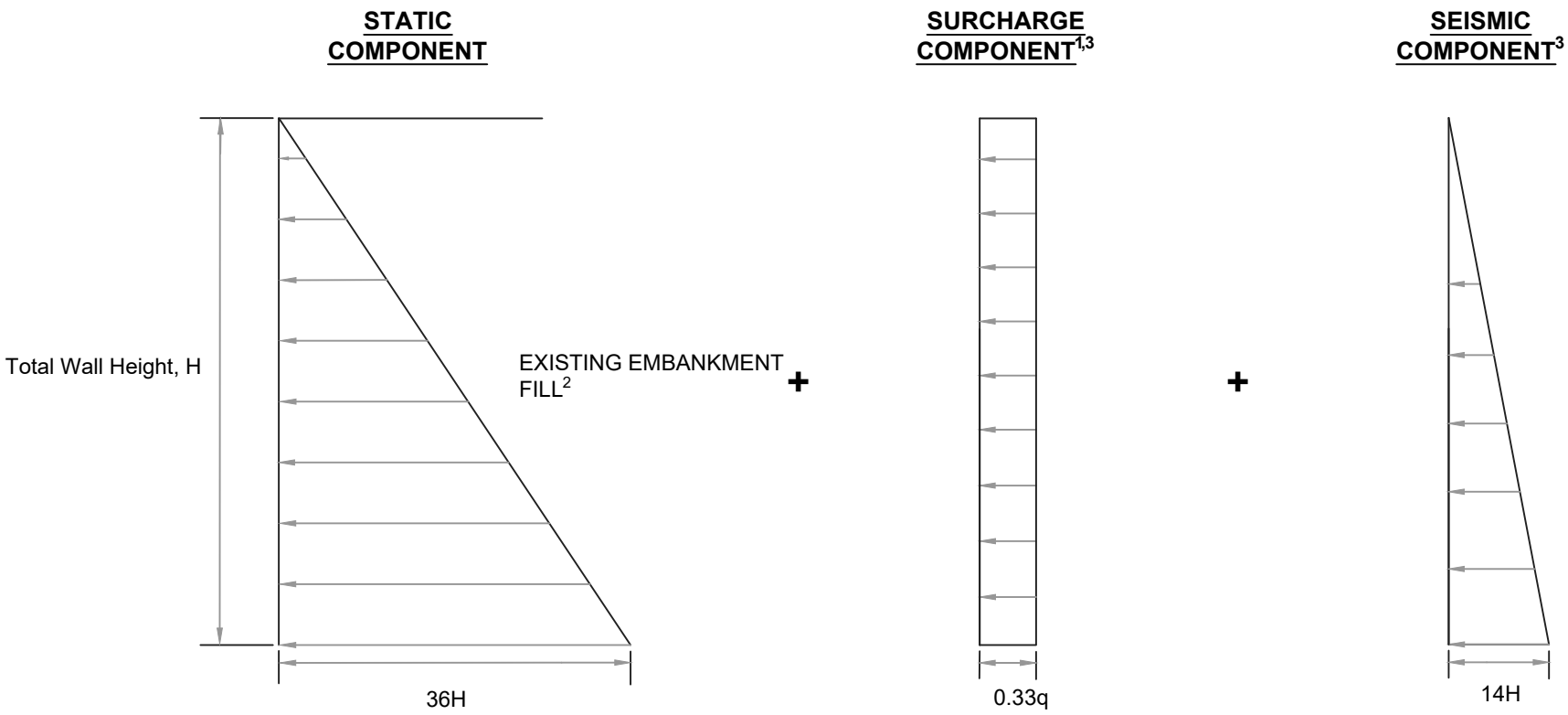
Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

FACTORED BEARING RESISTANCE VERSUS CIP HEADWALL FOOTING WIDTH

February 2024 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 6



NOT TO SCALE

MATERIAL PROPERTIES			
Backfill Material	Unit Weight, γ (pcf)	Friction Angle, ϕ (°)	Static Active, Ka, Flat Backslope
Existing Embankment Fill	110	30	0.33

NOTES

1. Surcharge due to live load shall include 250 psf as specified in ODOT GDM Section 15.3.12.
2. Wall backfill assumed to be drained existing embankment fill material.
3. Pressure increase due to surcharge and seismic loading should be added to the static pressure.
4. Groundwater assumed to be below the bottom of the wall footings.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

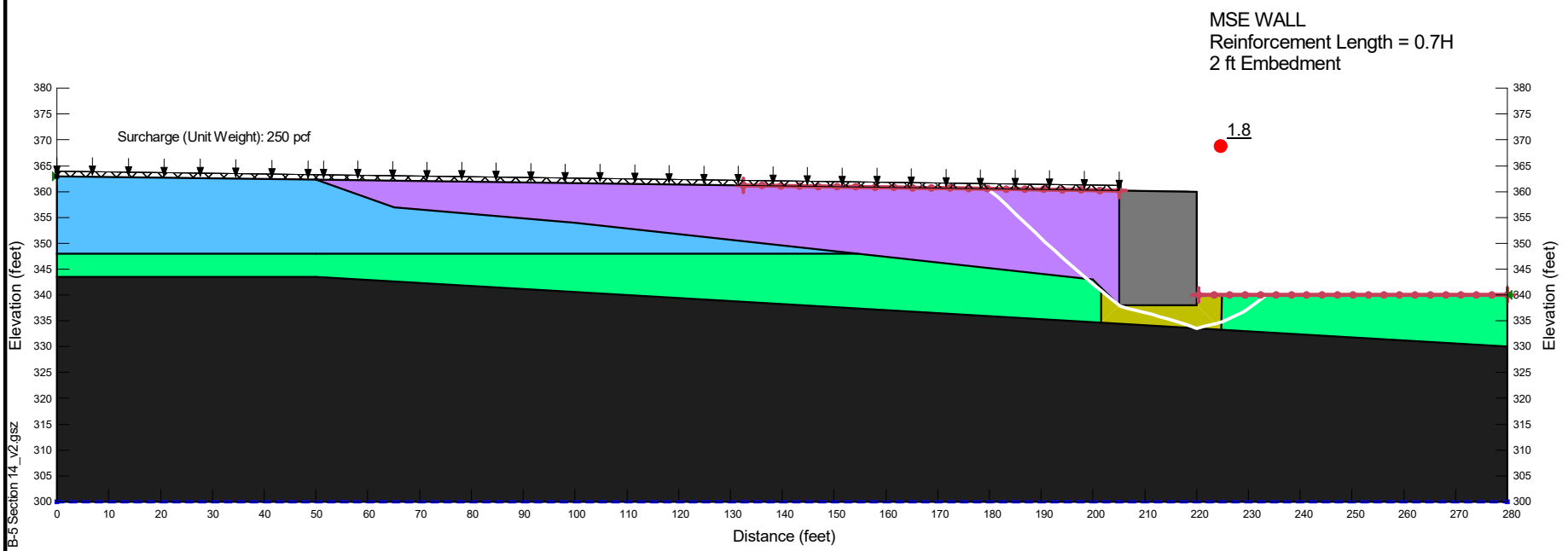
LATERAL EARTH PRESSURE DISTRIBUTION ON MSE WALLS

February 2024 105483-063

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 7

FIG. 7



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Basalt	High Strength	140		
	Clay (Residual Soil)	Mohr-Coulomb	120	100	28
	General Borrow	Mohr-Coulomb	110	0	30
	Granular Structure Backfill	Mohr-Coulomb	130	0	34
	MSE Wall	High Strength	130		
	Silty Clay (Fill)	Mohr-Coulomb	110	100	26

Stafford Road: Pattulo Way to Rosemont
Road Improvements
Clackamas County, Oregon

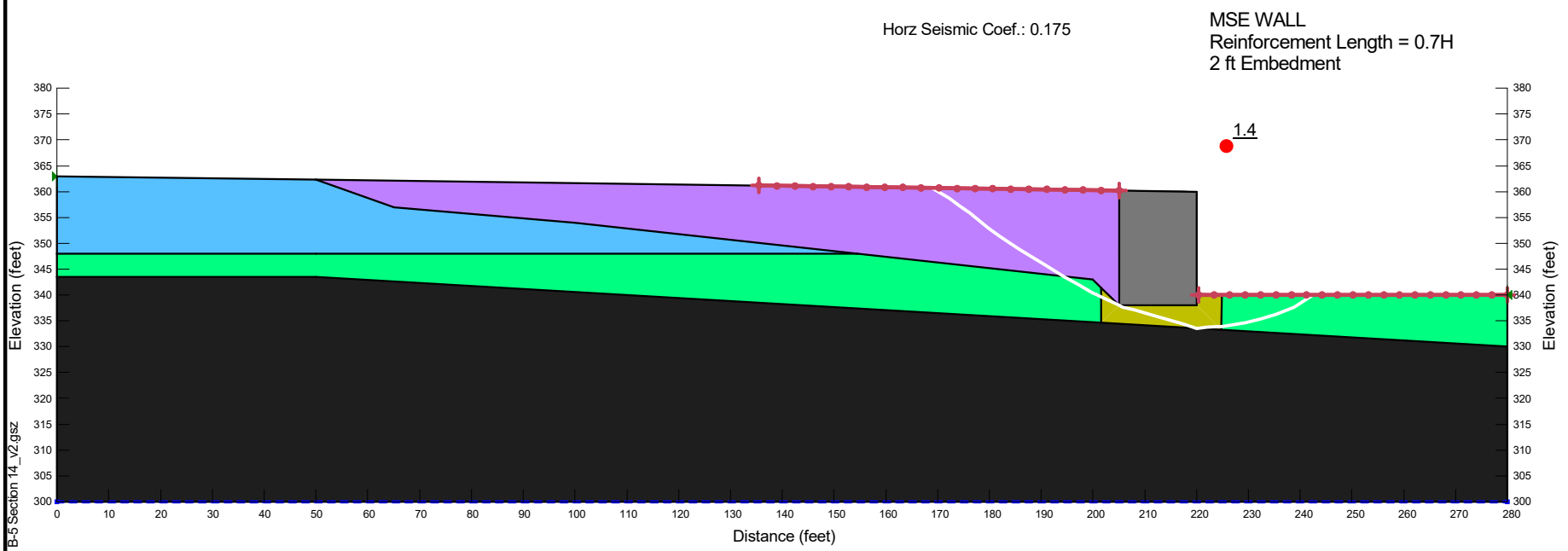
GLOBAL STABILITY ANALYSIS
STATIC CONDITION
MSE WALL STATION 1+25

February 2024 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 8

P:\PDX\105000s\105483 Clackamas Co. SA\Analysis\MSE Wall Design\Stafford Rd B-5 Section 14_v2.gsz



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Basalt	High Strength	140		
	Clay (Residual Soil)	Mohr-Coulomb	120	100	28
	General Borrow	Mohr-Coulomb	110	0	30
	Granular Structure Backfill	Mohr-Coulomb	130	0	34
	MSE Wall	High Strength	130		
	Silty Clay (Fill)	Mohr-Coulomb	110	100	26

Stafford Road: Pattulo Way to Rosemont
Road Improvements
Clackamas County, Oregon

GLOBAL STABILITY ANALYSIS
SEISMIC CONDITION
MSE WALL STATION 1+25

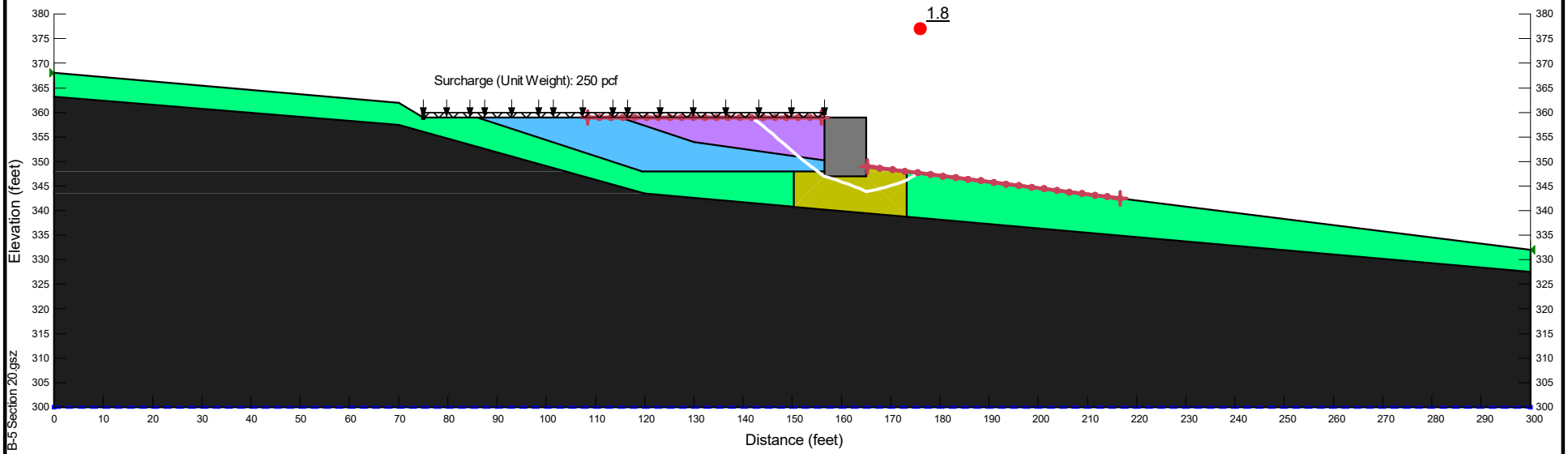
February 2024 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 9

P:\PDX\105000s\105483 Clackamas Co. SA\Analysis\MSE Wall Design\Stafford Rd B-5 Section 14_v2.gsz

MSE WALL
Reinforcement Length = 0.7H
2 ft Embedment



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Basalt	High Strength	140		
	Clay (Residual Soill)	Mohr-Coulomb	120	100	28
	General Borrow	Mohr-Coulomb	110	0	30
	Granular Structure Backfill	Mohr-Coulomb	130	0	34
	MSE Wall	High Strength	130		
	Silty Clay (Fill)	Mohr-Coulomb	110	100	26

Stafford Road: Pattulo Way to Rosemont
Road Improvements
Clackamas County, Oregon

GLOBAL STABILITY ANALYSIS
STATIC CONDITION
MSE WALL STATION 0+64

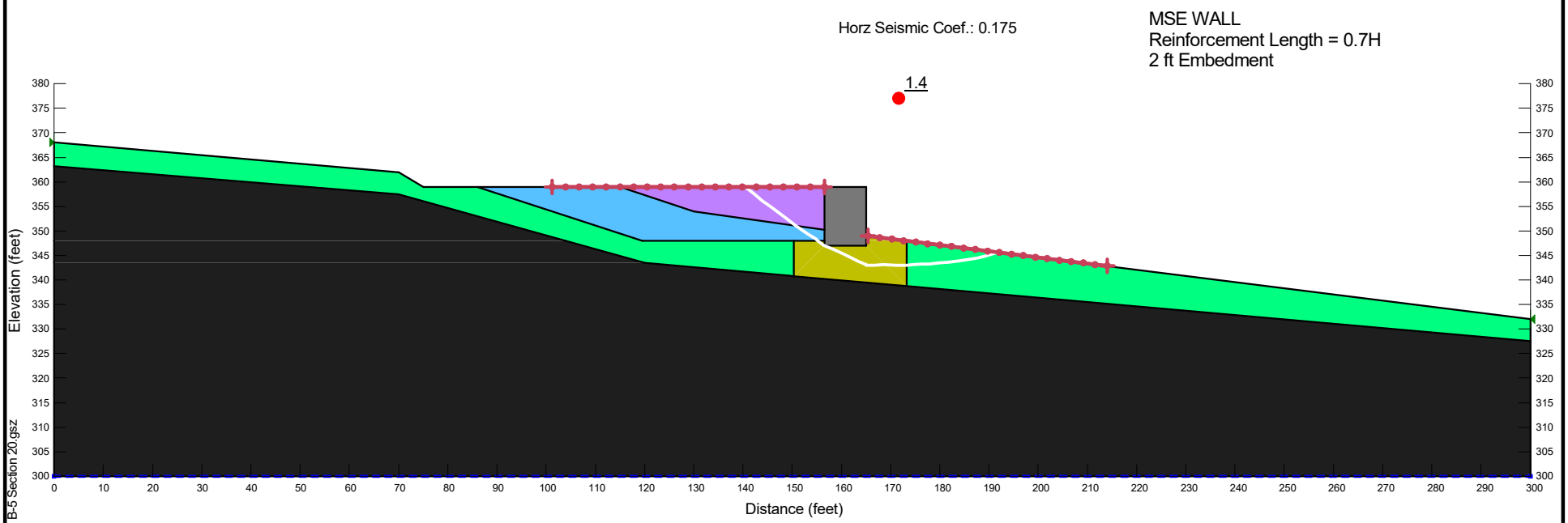
February 2024

105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 10

P:\PDX\105000s\105483 Clackamas Co. SA\Analysis\MSE Wall Design\Stafford Rd B-5 Section 20.gsz



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Basalt	High Strength	140		
	Clay (Residual Soill)	Mohr-Coulomb	120	100	28
	General Borrow	Mohr-Coulomb	110	0	30
	Granular Structure Backfill	Mohr-Coulomb	130	0	34
	MSE Wall	High Strength	130		
	Silty Clay (Fill)	Mohr-Coulomb	110	100	26

Stafford Road: Pattulo Way to Rosemont
Road Improvements
Clackamas County, Oregon

GLOBAL STABILITY ANALYSIS
SEISMIC CONDITION
MSE WALL STATION 0+64

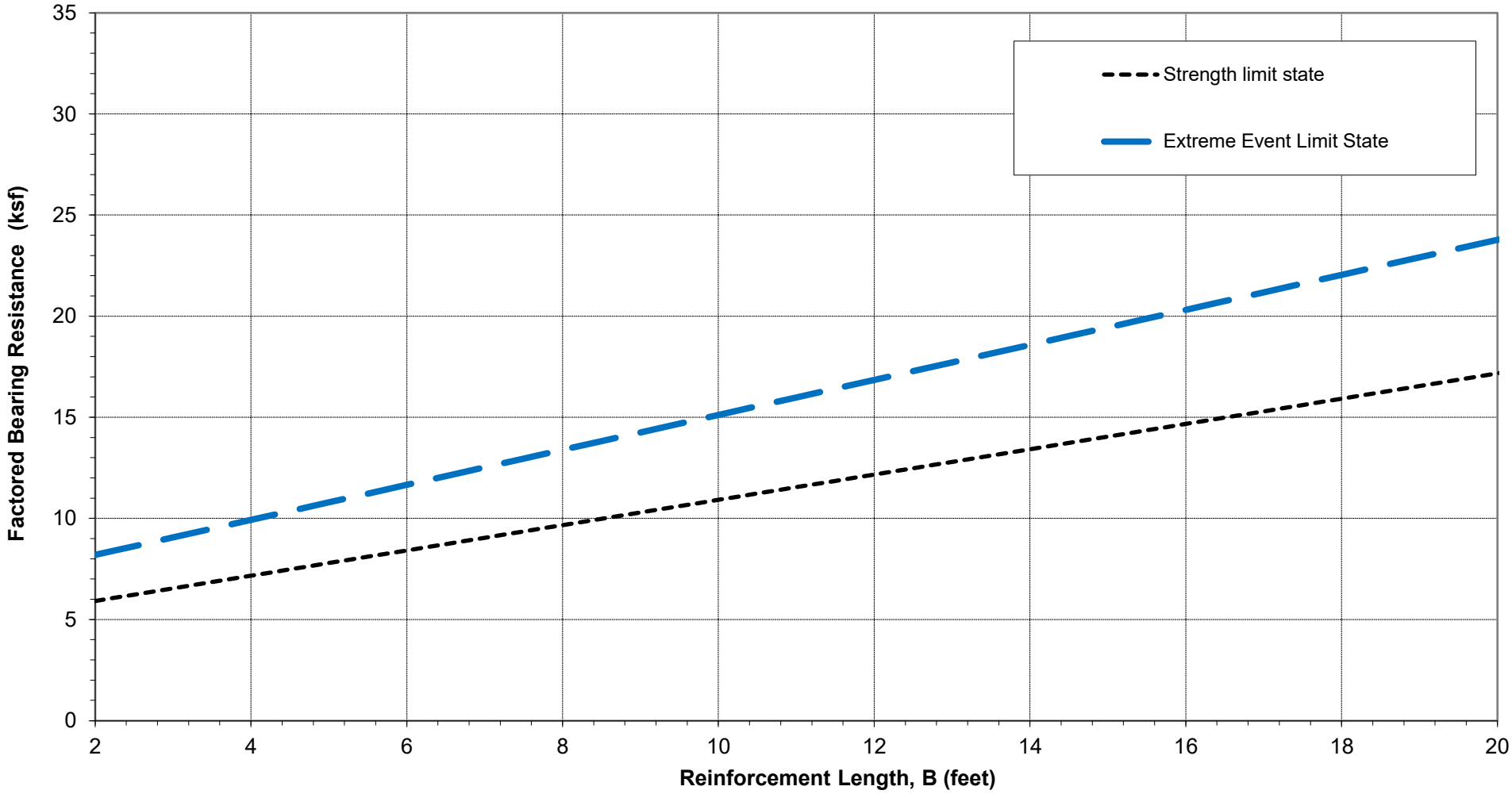
February 2024

105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 11

P:\PDX\105000s\105483 Clackamas Co. SA\Analysis\MSE Wall Design\Stafford Rd B-5 Section 20.gsz



NOTES

1. We recommend using the following resistance factors for footing LRFD design; the plotted bearing capacities use the bearing capacity resistance factors.

Limit State	Sliding Shear	Passive Press.	Bearing Capacity
Service	N/A	Ignore Passive	1.0
Strength	1.0	Ignore Passive	0.65
Extreme Event	1.0	Ignore Passive	0.9

2. The factored bearing capacities are based on a soil friction angle of 28 degrees, a soil cohesion of 100 psf, a total unit weight of 120 pcf, a Poisson's ratio of 0.4, and a soil elastic modulus of 1000 ksf. We assumed that the bottom of the footing was 2 feet below the ground surface.
3. **psf** - pounds per square foot; **pcf** - pounds per cubic foot; **ksf** - kips per square foot (1 kip = 1000 pounds)

FIG. 12

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

FACTORED BEARING RESISTANCE VERSUS MSE REINFORCEMENT LENGTH RECTANGULAR FOOTING, L/B = 10

February 2024 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 12

APPENDIX A: VISUAL PAVEMENT ASSESSMENT

Appendix A

Visual Pavement Assessment

Figures

Station 0+00 was selected as the intersection of Stafford Road and Rosemont Road (the “Yield” sign). Station numbers increase towards the south end of the project limit at the intersection of Stafford Road and Pattulo Way. The fog line on the NB lane was used for station numbering.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

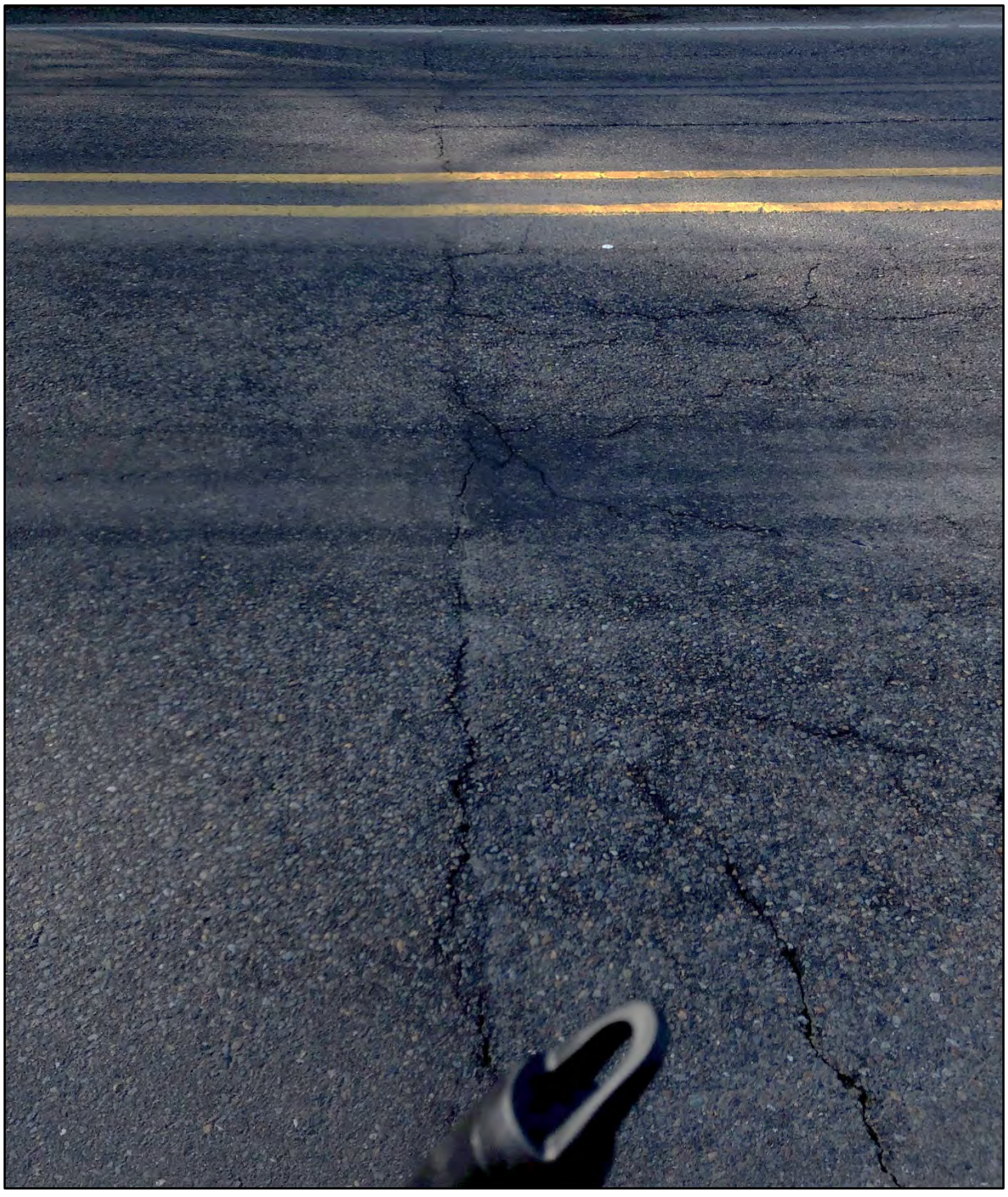
STA. 0+00 TO 43+22
Survey Limits

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A1

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx



This section's cross-section seems to be different from the adjacent pavement as there is a transverse crack at station 3+20 that seems to be a construction joint reflected from the bottom layers of the pavement.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 0+00 TO 3+20
Multiple Distresses

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A2

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

This section exhibits moderate severity raveling especially in the wheel paths.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 0+00 TO 3+20
Raveling

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A3

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

There are moderate severity non-wheel path longitudinal and transverse cracks, and some are interconnected showing patterns of onset of block cracking.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 0+00 TO 3+20
Non-Wheel Path Cracking

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A4

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

Moderate to high severity fatigue cracking is also evident in this section.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 0+00 TO 3+20
Multiple Distresses

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A5

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

There is a small area (4’ by 4’) exhibiting high severity fatigue cracking at station 1+15.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 1+15
Fatigue Cracking

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A6

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

There are 3 instances of small (1’ by 1’) low to moderate severity potholes in the form of shallow delamination.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 0+00 TO 3+20
Multiple Distresses

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A7

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

There is a moderate to high severity patch approximately 50’ by 5’ approximately between stations 1+00 and 1+50.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

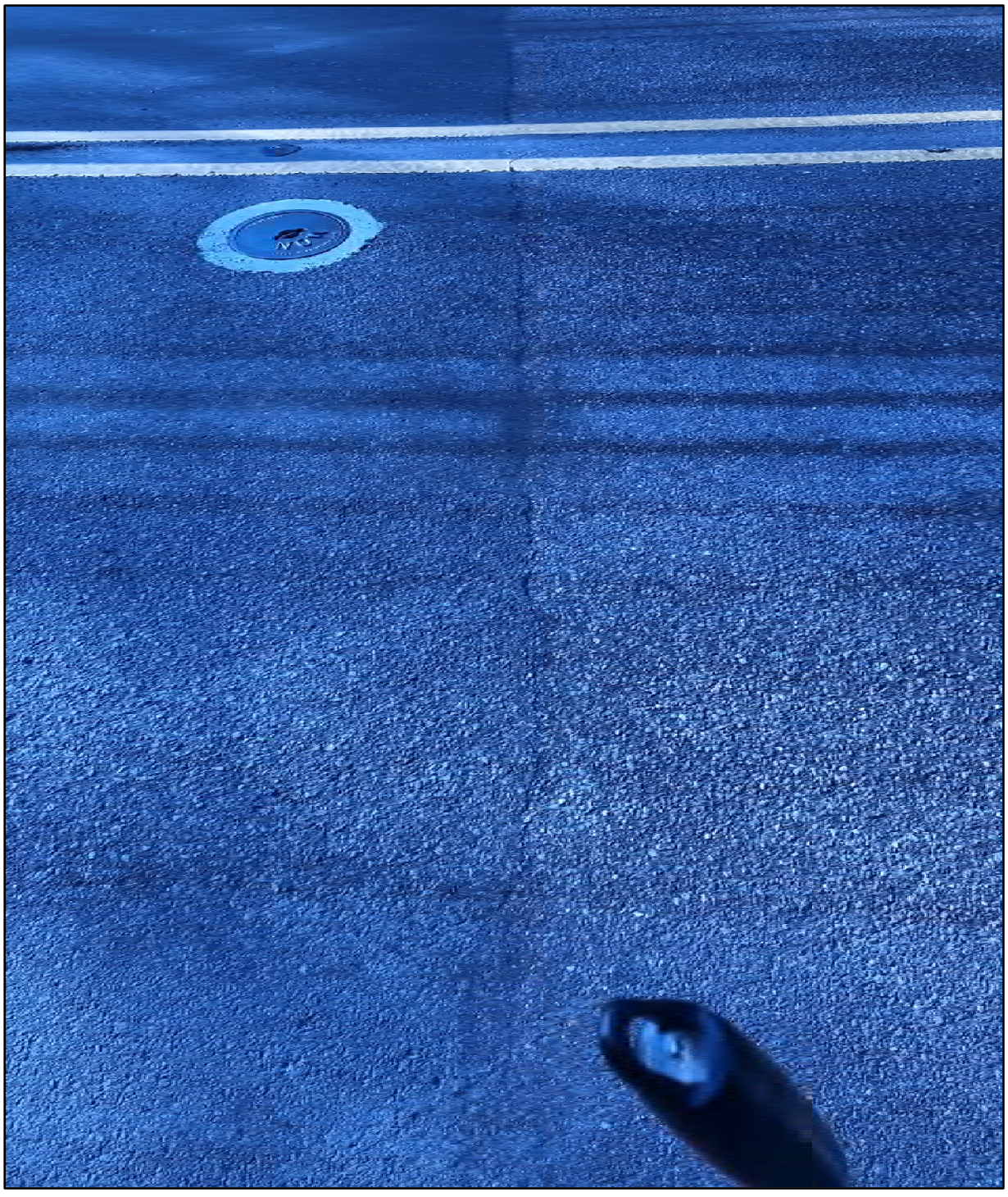
STA. 1+00 TO 1+50
Multiple Distresses

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A8

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx



There is a transverse crack at station 40+99 that seems to be a construction joint reflected from the bottom layers of the pavement.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 3+20 TO 40+99
Multiple Distresses

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A9

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

This section shows moderate severity raveling especially in the wheel paths.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

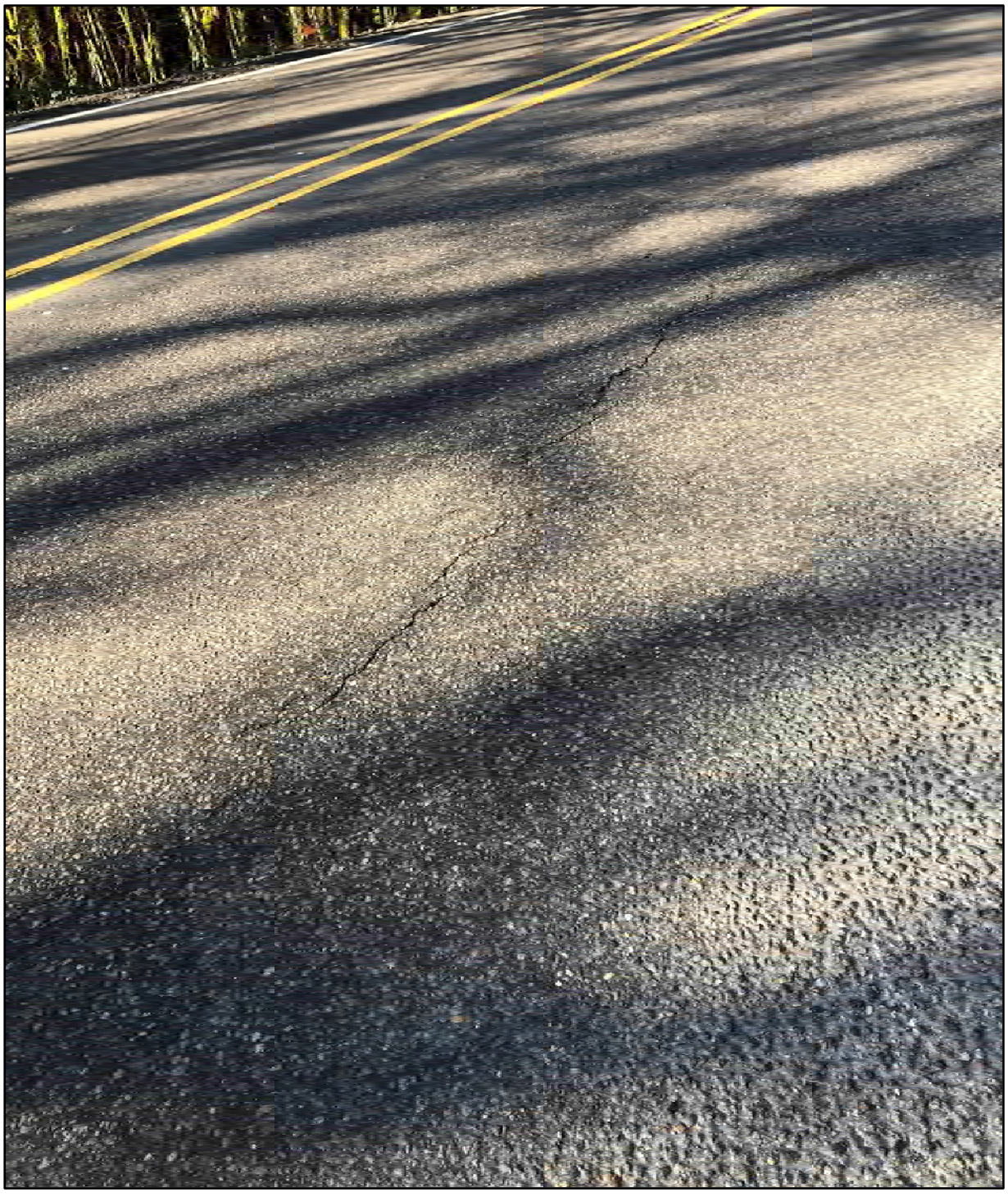
STA. 3+20 TO 40+99
Raveling

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A10

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx



An isolated moderate severity non-wheel path longitudinal crack approximately at station 32+28.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

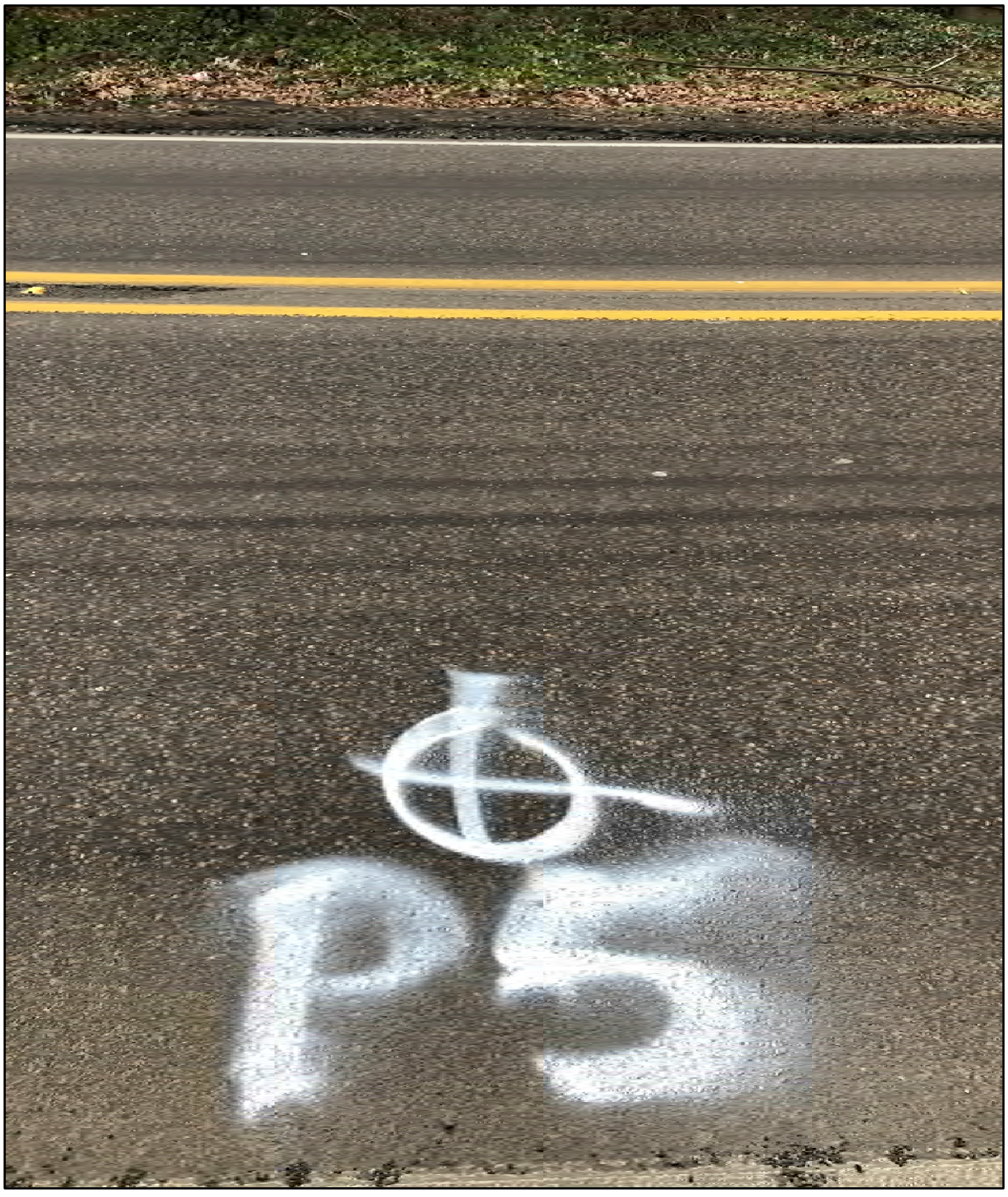
STA. 32+28
Multiple Distresses

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A11

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx



This section shows moderate severity raveling especially in the wheel paths.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

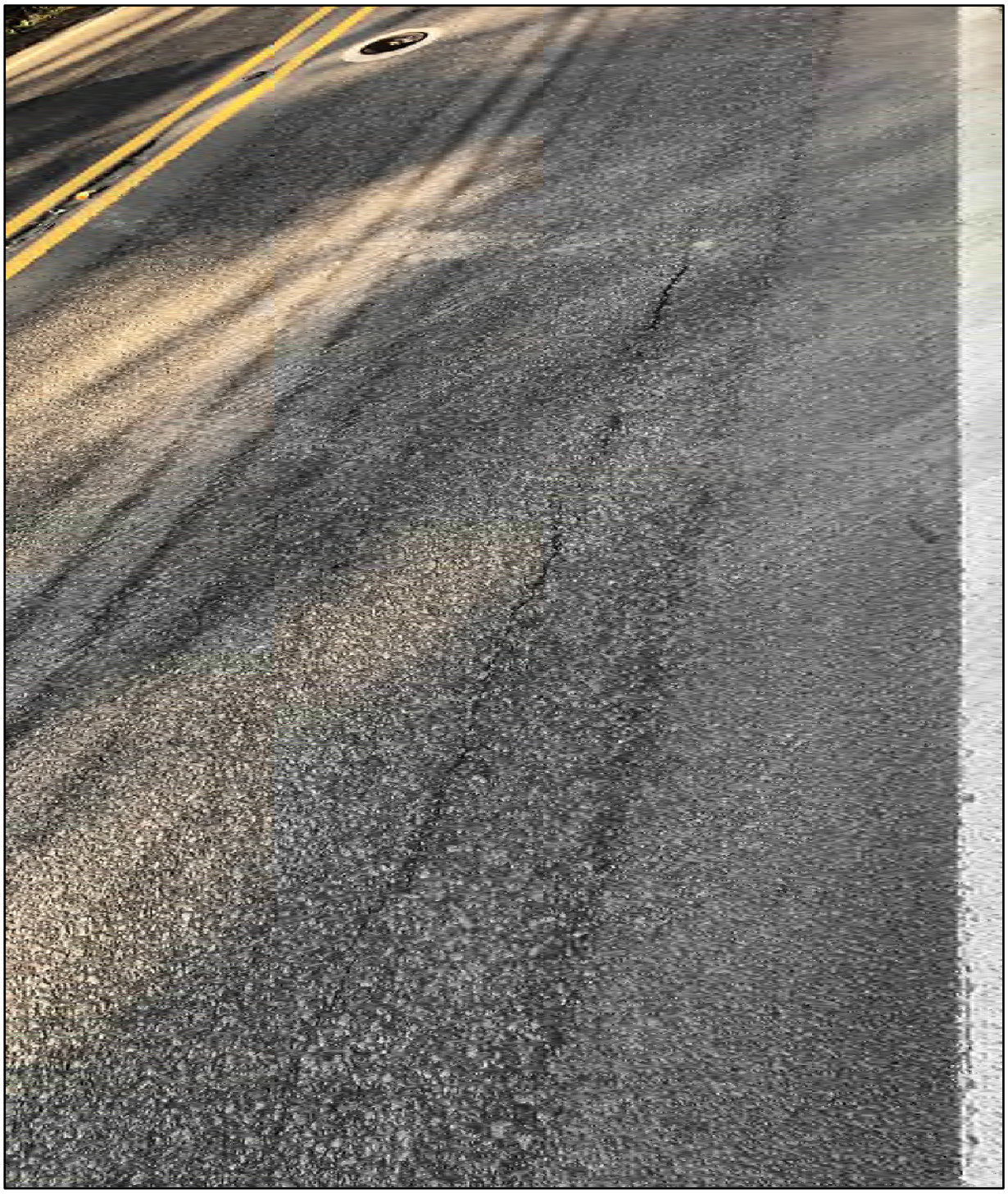
STA. 40+99 TO 43+22
Raveling

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A12

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx



An isolated moderate severity wheel path longitudinal crack (fatigue crack) approximately at station 41+18.

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

STA. 41+18
Fatigue Cracking

February 2022 105483-061

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A13

I:\EF\PDX\105000s\105483 Clackamas Co. SI\Photos\Pavement Condition Assessment-2-10-21/Pavement Assessment Photo Log-SW Stafford Rd.pptx

APPENDIX B: FIELD EXPLORATIONS

Appendix B

Field Explorations

CONTENTS

Figures

APPENDIX B: FIELD EXPLORATIONS

APPENDIX B: FIELD EXPLORATIONS

B.1 GENERAL

Shannon & Wilson, Inc., explored subsurface conditions for the Stafford Road Improvements Project with eight (8) geotechnical borings designated B-1 through B-8, five (5) pavement borings designated P-1 though P-5, one hand auger boring designated HA-1, and one infiltration test designated FH-3. Dynamic Cone Penetrometer (DCP) testing was also completed in the pavement borings P-1 through P-5 and pavement core samples were taken and logged. Boring elevations were estimated from existing grade surface provided by Murraysmith on October 13, 2021. Boring locations were measured relative to objects in the field and handheld GPS, and the approximate boring locations are shown on the Site and Exploration Plan, Figure 2. This appendix describes the techniques used to advance and sample the borings, presents logs of the materials encountered, pavement core logging procedures, and DCP test data and procedures.

B.2 DRILLING

Drilling explorations were completed in two separate mobilizations. Five (5) pavement borings designated P-1 though P-5 were drilled on February 17 and February 18, 2021 using a trailer mounted Simco 2800 drill rig provided and operated by Greg Vandehey Soil Sampling out of Forest Grove, Oregon. The pavement borings ranged in depth from 4.0 to 11.5 feet below ground surface (bgs) and included pavement core sampling and Dynamic Cone Penetrometer tests in each boring. The borings were drilled using solid stem auger drilling techniques.

The geotechnical borings were drilled between October 12, 2021 and November 3, 2021 using a truck mounted CME-75 drill rig, a track mounted Geoprobe 7822DT drill rig, and a CME-55X ATV drill rig, all provided and operated by Western States Soil Conservation, Inc. of Hubbard, Oregon. The borings were advanced to depths ranging from 22.0 to 41.5 feet bgs using open-hole mud rotary drilling and HQ-wireline coring techniques.

Shannon & Wilson geology and engineering staff were on site throughout the exploration program to locate the borings, observe the drilling, collect samples, and log the materials encountered.

D.1.1 Disturbed Sampling

Disturbed samples were collected in the borings, typically at 2.5- to 5-foot depth intervals, using a standard 2-inch outside diameter (O.D.) split spoon sampler in conjunction with Standard Penetration Testing. In a Standard Penetration Test (SPT), ASTM D1586, the

sampler is driven 18 inches into the soil using a 140-pound hammer dropped 30 inches. The number of blows required to drive the sampler the last 12 inches is defined as the standard penetration resistance, or N-value. The SPT N-value provides a measure of in situ relative density of cohesionless soils (silt, sand, and gravel), and the consistency of cohesive soils (silt and clay). All disturbed samples were visually identified and described in the field, sealed to retain moisture, and returned to our laboratory for additional examination and testing.

SPT N-values can be significantly affected by several factors, including the efficiency of the hammer used. Automatic hammers generally have higher energy transfer efficiencies than cathead-driven (manual) hammers. Based on information we received from Western States, the energy efficiency of the automatic hammer used for all SPTs attempted in borings B-1 averaged 85.6 percent, the energy efficiency of the automatic hammer used in borings B-2 and B-8 averaged 85% percent, the energy efficiency of the automatic hammer used in borings B-3, B-5, B-6, and B-7 averaged 78.4 percent, and the energy efficiency of the automatic hammer used in boring B-4 averaged 82.2%. The energy efficiency for all of the automatic hammers were measured in April 2020. A cathead hammer was used to drive the sampler in the pavement borings P-1 through P-5 and cathead hammers are typically assumed to have an average energy transfer efficiency of 60 percent. All N-values presented in this report are in blows per foot, as counted in the field. No corrections of any kind have been applied.

An SPT was considered to have met refusal where more than 50 blows were required to drive the sampler 6 inches. If refusal was encountered in the first 6-inch interval (for example, 50 for 1.5”), the count is reported as 50/1st 1.5”. If refusal was encountered in the second 6-inch interval (for example, 48, 50 for 1.5”), the count is reported as 50/1.5”. If refusal was encountered in the last 6-inch interval (for example, 39, 48, 50 for 1.5”), the count is reported as 98/7.5”.

D.1.2 Undisturbed Sampling

Undisturbed samples were collected in a 3-inch O.D. thin-wall Shelby tube which was hydraulically pushed into the undisturbed soil. The soils exposed at the ends of the tube were examined and described in the field. After examination, the tubes were sealed to preserve the natural moisture of the sample. The sealed tubes were stored in the upright position, and care was taken to avoid shock and vibration during their transport and storage in our laboratory.

D.1.3 Continuous Coring

Continuous HQ-wireline coring was used in borings B-1 through B-8 to sample and advance through rock. Core samples were visually described in the field then boxed for transport to our laboratory for further examination. The rock core recovery (presented on the Drill Logs) was calculated by dividing the length of core recovered in the barrel by the length of the total drilled run. This ratio is expressed as a percent.

The rock quality designation (RQD), also presented on the Drill Logs, is a modified core recovery percentage including only the total length of the specimens of intact rock more than 4 inches in length, divided by the total length of the core run. The smaller pieces are considered to be the result of close jointing, fracturing, or weathering in the rock mass and are excluded from the determination. Difficulties such as distinguishing natural fractures in the rock core from mechanical breaks due to drilling operations restrict the use of the RQD in evaluating in situ rock properties. However, it does provide a subjective estimate of rock mass quality and a comparison of rock quality in the borings.

D.2 MATERIAL DESCRIPTIONS

In the field, samples were described and identified visually in accordance with the ODOT Soil and Rock Classification Manual (1987). The ASTM International (ASTM) D2488 Visual-Manual method was also used as a guide in determining the key diagnostic properties of soils. Consistency, color, relative moisture, degree of plasticity, peculiar odors, and other distinguishing characteristics of the samples were noted. Once returned to our laboratory, the samples were reexamined, various laboratory tests were conducted, and the field descriptions and identifications were modified where necessary. Please refer to the ODOT Soil and Rock Classification Manual (1987) for definitions of descriptive terminology used in the Drill Logs.

D.3 DRILL LOGS

Summary logs of the borings are presented in the Drill Logs, Figures B1 through B14. Material descriptions and interfaces on the logs are interpretive, and actual changes may be gradual. The left-hand portion of the logs show individual sample intervals, percent recovery, SPT data, and natural moisture content measurements. Material descriptions and geotechnical unit designations are shown in the center of the drill logs, and the right-hand portion provides a graphic log, miscellaneous comments, and a graphic depicting hole installation and backfill details. Photographs of the rock core obtained during drilling are presented in Figures B15 through B22.

D.4 BOREHOLE ABANDONMENT

Geotechnical borings were backfilled in accordance with Oregon Department of Water Resources regulations, using bentonite cement or bentonite chips. Pavement sections at the surface were repaired using matching thicknesses of asphalt cold patch and pea gravel extending to a minimum depth of 2 feet.

D.5 IN-SITU INFILTRATION TESTING

In situ infiltration testing was completed using the Encased Falling Head Test method to support design of stormwater infiltration facilities. The tests were conducted in accordance with the 2020 City of Portland Stormwater Management Manual. At each of the infiltration test locations, a hole was drilled to the desired test depth of 5 feet. A 6-inch diameter PVC casing was installed and encased into the bottom of the hole. Twelve inches of water was then added to the bottom of the PVC casing or auger to presoak the soil. After the presoak period, water was again added to the hole to return the level to 12 inches over the test surface, and the drawdown was measured at 10-minute intervals for 1 hour. This process was repeated two more times for a total of three trials. At the beginning of each trial, the water level was returned to approximately 12 inches. The infiltration test results are presented in Figure B23.

D.6 PAVEMENT CORING

Core samples of existing pavements were taken in all borings to aid in assessment of existing pavement conditions. All core samples were drilled and extracted using an approximate 8-inch diameter core barrel. Logs and photographs of the pavement core samples obtained from our borings are presented in Figures B24 through B28.

D.7 DYNAMIC CONE PENETROMETER TESTING

Pavement subgrade testing was conducted the pavement borings P-1 through P-5 using a Dynamic Cone Penetrometer (DCP). The tests were conducted prior to drilling through the test interval. The DCP is a device widely used to determine in-situ strength properties of base materials and subgrade soils. The four main components of the DCP include the cone, rod, anvil, and hammer. The cone is attached to one end of the DCP rod while the anvil and hammer are attached to the other end. Energy is applied to the cone tip through the rod by dropping the 17.64-pound hammer a distance of 22.6 inches against the anvil. The diameter of the cone is 0.16 inches larger than the rod to ensure that only tip resistance is measured. The number of blows required to advance the cone into the subsurface materials is recorded.

The DCP index is the ratio of the depth of penetration to the number of blows of the hammer. This can be correlated to a variety of material properties, including CBR and Resilient Modulus. DCP testing was performed and documented by Shannon & Wilson field personnel. This appendix presents DCP Test Data in Figures B29 through B33.

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **B-1**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Cut Slope**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 122,120**	Easting: **~ 342,358**		Start Card No. **N/A**
Equipment **CME-550X ATV Rig (Hammer Efficiency = 85.6%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Christine Maher**	Ground Elev. **~ 294 ft.**
Start Date **October 14, 2021**	End Date **October 14, 2021**	Total Depth **41.50 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Topsoil**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
	N1	80	7-13-17		N- 1 (2.50-4.00) SILT with trace sand; ML; Brown to gray mottled; Nonplastic to low plasticity; Moist; Very stiff to hard; Fine sand; Pockets of Silty CLAY (CL); Micaceous; (Missoula Flood Deposits - Fine Grained Facies)	**1.00 - 4.50 SILT with trace sand; ML; Brown to gray mottled; Nonplastic to low plasticity; Moist; Very stiff to hard; Fine sand; Pockets of Silty CLAY (CL); Micaceous; (Missoula Flood Deposits - Fine-grained Facies)**			
5	N2	80	5-8-8		N- 2 (5.00-6.50) SILT with some sand; ML; Brown; Nonplastic to low plasticity; Moist; Very stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine Grained Facies)	**4.50 - 10.00 SILT with some sand; ML; Brown; Nonplastic to low plasticity; Moist; Stiff to very stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)**			
	N3	87	4-5-5		N- 3 (7.50-9.00) SILT with some sand; ML; Brown; Low plasticity; Moist; Stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine Grained Facies)				
10	U1	100			U- 1 (10.00-12.00) Silty CLAY; CL; Red-brown; Low plasticity; Moist; Fine sand; Slight iron oxide staining; (Residual Soil)	**10.00 - 13.00 Silty CLAY; CL; Brown; Low plasticity; Moist; Very stiff; Fine sand; Slight iron oxide staining; (Residual Soil)**			
	N4a	73	2-4-25		N- 4a (12.00-13.00) Silty CLAY; CL; Brown; Low plasticity; Moist; Very stiff; Fine sand; Slight iron oxide staining; (Residual Soil)				
	N4b	13			N- 4b (13.00-13.50) Sandy clayey GRAVEL; GC; Gray; Medium plasticity fines; Moist; Medium dense; Fine to coarse, subangular gravel; Fine to coarse sand; Slight iron oxide staining; (Residual Soil)	**13.00 - 14.50 Sandy clayey GRAVEL; GC; Gray; Medium plasticity fines; Moist; Medium dense; Fine to**			
15									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N5	7	50/1st 2"		N- 5 (15.00-15.20) BASALT; Gray to red-brown; Moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)	**coarse, subangular gravel; Fine to coarse sand; Slight iron oxide staining; (Residual Soil)**			
						14.50 - 24.00 BASALT: gray; Moderately to highly weathered; Soft (R2); Joint structure indiscernable in SPT sample; (Columbia River Basalt)			
20	N6	20	50/1st 4"		N- 6 (20.00-20.30) BASALT; Gray to red-brown; Moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)				
						24.00 - 41.50 BASALT; Gray to red-brown; Slightly to moderately wethered; Medium hard to hard (R3-R4); Very close to closely spaced, rough, undulating low to high angle joints with 1-mm to >1-cm clay and mineral infilling and heavy iron oxide staining; 0° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)			
25	N7	13	50/1st 4"		N- 7 (25.00-25.30) BASALT; Gray to red-brown; Moderately weathered; (R3-R4); Joint structure indiscernible in SPT sample; (Columbia River Basalt)			Switch to HQ-WL coring (4-inch hole) at 25.3 feet.	
	C1	100	(R3-R4) RQD = 27		C- 1 (25.30-26.50) BASALT; Gray to red-brown; Slightly to moderately wethered; (R3-R4); Very close to closely spaced, rough, undulating low to high angle joints with 1-mm to 5-mm clay and mineral infilling and iron oxide staining; 10° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)				
	C2	85	(R3-R4) RQD = 6		C- 2 (26.50-30.50) BASALT; Gray to red-brown; Slightly to moderately wethered; (R3-R4); Very close to closely spaced, rough, undulating low to high angle joints with 1-mm to 5-mm clay and mineral infilling and iron oxide staining; 5° to 40°; Fracture and rubble zones throughout; (Columbia River Basalt)				
30	C3	70	(R3-R4) RQD = 0		C- 3 (30.50-31.50) BASALT; Gray to red-brown; Slightly to moderately wethered; (R3-R4); Very close to closely spaced, rough, undulating low to high angle joints with 1-mm to 5-mm clay and mineral infilling and iron oxide staining; 5° to 40°; Fracture and rubble zones throughout; (Columbia River Basalt)			Core barrel blocked off at 30.5 feet.	
	C4	80	(R3-R4) RQD = 30		C- 4 (31.50-35.50) BASALT; Gray to red-brown; Slightly to moderately wethered; (R3-R4); Very close to closely spaced, rough, undulating low to high angle joints with 1-mm to >1-cm clay and mineral infilling and heavy iron oxide staining; 5° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)				
35	C5	100	(R3-R4) RQD = 100		C- 5 (35.50-36.50) BASALT; Gray; Slightly weathered; (R3-R4); Very close to closely spaced, rough, undulating low to high angle joints with 1-mm to 8-mm clay and mineral infilling and heavy iron oxide staining; 15° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)			Core barrel blocked off at 35.5 feet.	
	C6	100	(R3-R4) RQD = 64		C- 6 (36.50-41.50) BASALT; Gray; Fresh; (R3-R4); Very close to closely spaced, rough, undulating low to high				
38									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
38					angle joints with 1-mm to 5-mm clay and mineral infilling and iron oxide staining; 10° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)				
40									
						41.50 **End of hole**			
45									
50									
55									
60									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **B-2**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Cut Slope**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 122,854**	Easting: **~ 342,349**		Start Card No. **N/A**
Equipment **CME-850 Track Rig (Hammer Efficiency = 85%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Christine Maher**	Ground Elev. **~ 341 ft.**
Start Date **October 12, 2021**	End Date **October 12, 2021**	Total Depth **41.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Topsoil**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
						1.00 - 4.50 SILT with trace sand; ML; Brown; Nonplastic; Moist; Loose to medium dense; Fine sand; Micaceous; Trace organics with rootlets; (Missoula Flood Deposits - Fine-grained Facies)			
	N1	40	3-5-5		N- 1 (2.50-4.00) SILT with trace sand; ML; Brown; Nonplastic; Moist; Loose to medium dense; Fine sand; Micaceous; Trace organics with rootlets; (Missoula Flood Deposits - Fine Grained Facies)				
5	N2	100	4-6-6		N- 2 (5.00-6.50) Silty CLAY; CL; Brown; Low to medium plasticity; Moist; Stiff; Fine sand; Micaceous; Trace organics with rootlets; (Missoula Flood Deposits - Fine Grained Facies)	**4.50 - 7.00 Silty CLAY; CL; Brown; Low to medium plasticity; Moist; Stiff; Fine sand; Micaceous; Trace organics with rootlets; (Residual Soil)**			
	N3	60	19-20-50/4"		N- 3 (7.50-8.80) Sandy clayey GRAVEL; GC; Brown; Low to medium plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Residual Soil)	**7.00 - 9.50 Sandy clayey GRAVEL; GC; Brown; Low to medium plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Residual Soil)**		Gravelly drill action at 7.5-feet.	
10	N4	80	12-7-5		N- 4 (10.00-11.50) Sandy clayey SILT with some gravel; MH; Gray to red-brown mottled; High plasticity; Moist; Stiff; Fine to coarse, subangular gravel; Fine to coarse sand; Heavy iron oxide staining; (Residual Soil)	**9.50 - 14.00 Sandy clayey SILT with some gravel; MH; Gray to red-brown mottled; High plasticity; Moist; Stiff; Fine to coarse, subangular gravel; Fine to coarse sand; Heavy iron oxide staining; (Residual Soil)**			
15						**14.00 - 23.00 Sandy clayey SILT;**			

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N5	100	3-7-7		N- 5 (15.00-16.50) Sandy clayey SILT; MH; Red-orange; High plasticity; Moist; Very stiff; Fine to medium sand; Heavy iron oxide staining; (Residual Soil)	**MH; red-brown, gray, yellow-brown mottled; High Plasticity; Moist; Stiff to very stiff; Fine, subangular gravel; Fine to coarse sand; Heavy iron oxide staining; (Residual Soil)**			
20	N6	100	4-7-8		N- 6 (20.00-21.50) Sandy clayey SILT; MH; Gray, yellow-brown mottled; High plasticity; Moist; Stiff to very stiff; Fine, subangular gravel; Fine to coarse sand; Heavy iron oxide staining; (Residual Soil)				
						23.00 - 41.00 BASALT; Gray; Fresh; Medium hard to hard (R3-R4); Close to medium spaced, rough, undulating, moderate to high angle joints with 1-mm to 3-mm clay infilling and iron oxide staining; 20° to 90°; (Columbia River Basalt)			
25	N7	27	50/1st 5"		N- 7 (25.00-25.40) BASALT; Gray; Fresh to slghtly weathered; (R2-R3); Joint structure indiscernible in SPT sample; (Columbia River Basalt)				
	C1	100	(R3-R4) RQD = 100		C- 1 (27.50-31.00) BASALT; Gray; Fresh; (R3-R4); Close to medium spaced, rough, undulating, moderate angle joints with heavy iron oxide staining; 30° to 40°; (Columbia River Basalt)			Switched to HQ-WL coring (4-inch hole) at 27.5 feet.	
30									
	C2	100	(R3-R4) RQD = 94		C- 2 (31.00-36.00) BASALT; Gray; Fresh; (R3-R4); Close to medium spaced, rough, undulating, moderate angle joints with heavy iron oxide staining; 30° to 40°; (Columbia River Basalt)				
35									
	C3	100	(R3-R4) RQD = 92		C- 3 (36.00-41.00) BASALT; Gray; Fresh; (R3-R4); Close to medium spaced, rough, undulating moderate to high angle joints with 1-mm to 3-mm clay infilling and iron oxide staining; 20° to 90°; (Columbia River Basalt)				
38									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
38									
40									
						41.00 **End of hole**			
45									
50									
55									
60									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

		Hole No. **B-3**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**	Purpose **Retaining Wall**	E.A. No. **N/A**
Highway **N/A**	County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,290** Easting: **~ 342,711**		Start Card No. **N/A**
Equipment **CME-75 Truck Rig (Hammer Efficiency = 78.4%)**	Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**	Recorder **Christine Maher**	Ground Elev. **~ 363 ft.**
Start Date **November 1, 2021** End Date **November 1, 2021**	Total Depth **30.80 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.40 Asphalt Concrete: 17-inches thick; (Fill)**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
						1.40 - 2.00 Base Aggregate: 7-inches thick; (Fill)		Softer drilling at 2 feet.	
	N1	60	26-24-12		N- 1 (2.50-4.00) Sandy silty GRAVEL; GM; Gray to red-brown; Low plasticity fines; Moist; Dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Fill)	**2.00 - 4.50 Sandy silty GRAVEL; GM; Gray to red-brown; Low plasticity fines; Moist; Dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Fill)**			
5	N2	73	33-47-40		N- 2 (5.00-6.50) Sandy silty GRAVEL, with cobbles; GM; Gray to red-brown; Low plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Residual Soil)	**4.50 - 7.00 Sandy silty GRAVEL, with cobbles; GM; Gray to red-brown; Low plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Residual Soil)**			
	N3	13	50/1st 5"		N- 3 (7.50-7.90) Sandy silty GRAVEL, with cobbles and boulders; GM; Gray to red-brown; Low plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; Possible basalt boulders; (Decomposed Columbia River Basalt)	**7.00 - 13.50 Sandy silty GRAVEL, with cobbles and boulders; GM; Gray to red-brown; Low plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; Possible basalt boulders; (Decomposed Columbia River Basalt)**			
10	N4	67	29-50/6"		N- 4 (10.00-11.00) Sandy silty GRAVEL; GM; Gray to red-brown; Low plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; (Decomposed Columbia River Basalt)				
						13.50 - 17.50 Silty SAND with some gravel, with cobbles; SM; Brown;			
15									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N5	100	14-40-50/5"		N- 5 (15.00-16.40) Silty SAND with some gravel, with cobbles; SM; Brown; Low plasticity; Moist; Very dense; Fine, subangular to subrounded gravel; Fine to coarse sand; (Decomposed Columbia River Basalt)	**Low plasticity; Moist; Very hard; Fine, subangular to subrounded gravel; Fine to coarse sand; (Decomposed Columbia River Basalt)**		
						17.50 - 30.80 BASALT; Gray; Slightly weathered; Very hard (R5); Very close to closely spaced, smooth to rough, undulating and planar; low to high angle joints with 1-mm to 2-mm clay infilling and heavy iron oxide staining; 5° to 65°; (Columbia River Basalt)		
20	N6	0	50/1st 0"		N- 6 (20.00-20.00) No recovery			Switch to HQ-WL coring (4-inch hole) at 20.0 feet.
	C1	48	(R5) RQD = 25		C- 1 (20.00-24.00) BASALT; Gray; Slightly weathered; (R5); Very close to closely spaced, smooth to rough, undulating and planar; low to high angle joints with 1-mm clay infilling and iron oxide staining; 5° to 50°; (Columbia River Basalt)			Core bareel blocked off at 24.0 feet.
	C2	100	(R5) RQD = 75		C- 2 (24.00-26.00) BASALT; Gray; Slightly weathered; (R5); Very close to closely spaced, smooth to rough, undulating and planar; low to high angle joints with 1-mm to 2-mm clay infilling and iron oxide staining; 5° to 30°; (Columbia River Basalt)			UCS C2: 32,521 psi.
25	C3	67	(R5) RQD = 23		C- 3 (26.00-30.75) BASALT; Gray; Slightly weathered; (R5); Very close to closely spaced, smooth to rough, undulating and planar; low to high angle joints with 1-mm to 2-mm clay infilling and heavy iron oxide staining; 5° to 65°; (Columbia River Basalt)			
30								Core bareel blocked off at 30.8 feet.
						30.80 End of hole		
35								
38								

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **B-4**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Retaining Wall**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,278**	Easting: **~ 342,809**		Start Card No. **N/A**
Equipment **Geoprobe 7822DT (Hammer Efficiency = 82.2%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Seth Sonnier**	Ground Elev. **~ 381 ft.**
Start Date **October 26, 2021**	End Date **October 26, 2021**	Total Depth **30.50 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Topsoil**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
	N1	67	4-5-9		N- 1 (2.50-4.00) Silty CLAY with trace sand; CL; Light brown; Medium plasticity; Moist; Stiff; Fine sand; Trace organics; (Colluvium)	**1.00 - 4.50 Silty CLAY with trace sand; CL; Light brown; Medium plasticity; Moist; Stiff; Fine sand; Trace organics; (Colluvium)**			
5	N2	27	22-29-34		N- 2 (5.00-6.50) Clayey SILT with some gravel and trace sand; MH; Red-brown mottled; High plasticity; Moist; Very hard; Fine to coarse, subangular gravel; Fine sand; Relict basalt texture; (Residual Soil)	**4.50 - 7.00 Clayey SILT with some gravel and trace sand; MH; Red-brown mottled; High plasticity; Moist; Very hard; Fine to coarse, subangular gravel; Fine sand; Relict basalt texture; (Residual Soil)**			
	N3	67	5-5-8	53	N- 3 (7.50-9.00) Clayey SILT with some gravel and trace sand; MH; Red-brown mottled; High plasticity; Moist; Stiff; Fine to coarse, subangular gravel; Fine sand; Relict basalt texture; Some gravel and sand remold to Clayey SILT (MH); (Residual Soil)	**7.00 - 12.00 Clayey SILT with some gravel and sand to Sandy clayey SILT, with cobbles; MH; Red-brown mottled; High plasticity; Moist; Stiff; Fine to coarse, subangular gravel; Fine sand; Relict basalt texture; Some gravel and sand remold to Clayey SILT (MH); (Residual Soil)**		Atterberg Limits N3: LL=85, PL=47, PI=38.	
10	N4	100	7-9-18		N- 4 (10.00-11.50) Clayey SILT with some sand to Sandy clayey SILT, with cobbles; MH; Gray to red-brown mottled; High plasticity; Moist; Very stiff; Fine to coarse sand; Relict basalt texture; Some sand remold to Clayey SILT (MH); (Residual Soil)				
	N5	33	50/1st 3"		N- 5 (12.50-12.80) BASALT; Gray; Slightly weathered; (R3-R4); Joint structure indiscernible in SPT sample; (Columbia River Basalt)	**12.00 - 30.50 BASALT; Gray; Slightly weathered; Medium hard to hard (R3-R4); Very close to close, rough,**			
15									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N6	100	50/1st 3"		N- 6 (15.00-15.30) BASALT; Gray; Slightly weathered; (R3-R4); Joint structure indiscernible in SPT sample; (Columbia River Basalt)	**undulating low to moderate angle joints with 1-mm to 5-mm mineral and rubble infilling and iron oxide staining; 5° to 55°; Fracture, rubble, and incipient joint zones throughout; Slightly vesicular; (Columbia River Basalt)**		Switched to HQ-WL coring (4-inch hole) at 15.3 feet.
	C1	91	(R3-R4) RQD = 0		C- 1 (15.30-17.50) BASALT; Gray; Slightly weathered; (R3-R4); Very close to closely spaced, rough, undulating moderate angle joints with iron oxide staining; 30° to 40°; Fracture and rubble zones throughout; (Columbia River Basalt)			Gray DF return.
	C2	74*	(R3-R4) RQD = 0*		C- 2 (17.50-22.50) BASALT; Gray; Slightly weathered; (R3-R4); *Structure indiscernible after driller damaged the core run; (Columbia River Basalt)			Lost DF circulation in upper 3 feet of boring.
20								
	C3	78	(R3-R4) RQD = 26		C- 3 (22.50-27.50) BASALT; Gray; Slightly weathered; (R3-R4); Very close to close, rough, undulating low to moderate angle joints with 1-mm to 5-mm mineral and rubble infilling and iron oxide staining; 5° to 55°; Fracture, rubble, and incipient joint zones throughout; Slightly vesicular; (Columbia River Basalt)			Core sample from C2 damaged by drillers. UCS C3: 9,375 psi.
25								
	C4	83	(R3-R4) RQD = 20		C- 4 (27.50-30.50) BASALT; Gray; Slightly weathered; (R3-R4); Very close to close, rough, undulating low to moderate angle joints with 1-mm mineral and rubble infilling and iron oxide staining; 15° to 30°Fracture, and rubble zones throughout; Slightly vesicular; (Columbia River Basalt)			
30						**30.50 End of hole**		
35								
38								

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **B-5**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **MSE Wall/Traffic Signal**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,437**	Easting: **~ 342,663**		Start Card No. **N/A**
Equipment **CME-75 Truck Rig #1 (Hammer Efficiency = 78.4%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Christine Maher**	Ground Elev. **~ 361 ft.**
Start Date **November 3, 2021**	End Date **November 3, 2021**	Total Depth **30.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Asphalt Concrete: 12-inches thick; (Fill)**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
						1.00 - 1.83 Base Aggregate: 10-inches thick; (Fill)			
	N1	47	2-3-4		N- 1 (2.50-4.00) Silty CLAY with some gravel and sand; CL; Brown; Low plasticity; Moist; Medium stiff; Fine, subangular to subrounded gravel; Fine to medium sand; Pockets of CLAY with some sand (CH); (Fill)	**1.83 - 7.50 Silty CLAY with some gravel and sand; CL; Brown; Low plasticity; Moist; Soft to medium stiff; Fine to coarse, subrounded gravel; Fine to coarse sand; (Fill)**			
5	U1	100			U- 1 (5.00-6.00) Silty CLAY with some gravel and sand; CL; Brown; Low plasticity; Moist; Fine, subangular to subrounded gravel; Fine to medium sand; (Fill)				
	N2	47	4-2-0		N- 2 (6.00-7.50) Silty CLAY with some gravel and sand; CL; Brown; Low plasticity; Moist; Soft; Fine to coarse, subrounded gravel; Fine to coarse sand; (Fill)				
	U2	88		26	U- 2 (7.50-9.50) Silty CLAY to CLAY with some sand and gravel; CL/CH; Brown; High plasticity; Moist; Medium stiff; Fine to coarse, subrounded gravel; Fine to medium sand; (Fill)	**7.50 - 13.00 Silty CLAY to CLAY with some sand and gravel; CL/CH; Brown; High plasticity; Moist; Medium stiff; Fine to coarse, subrounded gravel; Fine to medium sand; Trace iron nodules; (Fill)**		Atterberg Limits U2: LL=50, PL=24, PI=26.	
	N3	33	2-2-3		N- 3 (9.50-11.00) Silty CLAY to CLAY with some sand and gravel; CL/CH; Brown; High plasticity; Moist; Medium stiff; Fine to coarse, subrounded gravel; Fine to medium sand; Trace iron nodules; (Fill)				
10									
						13.00 - 17.50 Sandy silty GRAVEL; GM; Gray-brown; Low plasticity fines; Moist; Very dense; Fine to coarse,			
15									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N4	53	17-50/3"		N- 4 (15.00-15.75) Sandy silty GRAVEL; GM; Gray-brown; Low plasticity fines; Moist; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse; (Residual Soil)	**subangular to subrounded gravel; Fine to coarse; (Residual Soil)**			
						17.50 - 23.00 BASALT; Gray; Slightly to moderately weathered; Soft (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)			
20	N5	33	50/1st 6"		N- 5 (20.00-20.50) BASALT; Gray; Slightly to moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)				
						23.00 - 30.00 BASALT; Gray; Slightly weathered; Medium hard to hard (R3-R4); Very close to closely spaced, rough, undulating, low to high angle joints with 2-mm to >1-cm clay and mineral infilling and heavy iron oxide staining; Fracture and rubble zones throughout; (Columbia River Basalt)			
25	N6	7	50/1st 1"		N- 6 (25.00-25.10) BASALT; Gray; Slightly to moderately weathered; (R3-R4); Joint structure indiscernible in SPT sample; (Columbia River Basalt)			Switch to HQ-WL coring (4-inch hole) at 25.1 feet.	
	C1	70	(R3-R4) RQD = 16		C- 1 (25.10-30.00) BASALT; Gray; Slightly weathered; (R3-R4); Very close to closely spaced, rough, undulating, low to high angle joints with 2-mm to >1-cm clay and mineral infilling and heavy iron oxide staining; Fracture and rubble zones throughout; (Columbia River Basalt)				
30						**30.00 End of hole**			
35									
38									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **B-6**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **MSE Wall**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,413**	Easting: **~ 342,798**		Start Card No. **N/A**
Equipment **CME-75 Truck Rig #1 (Hammer Efficiency = 78.4%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Christine Maher**	Ground Elev. **~ 367 ft.**
Start Date **November 2, 2021**	End Date **November 2, 2021**	Total Depth **28.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 0.83 Asphalt Concrete: 10-inches thick; (Fill)**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
						0.83 - 1.16 Base Aggregate: 4-inches thick; (Fill)			
	N1	47	2-3-2	36	N- 1 (2.50-4.00) Sandy SILT with trace gravel; ML; Brown; Low plasticity; Moist; Medium stiff; Fine to coarse, angular to subrounded gravel; Fine to coarse sand; (Fill)	**1.16 - 4.50 Sandy SILT with trace gravel; ML; Brown; Low plasticity; Moist; Medium stiff; Fine to coarse, angular to subrounded gravel; Fine to coarse sand; (Fill)**		N1: 12% gravel, 40% sand, 48% fines.	
5	N2	33	1-3-3		N- 2 (5.00-6.50) Silty CLAY with some sand and gravel; CL; Brown; Medium plasticity; Moist; Medium stiff; Fine to coarse, angular to subrounded gravel; Fine to coarse sand; (Fill)	**4.50 - 8.50 Silty CLAY with some sand and gravel; CL; Brown; Medium plasticity; Moist; Medium stiff; Fine to coarse, angular to subrounded gravel; Fine to coarse sand; (Fill)**			
	U1	85			U- 1 (6.50-8.50) Silty CLAY with some sand and gravel; CL; Brown; Medium plasticity; Moist; Fine to coarse, angular to subrounded gravel; Fine to coarse sand; (Fill)				
	N3	67	2-2-4		N- 3 (8.50-10.00) SILT with some sand; ML; Brown; Low plasticity; Moist; Medium stiff; Fine sand; (Fill)	**8.50 - 12.50 SILT with some sand; ML; Brown; Low plasticity; Moist; Medium stiff; Fine sand; (Fill)**			
10	U2	0			U- 2 (10.00-11.00) No recovery				
						12.50 - 17.50 CLAY with some sand; CH; Brown; High plasticity; Moist; Very stiff; Fine sand; (Residual Soil)			
15									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N4	100	4-6-6	35	N- 4 (15.00-16.50) CLAY with some sand; CH; Brown; High plasticity; Moist; Very stiff; Fine sand; (Residual Soil)			Atterberg Limits N4: LL=61, PL=29, PI=32.	
20	N5	27	50/1st 5"		N- 5 (20.00-20.40) BASALT; Gray; Moderately to highly weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)	**17.50 - 26.60 BASALT; Gray; Moderately to highly weathered; Soft to medium hard (R2-R3); Very closely spaced, rough, undulating joints with 1-mm to 8-mm clay and mineral infilling and iron oxide staining; 0° to 90°; Large rubble zones throughout; (Columbia River Basalt)**		Switch to HQ-WL coring (4-inch hole) at 20.4 feet.	
	C1	50	(R2-R3) RQD = 0		C- 1 (20.40-25.00) BASALT; Gray; Moderately to highly weathered; (R2-R3); Very closely spaced, rough, undulating joints with 1-mm to 8-mm clay and mineral infilling and iron oxide staining; 0° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)				
25	C2	83	RQD = 20		C- 2 (25.00-28.00) Similar to above. Transitioning at 26.6 ft. to BASALT; Gray; Fresh to slightly weathered; (R3-R5), rough, undulating joints with 1-mm clay and mineral infilling and iron oxide staining; 15° to 30°; Fracture and rubble zones throughout; (Columbia River Basalt)	**26.60 - 28.00 BASALT; Gray; Fresh to slightly weathered; Medium hard to very hard (R3-R5), rough, undulating joints with 1-mm clay and mineral infilling and iron oxide staining; 15° to 30°; Fracture and rubble zones throughout; (Columbia River Basalt)**			
30						**28.00 End of hole**			
35									
38									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **B-7**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **MSE Wall**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,259**	Easting: **~ 342,650**		Start Card No. **N/A**
Equipment **CME-75 Truck Rig #1 (Hammer Efficiency = 78.4%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Christine Maher**	Ground Elev. **~ 359 ft.**
Start Date **November 1, 2021**	End Date **November 2, 2021**	Total Depth **22.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 0.83 Asphalt Concrete: 10-inches thick; (Fill)**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
						0.83 - 1.49 Base Aggregate: 8-inches thick; (Fill)			
	N1	47	27-18-8		N- 1 (2.50-4.00) Silty CLAY with some sand and gravel; CL; Brown; Low plasticity; Moist; Very stiff; Fine to coarse, suangular gravel; Fine to coarse sand; (Fill)	**1.49 - 4.50 Silty CLAY with some sand and gravel; CL; Brown; Low plasticity; Moist; Very stiff; Fine to coarse, suangular gravel; Fine to coarse sand; (Fill)**			
5	N2	80	3-6-14	28	N- 2 (5.00-6.50) SILT with some sand; ML; Brown; Low plasticity; Moist; Very stiff; Fine sand; (Fill)	**4.50 - 7.00 SILT with some sand; ML; Brown; Low plasticity; Moist; Very stiff; Fine sand; (Fill)**		N2: 80% fines.	
	N3	60	24-48-50/2"		N- 3 (7.50-8.70) Silty SAND to Sandy SILT with some gravel; SM/ML; Gray-brown; Low plasticity; Moist; Very hard; Fine, subangular to subrounded gravel; Fine to coarse sand; Mixed soil with relict basalt texture; (Residual Soil)	**7.00 - 9.00 Silty SAND to Sandy SILT with some gravel; SM/ML; Gray-brown; Low plasticity; Moist; Very dense; Fine, subangular to subrounded gravel; Fine to coarse sand; Mixed soil with relict basalt texture; (Residual Soil)**			
10	N4	13	50/1st 4"		N- 4 (10.00-10.40) BASALT; Gray; Slightly to moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)	**9.00 - 14.50 BASALT; Gray; Slightly to moderately weathered; Soft (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)**			
15						**14.50 - 22.00**			

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N5 C1	7 50	50/1st 1" (R3-R5) RQD = 25		N- 5 (15.00-15.10) BASALT; Gray; Fresh to slightly weathered; (R3-R5); Joint structure indiscernible in SPT sample; (Columbia River Basalt) C- 1 (15.00-17.00) BASALT; Gray; Fresh to slightly weathered; (R3-R5); Very close to closely spaced, rough, undulating joints; 20°; Fracture zones througout; (Columbia River Basalt)	**BASALT; Gray; Fresh to slightly weathered; Hard to very hard (R4-R5); Close to medium spaced, rough, undulating, low to high angle joints with 1-mm to 5-mm clay and mineral infilling and iron oxide staining; 10° to 70°; (Columbia River Basalt)**		Switch to HQ-WL coring (4-inch hole) at 15.0 feet.	
	C2	100	(R4-R5) RQD = 76		C- 2 (17.00-22.00) BASALT; Gray; Fresh to slightly weathered; (R4-R5); Close to medium spaced, rough, undulating, low to high angle joints with 1-mm to 5-mm clay and mineral infilling and iron oxide staining; 10° to 70°; (Columbia River Basalt)				
20									
						22.00 **End of hole**			
25									
30									
35									
38									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

Hole No. **B-8**

Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Fill Embankment**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,479**	Easting: **~ 342,810**		Start Card No. **N/A**
Equipment **CME-850 Track Rig (Hammer Efficiency = 85%)**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Christine Maher**	Ground Elev. **~ 355 ft.**
Start Date **October 12, 2021**	End Date **October 13, 2021**	Total Depth **41.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Topsoil**		Boring advanced using mud rotary drilling technique; 5-inch hole.	
						1.00 - 4.50 Silty CLAY with trace sand; CL; Brown; Medium plasticity; Moist; Medium stiff; (Colluvium)			
	N1	60	3-3-4		N- 1 (2.50-4.00) Silty CLAY with trace sand; CL; Brown; Medium plasticity; Moist; Medium stiff; (Colluvium)				
5	U1	100			U- 1 (5.00-6.50) Sandy silty GRAVEL; GM; Brown; Low plasticity fines; Moist; Fine to coarse, subangular gravel; Fine to coarse sand; Relict basalt texture; (Residual Soil)	**4.50 - 9.00 Sandy silty GRAVEL to Silty SAND with some gravel; GM/SM; Brown; Low plasticity fines; Moist; Very dense; Fine to medium sand; Relict basalt texture; Mixed soil; (Residual Soil)**			
	N2	80	8-30-24		N- 2 (6.50-8.00) Sandy silty GRAVEL to Silty SAND with some gravel; SM; Brown; Low plasticity fines; Moist; Very dense; Fine to medium sand; Relict basalt texture; Mixed soil; (Residual Soil)				
10	N3	7	50/1st 2"		N- 3 (10.00-10.20) BASALT; Gray; Slightly to moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)	**9.00 - 21.00 BASALT; Gray; Slightly to moderately weathered; Soft (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)**			
15									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
15	N4	7	50/1st 2"		N- 4 (15.00-15.20) BASALT; Gray; Slightly to moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)			Variable drilling action within weathered basalt from 10 to 20 feet.	
20	N5	7	50/1st 2"		N- 5 (20.00-20.20) BASALT; Gray; Slightly to moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)			Harder drilling action at 20 feet.	
						21.00 - 35.40 BASALT; Gray and red-brown; Moderately weathered; Soft to medium hard (R2-R3); Very close to closely spaced, rough, undulating, low to high angle joints with 1-mm to >1-cm clay and mineral infilling and iron oxide staining; 0° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)			
25	N6	13	50/1st 2"		N- 6 (25.00-25.30) BASALT; Gray; Slightly to moderately weathered; (R2); Joint structure indiscernible in SPT sample; (Columbia River Basalt)			Switch to HQ-WL coring (4-inch hole) at 25.3 feet.	
	C1	0	(R2) RQD = 0		C- 1 (25.30-26.00) BASALT; Gray; Slightly to moderately weathered; (R2); No recovery; (Columbia River Basalt)				
	C2	70	(R3) RQD = 12		C- 2 (26.00-31.00) BASALT; Gray and red-brown; Moderately weathered; (R3); Very close to closely spaced, rough, undulating, low to high angle joints with 1-mm to >1-cm clay and mineral infilling and iron oxide staining; 0° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)				
30									
	C3	100	(R3-R4) RQD = 30		C- 3 (31.00-36.00) BASALT; Gray and red-brown; Moderately weathered; (R3-R4); Very close to closely spaced, rough, undulating, low to high angle joints with 1-mm to 8-mm clay and mineral infilling and iron oxide staining; 5° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)				
35									
	C4	94	(R3-R4) RQD = 20		C- 4 (36.00-41.00) BASALT; Gray and red-brown; Moderately weathered; (R3-R4); Very close to closely spaced, rough, undulating, low to high angle joints with 1-mm to 8-mm clay and mineral infilling and iron oxide staining; 5° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)	**35.40 - 41.00 BASALT; Gray and red-brown; Slightly to moderately weathered; Medium hard to hard (R3-R4); Very close to closely**			
38									

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
38						**spaced, rough, undulating, low to high angle joints with 1-mm to 8-mm clay and mineral infilling and iron oxide staining; 5° to 90°; Fracture and rubble zones throughout; (Columbia River Basalt)**			
40						**41.00 End of hole**			
45									
50									
55									
60									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

Figure **B9**
Page **1** of **1**

		Hole No.	**P-1**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**	Purpose **Pavement Assessment**	E.A. No.	**N/A**
Highway **N/A**	County **Clackamas**	Key No.	**N/A**
Hole Location Northing: **~ 124,740** Easting: **~ 343,382**		Start Card No.	**N/A**
Equipment **Simco 2800 Trailer Rig; Cathead Hammer**	Driller **Greg Vandehey**	Bridge No.	**N/A**
Project Geologist **Seth Sonnier, RG**	Recorder **Shervin Jahangirnejad**	Ground Elev.	**~ 431 ft.**
Start Date **February 18, 2021** End Date **February 18, 2021**	Total Depth **11.50 ft**	Tube Height	**N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 0.80 Asphalt Concrete: 10-inches thick; (Fill)**		Borehole advanced using solid stem auger drilling techniques; 4-inch hole.	
						0.80 - 1.40 Portland Cement Concrete: 7-inches thick; (Fill)			
						1.40 - 3.00 Base Aggregate: 1.5-feet thick; (Fill)		Sample could not be retrieved due to caving borehole.	
						3.00 - 7.00 SILT with trace sand; ML; Brown; Low to medium plasticity; Moist; Medium stiff to stiff; Fine to medium sand; Micaceous; (Colluvium)		Water observed at 3.5 feet during drilling.	
5	N1	100	2-3-5		N- 1 (5.00-6.50) SILT with trace sand; ML; Brown; Low to medium plasticity; Moist; Medium stiff to stiff; Fine to medium sand; (Colluvium)			Drill bit broke at approximately 5 feet.	
	N2	100	5-6-9		N- 2 (7.50-9.00) CLAY with trace sand; CH; Brown; Medium to high plasticity; Moist; Stiff to very stiff; Fine subangular gravel; Fine to coarse sand; Micaceous; Slight iron oxide staining; (Residual Soil)	**7.00 - 11.50 CLAY with trace sand; CH; Brown; Medium to high plasticity; Moist; Stiff to very stiff; Fine subangular gravel; Fine to coarse sand; Micaceous; Slight iron oxide staining; (Residual Soil)**			
10	N3	100	5-6-17		N- 3 (10.00-11.50) CLAY with trace sand; CH; Brown; Medium to high plasticity; Moist; Very stiff; Fine subangular gravel; Fine to coarse sand; Micaceous; Slight iron oxide staining; (Residual Soil)				
						11.50 End of hole			
15									

ODOT DRILL LOG 105483.GPJ ODOT_MAN.GDT 12/8/21

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **P-2**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Pavement Assessment**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,889**	Easting: **~ 343,196**		Start Card No. **N/A**
Equipment **Simco 2800 Trailer Rig; Cathead Hammer**		Driller **Greg Vandehey**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Shervin Jahangirnejad**	Ground Elev. **~ 397 ft.**
Start Date **February 18, 2021**	End Date **February 18, 2021**	Total Depth **4.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.10 Asphalt Concrete: 13-inches thick; (Fill)**		Borehole advanced using solid stem auger drilling techniques; 4-inch hole.	
						1.10 - 2.50 Base Aggregate: 17-inches thick; (Fill)			
	N1	100	9-18-50/5"		N- 1 (2.50-4.00) Sandy SILT with some gravel; ML; Brown to orange; Nonplastic; Damp; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; Heavy iron oxide staining; (Residual Soil)	**2.50 - 4.00 Sandy SILT with some gravel; ML; Brown to orange; Nonplastic; Damp; Very dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; Heavy iron oxide staining; (Residual Soil)**		P-2 had to be re-drilled after refusal was encountered at 2.5 feet. Boring moved 20-feet south.	
						4.00 End of hole		Auger refusal at 4 feet.	
5									
10									
15									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **P-3**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Pavement Assessment**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,432**	Easting: **~ 342,941**		Start Card No. **N/A**
Equipment **Simco 2800 Trailer Rig; Cathead Hammer**		Driller **Greg Vandehey**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Shervin Jahangirnejad**	Ground Elev. **~ 372 ft.**
Start Date **February 17, 2021**	End Date **February 17, 2021**	Total Depth **11.50 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Asphalt Concrete: 12-inches thick; (Fill)**		Borehole advanced using solid stem auger drilling techniques; 4-inch hole.	
						1.00 - 1.70 Portland Cement Concrete: 8-inches thick; (Fill)			
	N1	73	4-3-5		N- 1 (2.50-4.00) CLAY; CH; Brown; Medium to high plasticity; Moist; Stiff; Disturbed texture; (Fill)	**1.70 - 2.30 Base Aggregate: 7-inches thick; (Fill)**			
						2.30 - 4.50 CLAY; CH; Brown; Medium to high plasticity; Moist; Stiff; Disturbed texture; (Fill)			
5	N2	100	6-7-11	32	N- 2 (5.00-6.50) CLAY with trace sand; CH; Brown; Medium plasticity; Moist; Very stiff; Fine sand; Trace organics: Iron oxidation and staining; (Residual Soil)	**4.50 - 9.50 CLAY with trace sand; CH; Brown; Medium plasticity; Moist; Very stiff; Fine sand; Slight iron oxide staining; (Residual Soil)**		Atterberg Limits N2: LL=56, PL=29, PI=27.	
	N3	100	7-7-10	28	N- 3 (7.50-9.00) CLAY with trace sand; CH; Brown; Medium plasticity; Moist; Very stiff; Fine sand; Iron oxidation and staining; (Residual Soil)			Atterberg Limits N3: LL=51, PL=24, PI=27.	
10	N4	100	13-22-24		N- 4 (10.00-11.50) Silty SAND with some gravel; SM; Brown; Nonplastic to low plasticity fines; Moist; Dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; Relict basalt texture; Heavy iron oxide staining; (Residual Soil)	**9.50 - 11.50 Silty SAND with some gravel; SM; Brown; Nonplastic to low plasticity fines; Moist; Dense; Fine to coarse, subangular to subrounded gravel; Fine to coarse sand; Relict basalt texture; Heavy iron oxide staining; (Residual Soil)**			
						11.50 End of hole			
15									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **P-4**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Pavement Assessment**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,048**	Easting: **~ 342,427**		Start Card No. **N/A**
Equipment **Simco 2800 Trailer Rig; Cathead Hammer**		Driller **Greg Vandehey**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Shervin Jahangirnejad**	Ground Elev. **~ 341 ft.**
Start Date **February 17, 2021**	End Date **February 17, 2021**	Total Depth **11.50 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.05 Asphalt Concrete: 13-inches thick; (Fill)**		Borehole advanced using solid stem auger drilling techniques; 4-inch hole.	
						1.05 - 2.50 Base Aggregate: 17-inches thick; (Fill)			
	N1	60	4-5-3		N- 1 (2.50-4.00) Silty CLAY with some sand; CL; Brown; Low to medium plasticity; Moist; Medium stiff to stiff; Fine sand; Slight iron oxide staining; Pockets of SILT with some sand (ML); (Fill)	**2.50 - 4.50 Silty CLAY with some sand; CL; Brown; Low to medium plasticity; Moist; Medium stiff to stiff; Fine sand; Slight iron oxide staining; Pockets of SILT with some sand (ML); (Fill)**			
5	N2	0	3-2-2		N- 2 (5.00-6.50) No recovery	**4.50 - 9.50 Silty CLAY with trace sand; CL; Brown; Medium plasticity; Moist; Medium stiff; Fine sand; Micaceous; Trace organics; (Missoula Flood Deposits - Fine-grained Facies)**			
	N3	100	2-2-4		N- 3 (7.50-9.00) Silty CLAY with trace sand; CL; Brown; Medium plasticity; Moist; Medium stiff; Fine sand; Micaceous; Trace organics; (Missoula Flood Deposits - Fine-grained Facies)				
10	N4	100	7-8-10		N- 4 (10.00-11.50) SILT with trace sand; ML; Light brown; Low plasticity; Moist; Very stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)	**9.50 - 11.50 Silt with trace sand; ML; Light brown; Low plasticity; Moist; Very stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)**			
						11.50 End of hole			
15									

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

Figure **B13**
Page **1** of **1**

		Hole No. **P-5**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**	Purpose **Pavement Assessment**	E.A. No. **N/A**
Highway **N/A**	County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 121,460** Easting: **~ 342,322**		Start Card No. **N/A**
Equipment **Simco 2800 Trailer Rig; Cathead Hammer**	Driller **Greg Vandehey**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**	Recorder **Shervin Jahangirnejad**	Ground Elev. **~ 229 ft.**
Start Date **February 17, 2021** End Date **February 17, 2021**	Total Depth **11.50 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core "GP" - GeoProbe®
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 0.80 Asphalt Concrete: 10-inches thick; (Fill)**		Borehole advanced using solid stem auger drilling techniques; 4-inch hole.	
						0.80 - 1.40 Portland Cement Concrete: 7-inches thick; (Fill)			
	N1	93	4-4-8		N- 1 (2.50-4.00) CLAY; CH; Brown; High plasticity; Moist; Stiff; Micaceous; Slight iron oxide staining; (Fill)	**1.40 - 2.50 Base Aggregate: 13-inches thick; (Fill)**			
						2.50 - 4.50 CLAY; CH; Brown; High plasticity; Moist; Stiff; Micaceous; Slight iron oxide staining; (Fill)			
5	N2	100	4-4-4		N- 2 (5.00-6.50) Silty CLAY with trace sand; CL; Brown; Low to medium plasticity; Moist; Medium stiff to stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)	**4.50 - 11.50 Silty CLAY with trace sand; CL; Brown; Low to medium plasticity; Moist; Medium stiff to stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)**			
	N3	100	2-3-3		N- 3 (7.50-9.00) Silty CLAY with trace sand; CL; Brown; Low to medium plasticity; Moist; Medium stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)				
10	N4	100	3-2-4		N- 4 (10.00-11.50) Silty CLAY with trace sand; CL; Brown; Low to medium plasticity; Moist; Medium stiff; Fine sand; Micaceous; (Missoula Flood Deposits - Fine-grained Facies)				
						11.50 End of hole			
15									

ODOT DRILL LOG 105483.GPJ ODOT_MAN.GDT 12/8/21

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

DRILL LOG

OREGON DEPARTMENT OF TRANSPORTATION

			Hole No. **HA-1**
Project **Stafford Road (Pattulo Way to Rosemont Road) Improvements Project**		Purpose **Retaining Wall**	E.A. No. **N/A**
Highway **N/A**		County **Clackamas**	Key No. **N/A**
Hole Location Northing: **~ 123,262**	Easting: **~ 342,754**		Start Card No. **N/A**
Equipment **2.5-inch Hand Auger**		Driller **Western States**	Bridge No. **N/A**
Project Geologist **Seth Sonnier, RG**		Recorder **Seth Sonnier**	Ground Elev. **~ 377 ft.**
Start Date **October 26, 2021**	End Date **October 26, 2021**	Total Depth **8.00 ft**	Tube Height **N/A**

Test Type
"A" - Auger Core
"X" - Auger
"C" - Core, Barrel Type
"N" - Standard Penetration
"U" - Undisturbed Sample
"T" - Test Pit
"GP" - GeoProbe®

Rock Abbreviations

Discontinuity	Shape	Surface Roughness
J - Joint	Pl - Planar	P - Polished
F - Fault	C - Curved	Sl - Slickensided
B - Bedding	U - Undulating	Sm - Smooth
Fo - Foliation	St - Stepped	R - Rough
S - Shear	Ir - Irregular	VR - Very Rough

Typical Drilling Abbreviations

Drilling Methods	Drilling Remarks
WL - Wire Line	LW - Lost Water
HS - Hollow Stem Auger	WR - Water Return
DF - Drill Fluid	WC - Water Color
SA - Solid Auger	DP - Down Pressure
CA - Casing Advancer	DR - Drill Rate
HA - Hand Auger	DA - Drill Action

Depth (ft)	Test Type, No.	Percent Recovery	Soil / Rock: Driving Resistance / Discontinuity Data Or RQD%	Percent Natural Moisture	Material Description (SOIL: Soil Name, USCS, Color, Plasticity, Moisture, Consistency/Relative Density, Texture, Cementation, Structure, Origin. ROCK: Rock Name, Color, Weathering, Hardness, Discontinuity Spacing, Joint Filling, Core Recovery, Formation Name.)	Unit Description	Graphic Log	Drilling Methods, Size and Remarks / Water Level/ Date	Backfill/ Instrumentation
0						**0.00 - 1.00 Topsoil**		Boring advanced using 2.5-inch diameter hand auger.	NATIVE MATERIAL
	JAR1				JAR- 1 (1.00-1.50) SILT with trace sand; ML; Dark brown; Medium plasticity; Moist; Fine to coarse sand; Trace organics; (Colluvium)	**1.00 - 7.00 SILT with trace sand; ML; Light to dark brown; Medium plasticity; Moist; Fine to coarse sand; Trace organics; (Colluvium)**			
	JAR2				JAR- 2 (2.00-2.50) SILT with trace sand; ML; Light brown; Medium plasticity; Moist; Fine to coarse sand; Trace organics; (Colluvium)				
5								Hard drilling from 3 to 7 feet.	
	JAR3				JAR- 3 (7.00-7.50) Silty CLAY with some gravel and sand, with cobbles; CL; Red-brown mottled; Medium plasticity; Moist; Fine to coarse, subangular gravel; Fine to coarse sand; Relict basalt texture; (Residual Soil)	**7.00 - 8.00 Silty CLAY with some gravel and sand, with cobbles; CL; Red-brown mottled; Medium plasticity; Moist; Fine to coarse, subangular gravel; Fine to coarse sand; Relict basalt texture; (Residual Soil)**		Gravels and possible cobbles encountered at 7 feet.	
10						**8.00 End of hole**		Auger met refusal in cobbles at 8 feet.	
15									

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-3
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

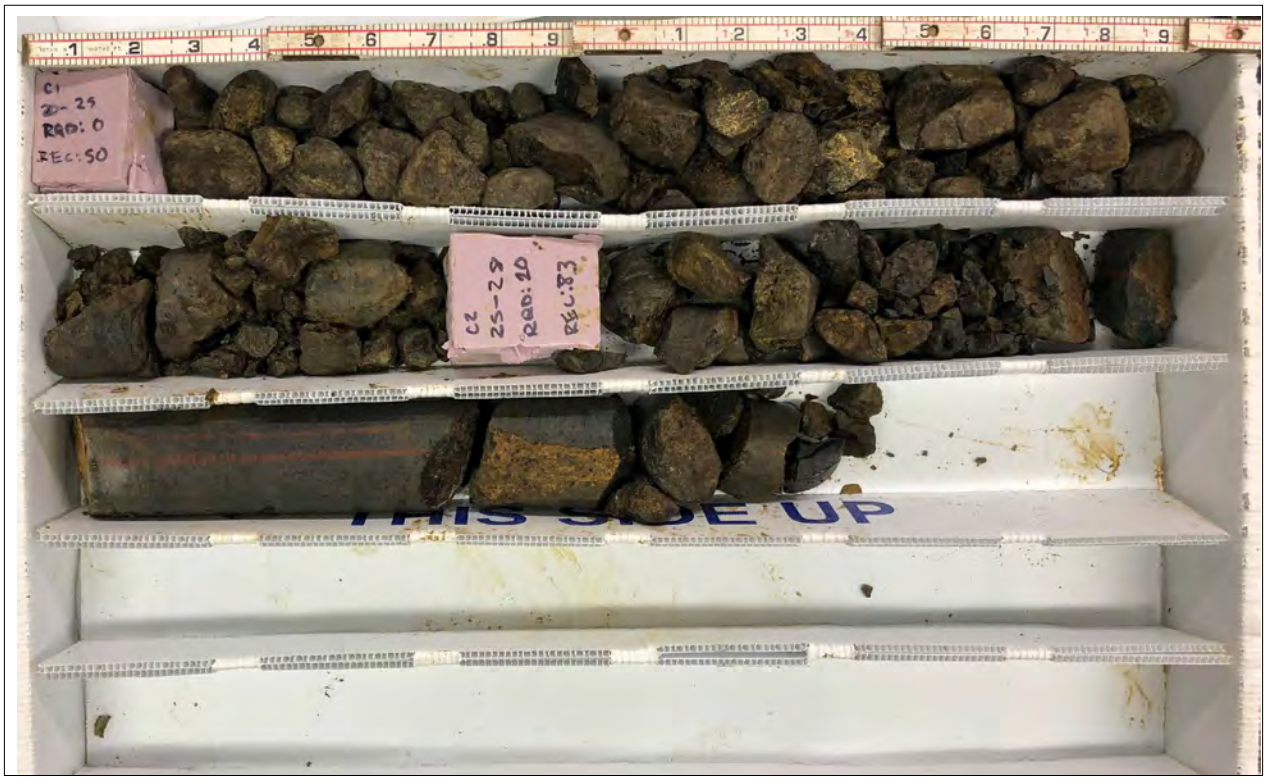
BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS



Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\IRock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

BORING B-□
ROC□ CORE PHOTOGRAPHS

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B□□

File: I:\EF\PDX\105000s\105483 Clackamas Co. S\Exp\Rock Core Photos\Core Photos.dwg Date: 12-0□-2021 Author: SCS

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Location: West Linn, OR	**Date:** 10/12/21 **Job Number: 105483**	**Infiltration Test Number:** FH-3
Depth to bottom of hole: 3.3 ft	**Dimension of hole:** 6" dia.	**Test Method:** Encased F.H.

Tester's Name: Christine Maher
Tester's Company: Shannon & Wilson, Inc.

Depth (feet):	**Soil Texture:**
0-3.2	*SILT with sand*
	Presoak Period: 12:30 10/12/2021 to 14:30 10/12/2021

Time	Time Interval (minutes)	Measurement (feet)	Head (feet)	Drop in Water Level (feet)	Infiltration rate (inches per hour)	Remarks
14:30	-	2.20	1.30	--	--	Lowest Measured Rate = 0.72 in/hr; Average Rate Over Trial = 1.2 in/hr
14:40	10	2.25	1.25	0.05	3.60	
14:50	10	2.26	1.24	0.01	0.72	
15:00	10	2.27	1.23	0.01	0.72	
15:10	10	2.28	1.22	0.01	0.72	
15:20	10	2.29	1.21	0.01	0.72	
15:30	10	2.30	1.20	0.01	0.72	
15:30	-	2.22	1.28	--	--	Lowest Measured Rate = 0.00 in/hr; Average Rate Over Trial = 0.48 in/hr
15:40	10	2.23	1.27	0.01	0.72	
15:50	10	2.23	1.27	0.00	0.00	
16:00	10	2.24	1.26	0.01	0.72	
16:10	10	2.24	1.26	0.00	0.00	
16:20	10	2.25	1.25	0.01	0.72	
16:30	10	2.26	1.24	0.01	0.72	
16:30	-	2.26	1.24	--	--	Lowest Measured Rate = 0.00 in/hr; Average Rate Over Trial = 0.48 in/hr
16:40	10	2.27	1.23	0.01	0.72	
16:50	10	2.27	1.23	0.00	0.00	
17:00	10	2.28	1.22	0.01	0.72	
17:10	10	2.29	1.21	0.01	0.72	
17:20	10	2.29	1.21	0.00	0.00	
17:30	10	3.00	1.20	0.01	0.72	

Notes:

Stafford Road: Pattulo Way to Rosemont Road Improvements
Clackamas County, Oregon

INFILTRATION TEST RESULTS FH-3

December 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. B23

CORE P-1

PAVEMENTS CORE LOG

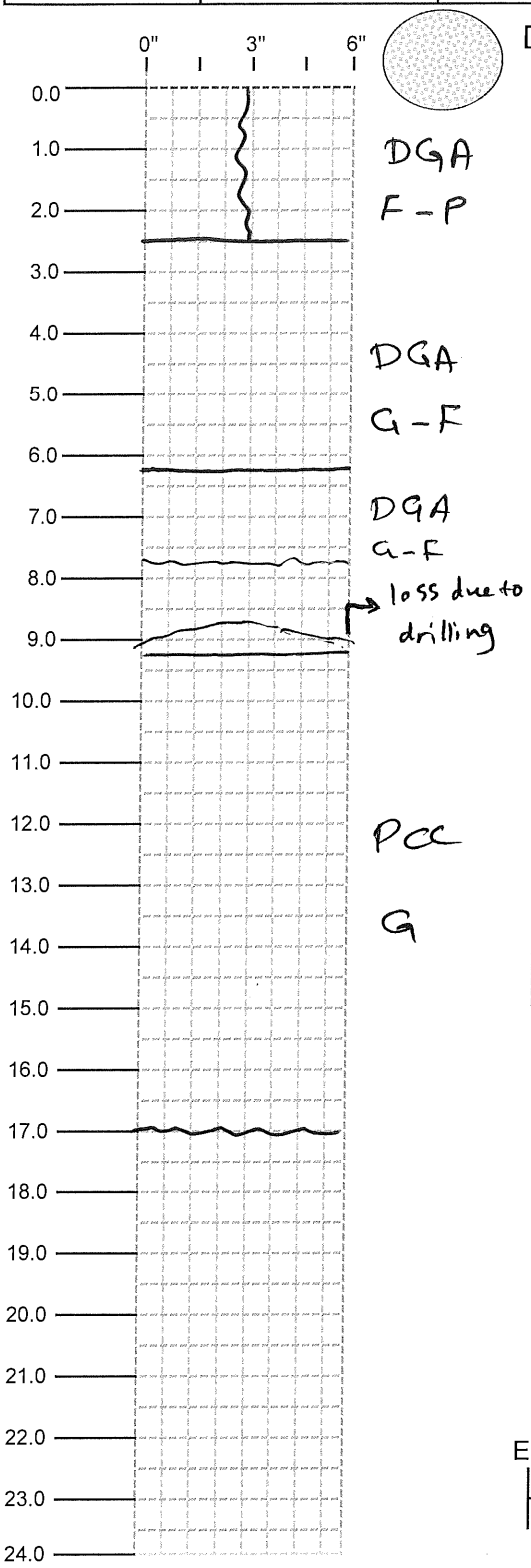
Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (C) (D) (Other)	LOC IWT ( ) BWT ( ) OWT (✓)	Date: 2-18-21

Depth: 17.00"

Note:



EP EP

Fig. B24

CORE P-2

PAVEMENTS CORE LOG

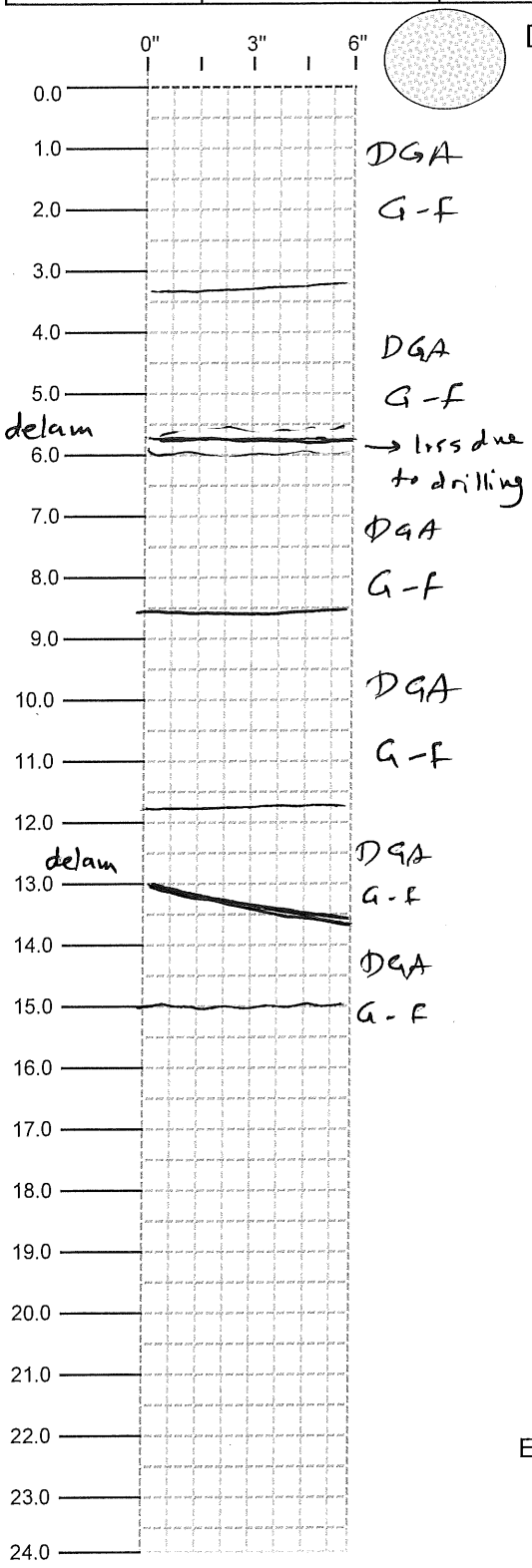
Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack	Drilled On Patch	DIR	LANE	LOC	Date:
(No) (Yes) L M H	(No) (Yes) L M H	(EB) (WB) (NB) (SB)	(A) (B) (Other) (C) (D)	IWT ( ) BWT (✓) OWT ( )	2-18-21

Depth: 15.00"

Note:



EP EP

Fig. B25

CORE P-3

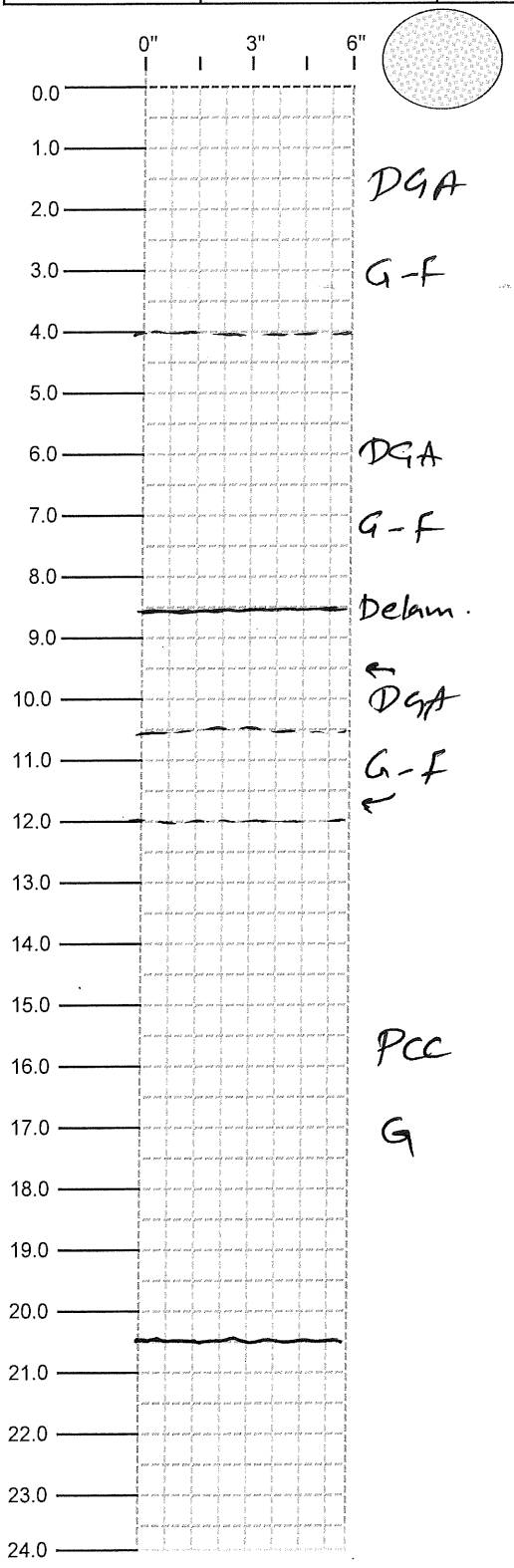
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack	Drilled On Patch	DIR	LANE	LOC	Date:
(No) (Yes) L M H	(No) (Yes) L M H	(EB) (WB) (NB) (SB)	(A) (B) (Other) (C) (D)	IWT ( ) BWT (✓) OWT ( )	2-17-21

Depth: 20.50 = Note:



EP EP

Fig. B26

CORE P-4

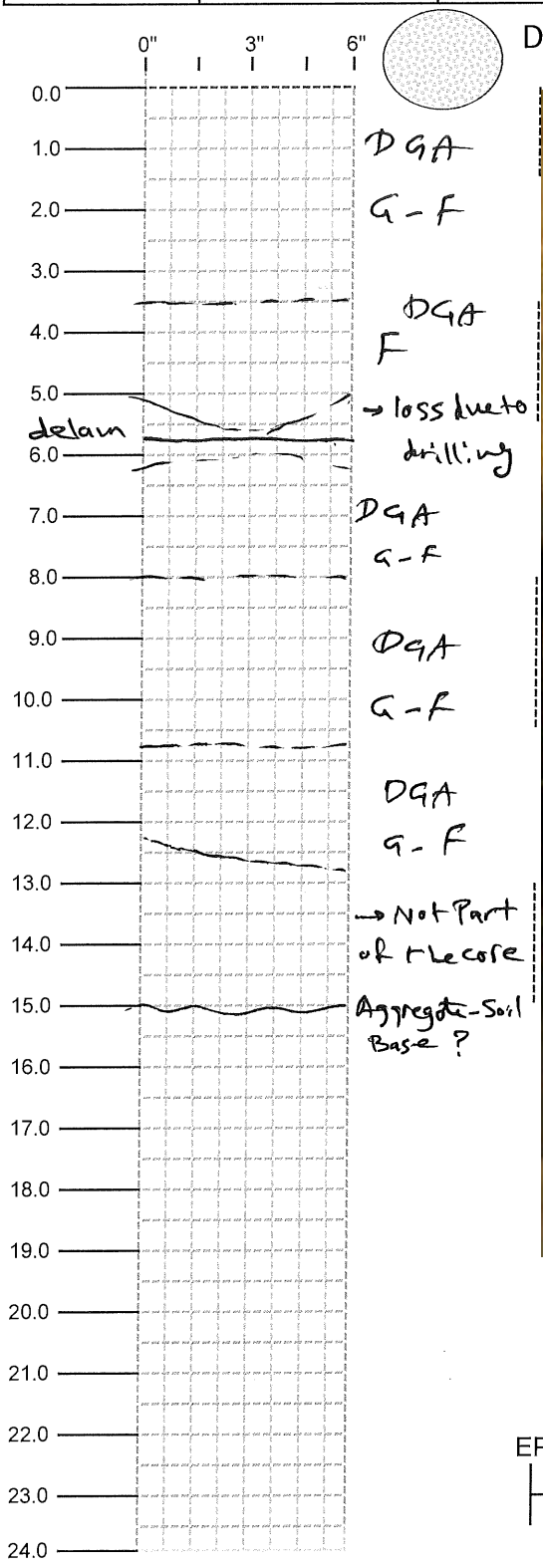
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT (✓)	Date: 2-17-21

Depth: 12.50 = Note:



EP EP

Fig. B27

CORE P-5

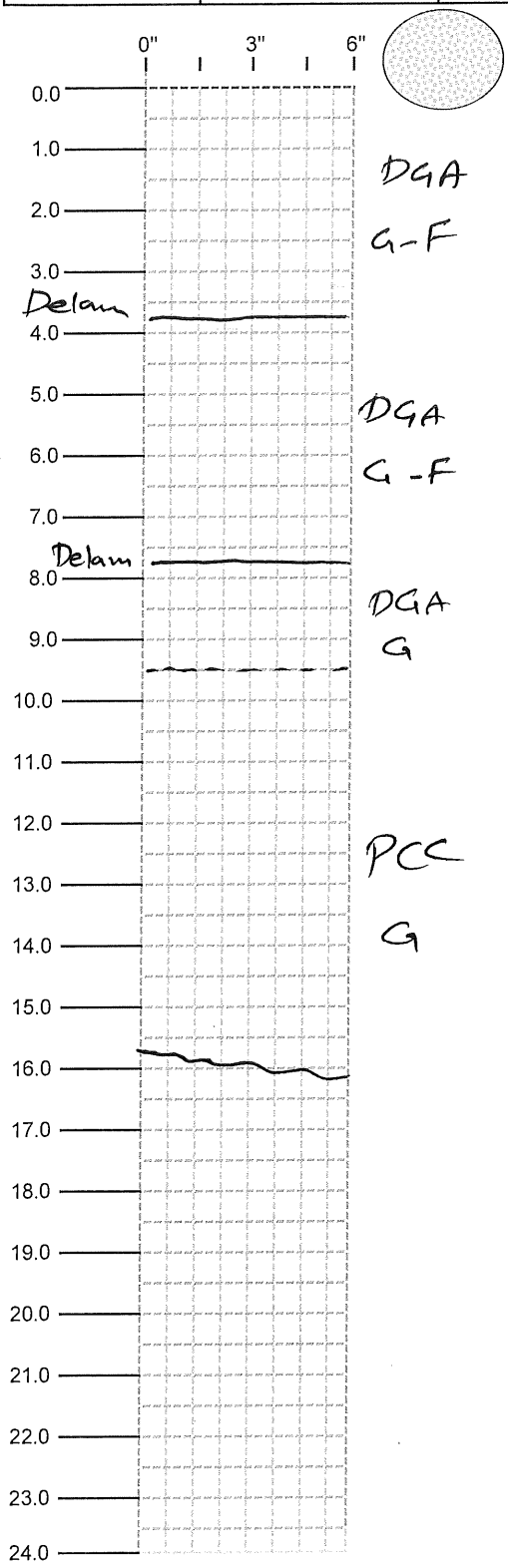
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack	Drilled On Patch	DIR	LANE	LOC	Date:
(No) (Yes) L M H	(No) (Yes) L M H	(EB) (WB) (NB) (SB)	(A) (B) (Other) (C) (D)	IWT ( ) BWT ( ) OWT (✓)	2-17-21

Depth: 16.00" Note:



EP EP

Fig. B28

DCP TEST DATA

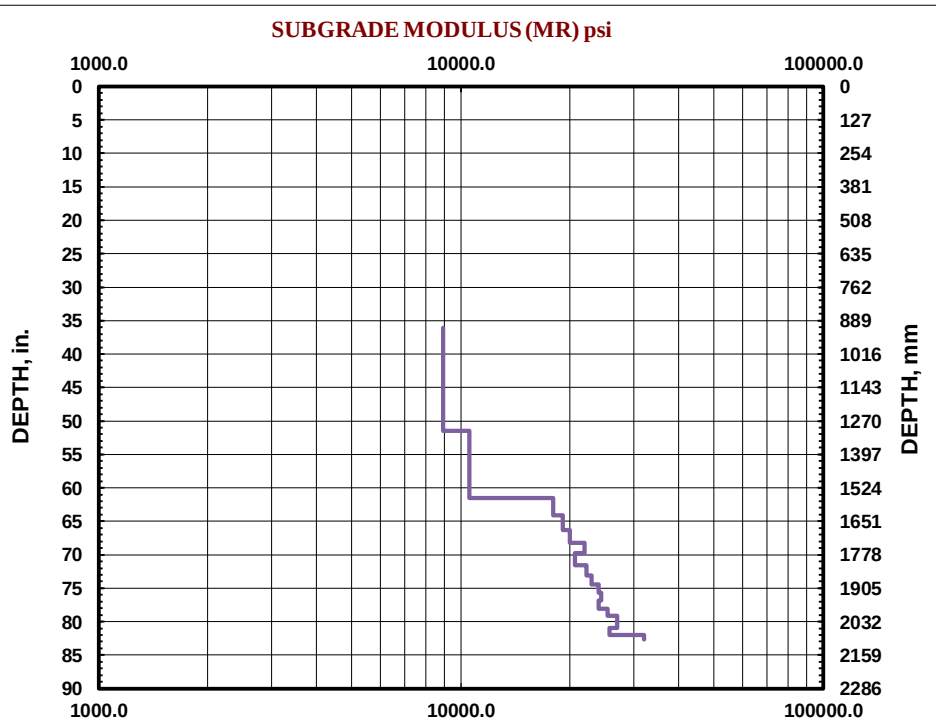
Project: *105483-Stafford Rd* **Date:** *18-Feb-21*

Location: *P-1* **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	914.4	1
5	1307.4	1
5	1562.4	1
5	1627.4	1
5	1683.4	1
5	1733.4	1
5	1772.4	1
5	1818.4	1
5	1856.4	1
5	1891.4	1
5	1922.4	1
5	1952.4	1
5	1983.4	1
5	2010.4	1
5	2033.4	1
5	2056.4	1
5	2082.4	1
5	2097.4	1



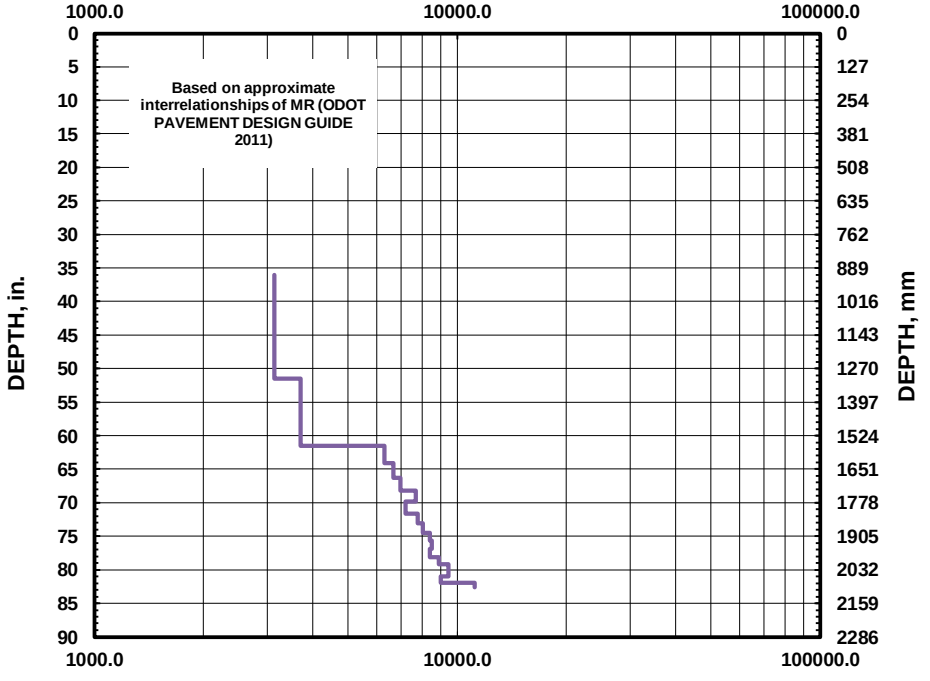


Fig. B29

DCP TEST DATA

Project: *105483-Stafford Rd* **Date:** *18-Feb-21*

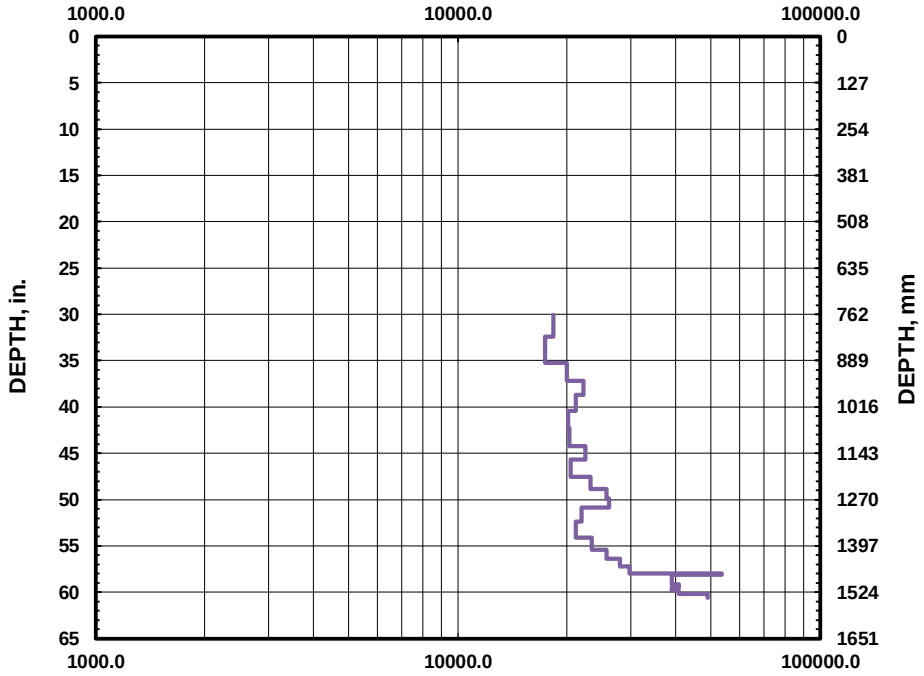
Location: *P-2* **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	762	1
5	824	1
5	895	1
5	945	1
5	983	1
5	1026	1
5	1075	1
5	1123	1
5	1160	1
5	1207	1
5	1241	1
5	1267	1
5	1292	1
5	1331	1
5	1374	1
5	1407	1
5	1433	1
5	1454	1
5	1472	1
5	1476	1
5	1485	1
5	1494	1
5	1503	1
5	1511	1
5	1520	1
5	1528	1
5	1533	1
5	1538	1

SUBGRADE MODULUS (MR) psi



CORRECTED SUBGRADE MODULUS (MR) psi

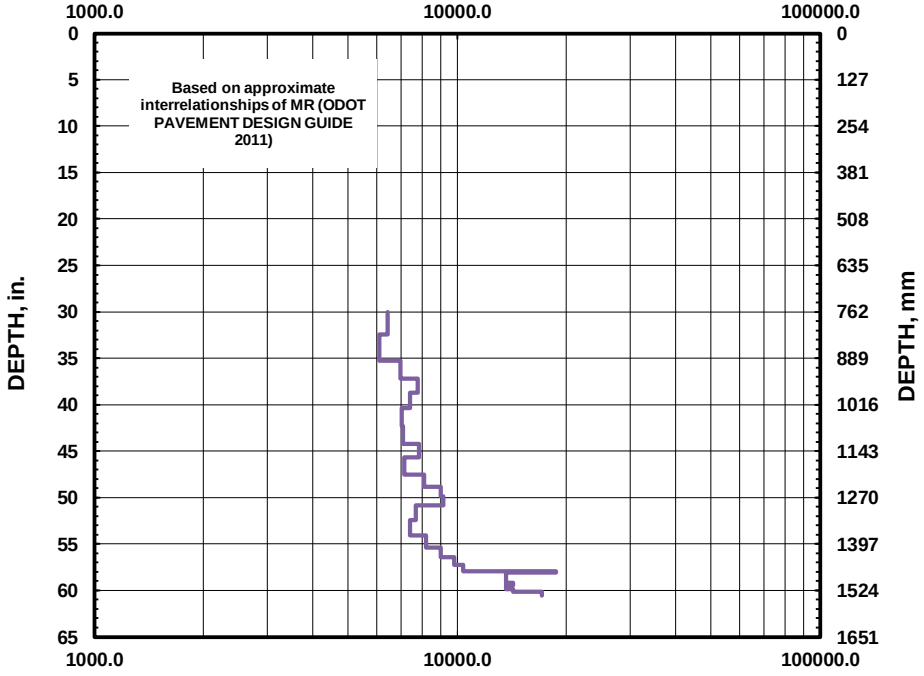


Fig. B30

DCP TEST DATA

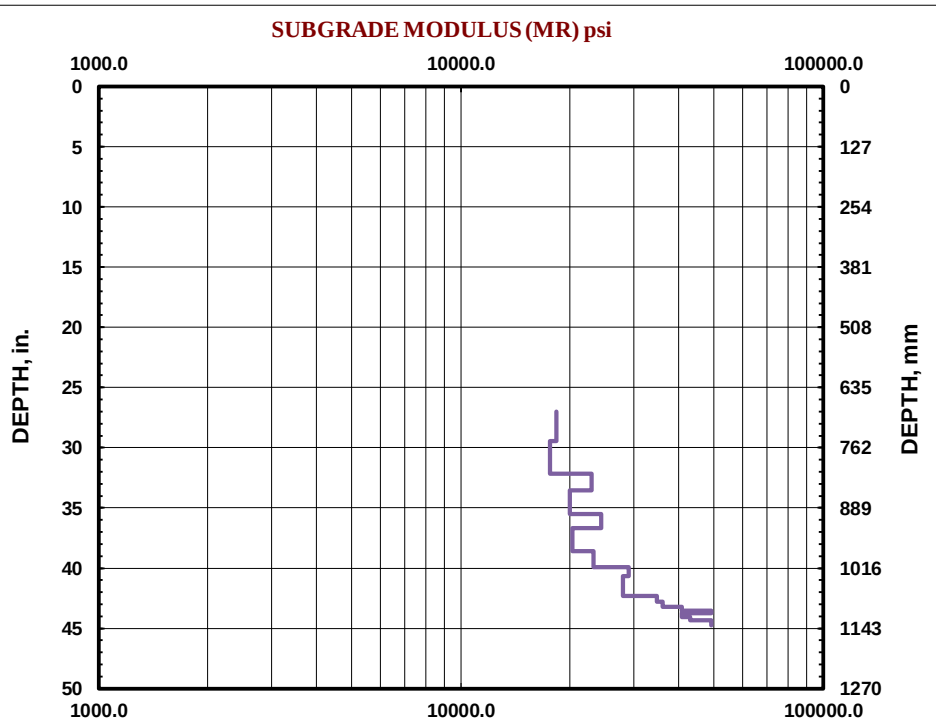
Project: *105483-Stafford Rd* **Date:** *17-Feb-21*

Location: *P-3* **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ● 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ● All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	685.8	1
5	747.8	1
5	816.8	1
5	851.8	1
5	901.8	1
5	931.8	1
5	979.8	1
5	1013.8	1
5	1032.8	1
5	1053.8	1
5	1074.8	1
5	1086.8	1
5	1097.8	1
5	1105.8	1
5	1110.8	1
5	1118.8	1
5	1125.8	1
5	1130.8	1
5	1135.8	1



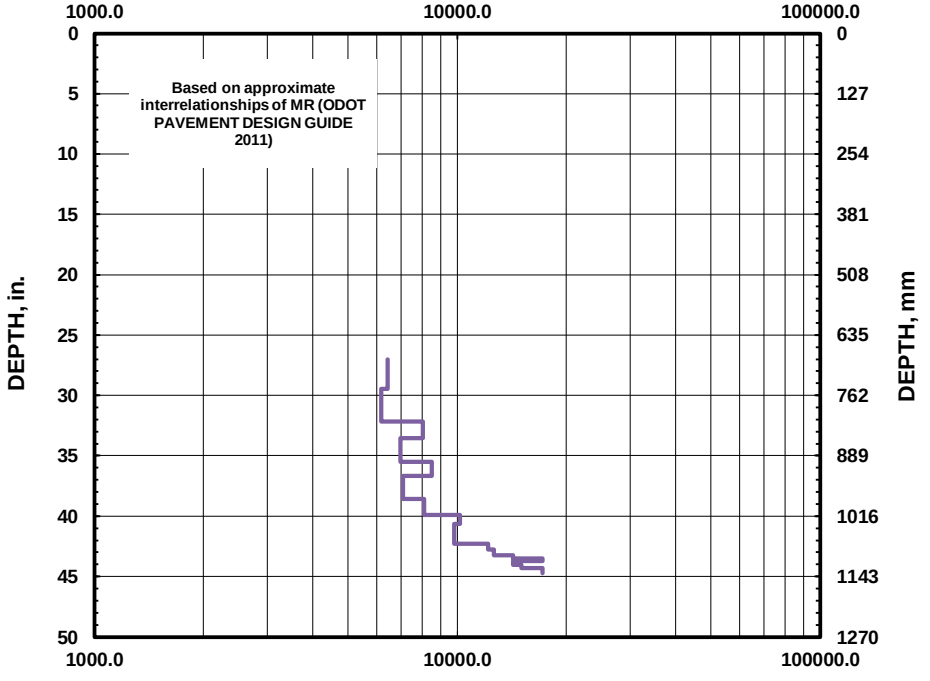


Fig. B31

DCP TEST DATA

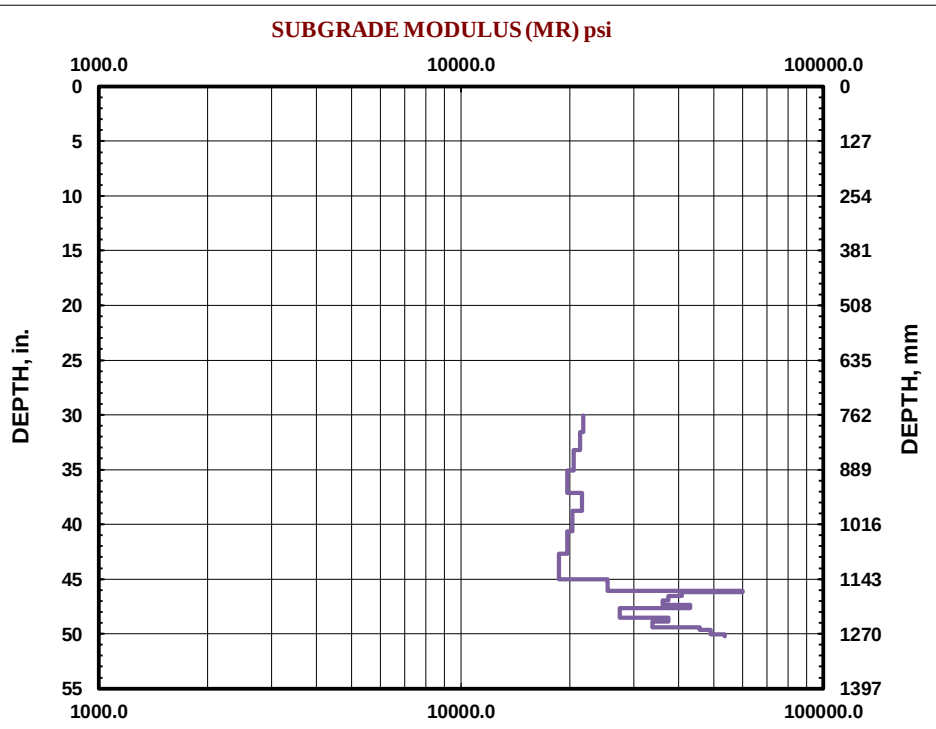
Project: *105483-Stafford Rd* **Date:** *17-Feb-21*

Location: *P-4* **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	762	1
5	802	1
5	844	1
5	891	1
5	943	1
5	984	1
5	1032	1
5	1084	1
5	1144	1
5	1171	1
5	1174	1
5	1182	1
5	1192	1
5	1203	1
5	1210	1
5	1232	1
5	1242	1
5	1255	1
5	1261	1
5	1266	1
5	1271	1
5	1275	1



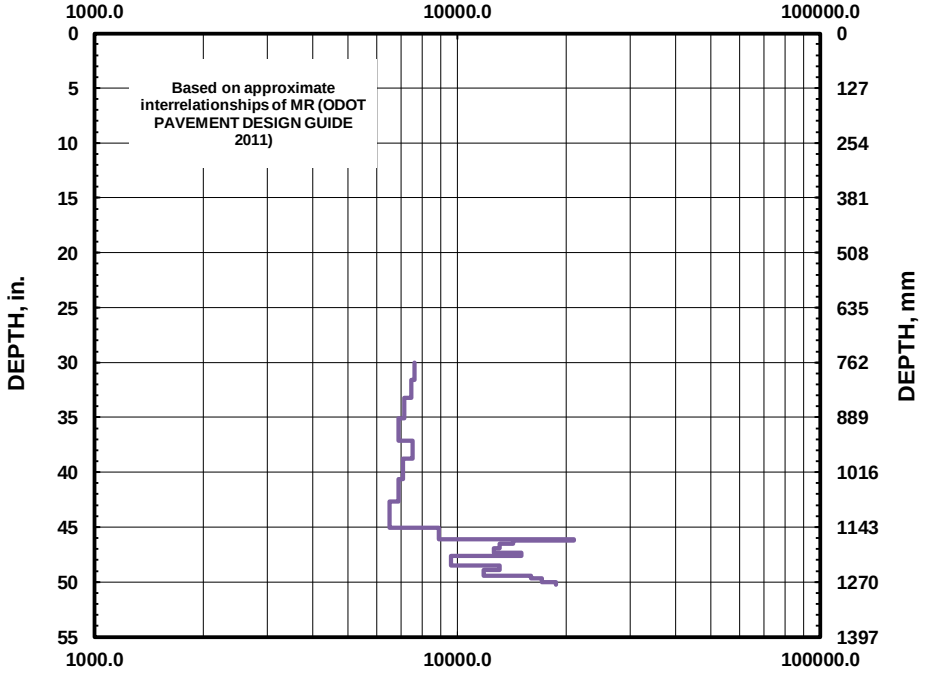


Fig. B32

DCP TEST DATA

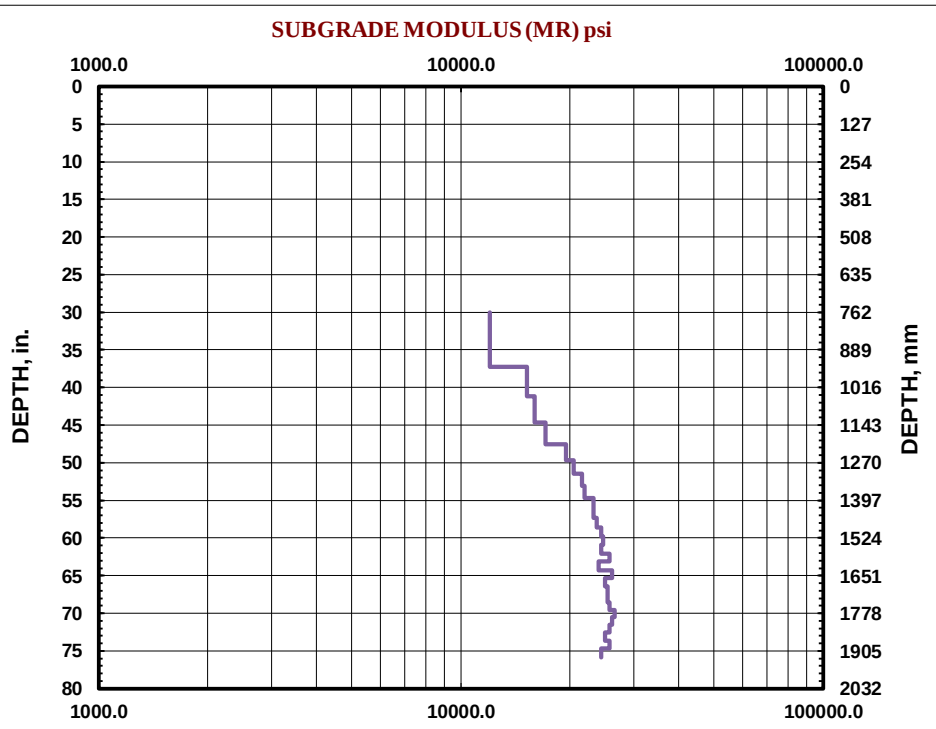
Project: *105483-Stafford Rd* **Date:** *17-Feb-21*

Location: *P-5* **Soil Type(s):**

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	762	1
5	946	1
5	1046	1
5	1134	1
5	1208	1
5	1261	1
5	1308	1
5	1349	1
5	1388	1
5	1422	1
5	1456	1
5	1488	1
5	1518	1
5	1547	1
5	1577	1
5	1603	1
5	1634	1
5	1659	1
5	1687	1
5	1714	1
5	1741	1
5	1767	1
5	1791	1
5	1816	1
5	1842	1
5	1870	1
5	1896	1
5	1926	1



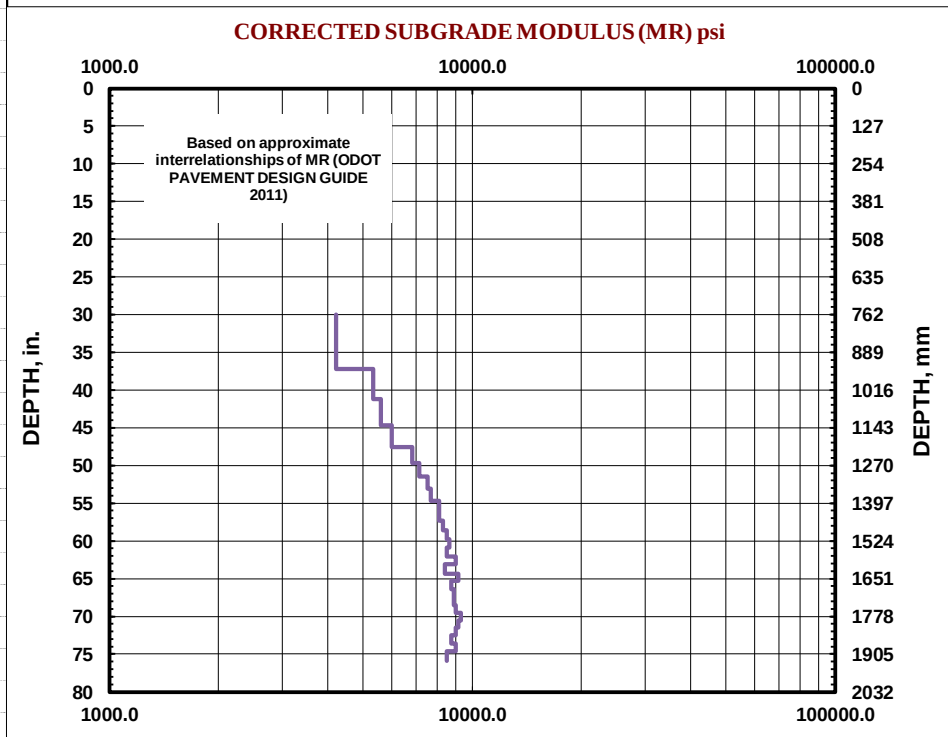


Fig. B33

APPENDIX C: FALLING WEIGHT DEFLECTOMETER

Appendix C

Falling Weight Deflectometer

CONTENTS

Pavement Testing and Backcalculation Report, Stafford Road, between Pattulo Way and Rosemont Road Project, RhinoOne Gotechnical, dated January 21, 2022.

Pavement Testing and Backcalculation Report

Stafford Road, between Pattulo Way and Rosemont Road Project

Stafford Road
Lake Oswego, Clackamas County, Washington

Prepared for:
Shannon & Wilson, Inc.
Attn: Mr. Travis Nguyen | Sr. Associate
3990 Collins Way, Suite 100
Lake Oswego, OR 97035

January 21, 2022
Project No. SNW-2020-006

RhinoOne Geotechnical | 12308 NE 56th Street Suite 1107 | Vancouver, WA 98682 | phone 360.258.1738

Table of Contents

Supporting Data

List of Figures

List of Tables

1.0 INTRODUCTION

This report documents pavement testing and backcalculation analysis in support of pavement analysis and design of a section of Stafford Road in Lake Oswego, Oregon between Pattulo Way and Rosemont Road. The project includes an approximately 4,200-foot-long section of Stafford Road. The project limits were identified by Shannon & Wilson, Inc, and are shown on Figure 1.

Within the project limits, Stafford Rd is an urban minor arterial. It supports one lane of traffic each in the northbound (NB) and southbound (SB) directions and is generally without traffic control devices within the project area, excepting the roundabout at the Rosemont Rd intersection. The project area generally slopes upward to the north.

The scope of our services included Falling Weight Deflectometer (FWD) testing and backcalculation analysis of the FWD data to calculate pavement and subgrade moduli, pavement structural numbers, and moduli of subgrade reaction as appropriate.

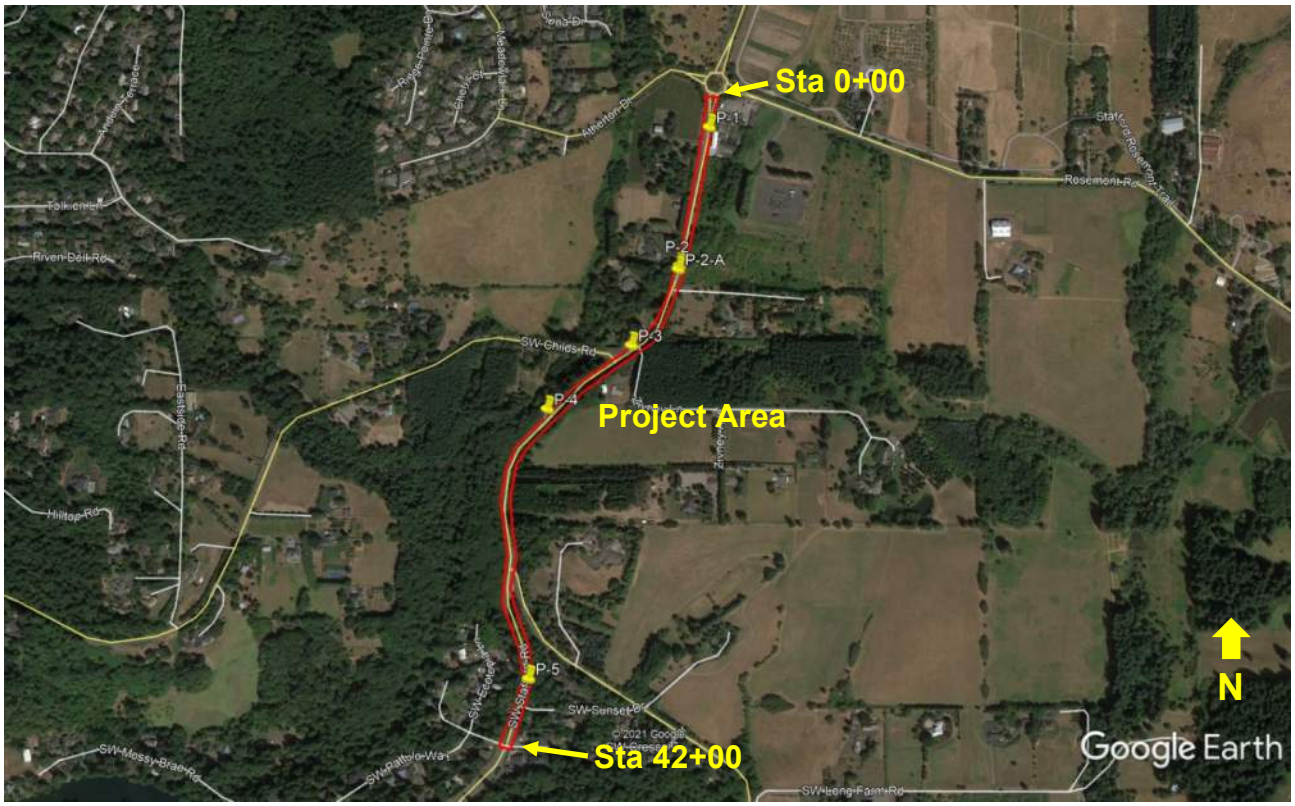


Figure 1 – Stafford Rd Project Vicinity Map (Source: Google Earth)

2.0 FIELD INVESTIGATION AND TESTING PROGRAM

2.1 Existing Conditions

Rhino One reviewed pavement core and subsurface exploration logs provided by Shannon & Wilson. Within the project limits the roadway surface is paved with asphalt concrete (AC) pavement. From the results of the pavement explorations, it appears that the NB lane is a composite pavement of AC over Portland cement concrete (PCC) over a thin aggregate base (AB), while the SB lane is only AC over AB. The posted speed limit is 40 mph. Stafford Rd has several driveways and street approaches within the project area.

2.1.1 Field Explorations

Exploration locations were determined by Shannon & Wilson, and the field explorations were conducted by them and their subcontractor. Rhino One reviewed their logs, the results of which are presented in Section 2.3.

2.2 Falling Weight Deflectometer Testing

On February 18th, 2021, we conducted FWD testing of the Stafford Rd project area. Two test lines were identified by Shannon & Wilson in the outer wheelpath of the NB and SB lanes, between Pattulo Way and Rosemont Road. The lines were tested at an interval of approximately 200 feet. The northern edge of the project area at Rosemont Road was established as Station (STA) 0+00 for the test lines. The tests were conducted in accordance with ASTM D4694 using our KUAB 150 Falling Weight Deflectometer device, as shown in Figure 2. The FWD test sequence consisted of four impact loads applied to the roadway surface at each test point. The initial impact load was used to seat the test equipment. Following this initial load, three test measurements were made at nominal impact loads of 6,000, 9,000, and 12,000 pounds (lbs). The loads were applied using a 12-inch diameter segmented load plate designed to apply a uniform surface pressure despite irregularities in the roadway surface. Surface deflection was measured by seismometers (absolute deflection sensors) positioned at 0, 8, 12, 18, 24, 36, 48 and 60 inches from the center of the load plate. The FWD deflection data normalized to a 9,000 lbs (9-kip) load basis are included in Appendix A.

Figure 2 – KUAB 150 Falling Weight Deflectometer

2.3 Soil Exploration

Six pavement cores and soil explorations were conducted by others. The core logs were provided for our review, the results of which are presented below. This data shows a stark contrast between the NB and SB lanes; the NB lane appears to be a composite AC over PCC pavement, while the SB lane appears to be AC over AB. The results indicated that in the NB lane the existing HMA layer varies between 9.25 and 12.0 inches over a PCC layer varying between 6.50 and 8.50 inches, with the underlying AB layer varying from approximately 6.50 inches to 19.00 inches thick. In the SB lane the AC layer was significantly thicker, with between 13.25 and 15.00 inches of AC over 12.00 to 16.75 inches of AB. The pavement and aggregate base layer thicknesses provided from S&W are detailed in Table 1, and the core logs are attached in Appendix B. In all cases, the thickness of the AB layer is an estimate, which may explain the significantly shallower layer recorded at P-3.

Table 1 – Summary of Pavement Core Explorations by Others

Core ID	FWD Test Line	Approximate Station	Asphalt Concrete Thickness (inch)	Portland Cement Concrete Thickness (inch)	Approximate Aggregate Base Thickness[1] (inch)
P-1	NB	2+20	9.25	7.75	19.00
P-2	SB	10+70	15.00	N/A	12.00
P-2-A	SB	10+90	13.25	N/A	16.75
P-3	NB	16+36	12.00	8.50	6.50
P-4	SB	22+60	15.00	N/A	15.00
P-5	NB	39+42	9.50	6.50	14.00

[1]Per S&W, "This is the difference between depth to top of subgrade as estimated by the drillers and core thickness, so it may not indicate actual or accurate aggregate base thickness."

2.4 Delineation of Analysis Units

The effective subgrade resilient modulus (M_r) and effective structural number (SN_{eff}) of the existing pavement structure were backcalculated for each FWD test location using an equivalent pavement thickness backcalculation procedure that is independent of pavement thickness or composition, as described in Chapter 5 and Appendix L of the 1993 AASHTO Guide for Design of Pavement Structures (AASHTO Guide). The resilient modulus values were corrected using the factor of 0.33 as recommended in the AASHTO Guide.

Based on analysis of the FWD and structural data, two analysis units (AUs) were used to determine the characteristics of the existing pavement structures by dividing the project area into AU NB (northbound composite pavement) and AU SB (southbound AC pavement). Our analysis showed that although there are some minor deviations in the pavement structures within those AU's, they are not significant for the purposes of our analysis. Within each AU the quality-checked FWD results are consistent throughout the project area.

3.0 BACKCALCULATION ANALYSIS

We conducted backcalculation analysis of the FWD test data using the methods prescribed in Chapter 5 and Appendix L of the AASHTO Guide. For the flexible pavement section, the AASHTO method allows the user to backcalculate the Mr at each FWD test location by solving a closed form equation and applying a correction factor to obtain effective subgrade resilient modulus (Mr) values appropriate for use in design. The AASHTO backcalculated values of the uncorrected and corrected subgrade Mr as well as the effective structural number of the existing pavement for each FWD test point within AU SB are included in Appendix C of this report.

We also conducted a supplementary backcalculation analysis of the flexible pavement, AU SB, using BAKFAA. BAKFAA was developed by the FAA specifically for the backcalculation of layered elastic properties of flexible and rigid pavement structures typically encountered at commercial airports. BAKFAA applies an iterative backcalculation method which utilizes layered elastic theory to estimate the elastic properties of pavement sections of up to 10 layers. BAKFAA can calculate resulting stresses and strains in a layered elastic model due to an imposed load at the surface. BAKFAA uses the LEAF subroutine and iteratively solves for the elastic moduli of user-defined pavement layers by minimizing the difference between computed and measured vertical pavement surface deflections.

We used BAKFAA version 3.3.0 to analyze our FWD test data and to estimate pavement layer moduli in the existing pavement structures for the flexible pavement in AU SB to provide individual layer moduli for the pavement layers. The summary of this analysis is provided in Table 2, with full results attached in Appendix C. Typical ODOT correction factors were applied to the base (0.62) and subgrade moduli (0.35) per the ODOT Pavement Design Guide Table 10. An additional correction factor of 0.75 was applied to the base modulus to account for the seasonal variation of the moduli in the cold testing weather, for a total correction factor of 0.465.

For the composite pavement section AU NB, the AASHTO method allows the user to backcalculate the dynamic and static effective k-values of the subgrade by solving a series of closed form equations and referring to figures F5.10 and F5.11 provided in Chapter 5. In this analysis we make assumptions about the moduli of the AC layers based on the pavement temperature, determine how much of the recorded deflection occurred in the AC and PCC layers, and use that result to determine the strength of the PCC layer and the k-values of the subgrade. These results are based on averaged factors from all test points within the analysis units, rather than being calculated at each test point. We present backcalculated values for dynamic and static k-values as well PCC elastic modulus and modulus of rupture for each composite pavement analysis unit in Appendix C.

A statistical summary of the FWD backcalculation analysis results is shown in Table 2 below.

Table 2 – Statistical Summary of Backcalculated Pavement Characteristics

Analysis Unit	FWD Test Line	Begin Station	End Station	Analysis Type	Analysis Parameter[1]	Mean ($\bar{x}$)	Std Deviation |s|	COV
SB (Flexible)	SB	0+00	42+00	AASHTO	SN_{eff}	**7.21**	0.83	11%
					M_r, psi	**12,617**	2,841	23%
				BAKFAA	AC M_r, psi	**869,924**	239,880	28%
					AB M_r, psi	**55,069**	14,374	26%
					Sub M_r psi	**9,354**	2,042	22%
NB (Composite)	NB	42+00	0+00	AASHTO	E, psi	**7,585,185**	-	-
					S'c, psi	**818**	-	-
					K_{static}	**175**	-	-

Based on these backcalculation results, the subgrade under the flexible pavement is relatively stiff, typical for the area. In accordance with ODOT Pavement Design Guide guidance, we would recommend caution in the use of subgrade resilient moduli in excess of 8,000 psi without additional analysis or testing that corroborates these results.

We recommend that the design values for each analysis unit be selected as the mean value, as suggested by the AASHTO Guide.

4.0 LIMITATIONS

This report was prepared solely for Shannon & Wilson, Inc. in support of pavement design and construction for the Stafford Road, between Pattulo Way and Rosemont Road project. The opinions and recommendations contained within the report are not intended, nor should they be construed, to represent a warranty, either express or implied. Our work has been performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession

currently practicing under similar conditions in the locale. No other warranty, expressed or implied, is made.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, if conditions have changed due to natural causes or construction operations at or adjacent to the site, or if the basic project scheme is significantly modified from that assumed, it is recommended this report be reviewed to determine the applicability of the conclusions and recommendations.

5.0 RESTRICTIONS

This report is for the exclusive use of the client for design of the development, as described in our proposal for this particular project, and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without the expressed written consent of the client and ROG.

We appreciate the opportunity to assist you in this project. Please feel free to contact us with any questions that you may have regarding the data in this report.

Sincerely,
RhinoOne Geotechnical

Jan 21, 2022

Rajiv Ali, PE GE
Principal Geotechnical Engineer

6.0 REFERENCES

American Association of State Highway and Transportation Officials. (1993). *AASHTO Guide for Design of Pavement Structures.* Washington D.C.: American Association of State Highway and Transportation Officials.

Federal Highway Administration. (2017). *Using Falling Weight Deflectometer Data With Mechanistic-Empirical Design and Analysis, Volume III: Guidelines for Deflection Testing, Analysis, and Interpretation.* Washington, DC: FHWA.

Oregon Department of Transportation. (2019). *ODOT PAVEMENT DESIGN GUIDE.* Salem, Oregon: Oregon Department of Transportation.

APPENDIX A

9-kip Normalized Deflections

FWD Normalized Deflection Test Data

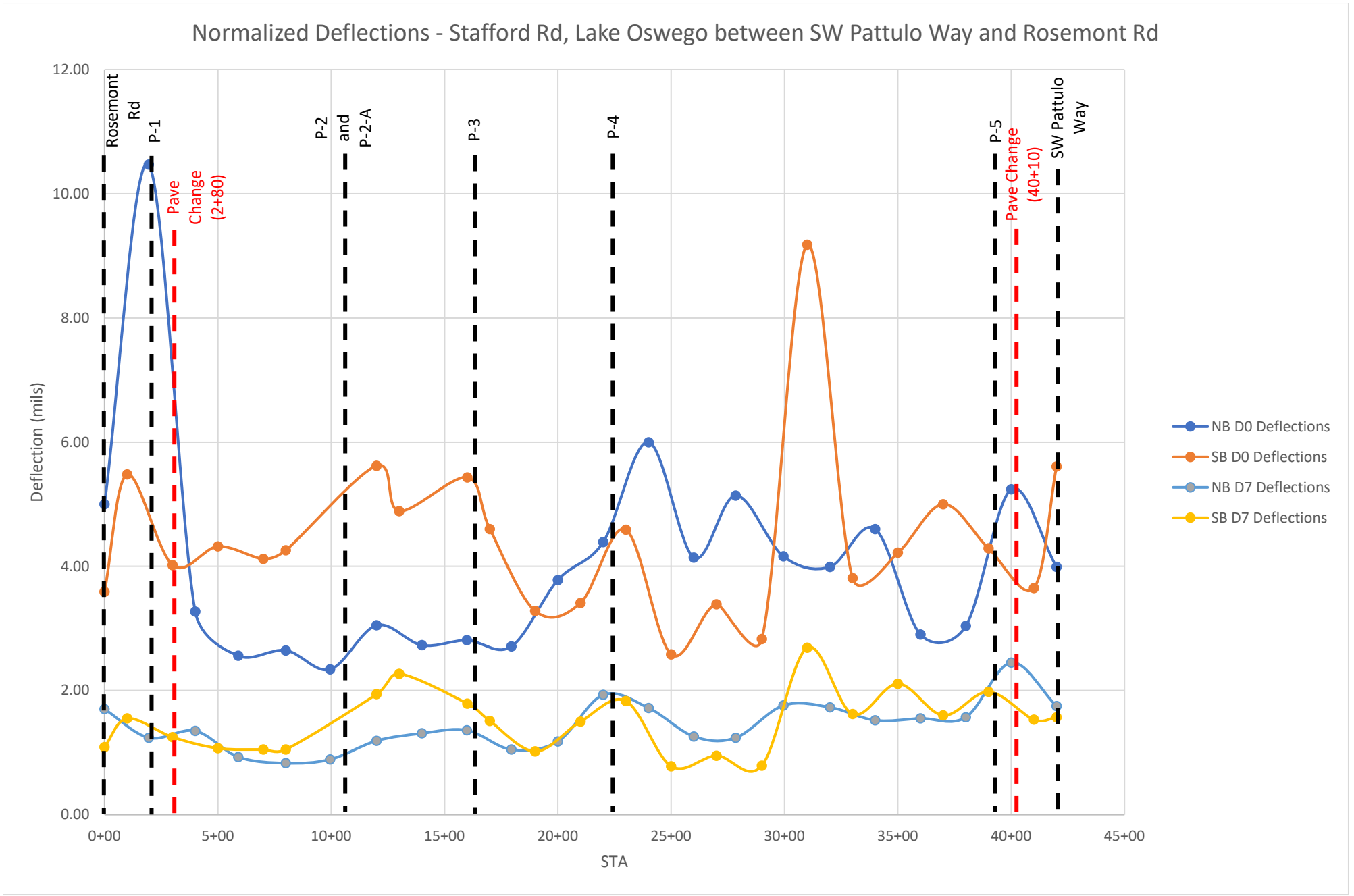
Test Section: STAFFORD RD
Start Point: PATTULO WAY 10+00
Test Date: 2/18/21
Test File: STAFFORD RD LAKE OSWEGO.fwd
Load Plate Radius, in: 5.91
Sensor Distance, in: 0 8 12 18 24 36 48 60

Deflections Normalized to 9000 lbf Basis

Test No.	Test Station	Adj. Test Station	Test Line	D 0, mils	D 1, mils	D 2, mils	D 3, mils	D 4, mils	D 5, mils	D 6, mils	D 7, mils	Surface Temp., °F	Modulus, MPa	Time
1	10+00	42+00	NB	3.99	3.40	3.15	2.82	2.67	2.15	1.95	1.75	44	1463	14:16:49
2	12+00	40+00	NB	5.24	4.78	4.60	4.31	4.08	3.64	3.21	2.45	45	1139	14:18:22
3	14+00	38+00	NB	3.04	2.71	2.61	2.44	2.30	1.78	1.77	1.57	44	1931	14:19:53
4	16+00	36+00	NB	2.90	2.56	2.48	2.29	2.24	1.93	1.65	1.55	43	2043	14:21:25
5	18+00	34+00	NB	4.60	4.12	3.88	3.48	3.11	2.47	2.10	1.52	44	1278	14:22:54
6	20+00	32+00	NB	3.99	3.70	3.57	3.31	3.04	2.34	2.06	1.73	44	1464	14:24:27
7	22+05	29+95	NB	4.16	3.69	3.51	3.22	2.99	2.65	2.20	1.76	43	1386	14:27:50
8	24+15	27+85	NB	5.14	4.37	3.99	3.31	2.81	2.06	1.52	1.24	44	1158	14:29:24
9	26+00	26+00	NB	4.14	3.63	3.35	3.00	2.69	2.15	1.51	1.26	44	1437	14:30:50
10	28+00	24+00	NB	6.00	5.52	5.09	4.34	3.72	2.78	2.15	1.72	44	958	14:32:21
11	30+00	22+00	NB	4.39	3.82	3.64	3.36	3.12	2.67	2.38	1.93	44	1358	14:33:55
12	32+00	20+00	NB	3.78	3.33	3.09	2.73	2.40	1.91	1.49	1.18	43	1541	14:35:44
13	34+05	17+95	NB	2.71	2.31	2.15	1.95	1.79	1.15	1.17	1.05	43	2152	14:37:15
14	36+01	15+99	NB	2.81	2.37	2.22	2.16	1.97	1.54	1.53	1.36	43	2121	14:38:48
15	38+00	14+00	NB	2.73	2.30	2.19	2.00	1.95	1.73	1.49	1.31	42	2199	14:40:40
16	40+00	12+00	NB	3.05	2.65	2.53	2.37	2.22	1.90	1.59	1.19	42	1901	14:42:23
17	42+05	9+95	NB	2.34	1.93	1.75	1.62	1.51	1.28	1.06	0.89	43	2463	14:44:52
18	44+00	8+00	NB	2.65	2.16	1.98	1.79	1.64	1.30	1.00	0.83	43	4594	14:46:19
19	46+10	5+90	NB	2.56	2.09	1.95	1.83	1.66	1.39	1.17	0.93	43	2307	14:47:53
20	48+00	4+00	NB	3.27	2.89	2.73	2.45	2.26	1.87	1.62	1.35	42	1784	14:49:39
21	50+05	1+95	NB	10.47	10.52	10.47	9.23	6.81	2.93	1.64	1.24	42	562	14:51:13
22	52+00	0+00	NB	5.00	4.43	4.10	3.59	3.32	2.67	2.19	1.70	41	1206	14:52:50
23	52+00	0+00	SB	3.59	3.38	3.28	3.17	2.95	2.56	2.05	1.09	42	1689	14:55:02
24	51+00	1+00	SB	5.48	4.78	4.39	3.86	3.46	2.64	2.03	1.55	43	1067	14:58:09
25	49+00	3+00	SB	4.02	3.45	3.19	2.83	2.55	2.02	1.54	1.25	42	1456	14:59:59

Deflections Normalized to 9000 lbf Basis

Test No.	Test Station	Adj. Test Station	Test Line	D 0, mils	D 1, mils	D 2, mils	D 3, mils	D 4, mils	D 5, mils	D 6, mils	D 7, mils	Surface Temp., °F	Modulus, MPa	Time
26	47+00	5+00	SB	4.32	3.80	3.44	2.93	2.50	1.85	1.34	1.07	42	1318	15:01:29
27	45+00	7+00	SB	4.12	3.38	3.05	2.62	2.33	1.74	1.39	1.05	42	1421	15:03:00
28	44+00	8+00	SB	4.26	3.61	3.25	2.83	2.51	1.92	1.33	1.05	42	1353	15:04:32
29	40+00	12+00	SB	5.62	5.08	4.73	4.24	3.77	2.89	2.28	1.94	42	1022	15:09:05
30	39+00	13+00	SB	4.89	4.46	4.28	4.00	3.69	3.16	2.52	2.27	41	1222	15:10:49
31	36+00	16+00	SB	5.43	4.48	4.08	3.62	3.29	2.64	2.12	1.79	42	1093	15:12:27
32	35+00	17+00	SB	4.60	3.97	3.71	3.17	2.86	1.94	1.84	1.51	42	1272	15:13:56
33	33+00	19+00	SB	3.28	2.85	2.61	2.25	2.01	1.45	1.58	1.02	41	1771	15:15:28
34	31+00	21+00	SB	3.41	2.97	2.79	2.24	2.25	1.70	1.65	1.50	41	1717	15:17:01
35	29+00	23+00	SB	4.59	4.04	3.77	3.20	3.08	2.31	2.20	1.83	42	1283	15:18:43
36	27+00	25+00	SB	2.58	2.13	1.93	1.48	1.52	1.18	0.98	0.78	42	2254	15:20:21
37	25+00	27+00	SB	3.39	2.89	2.61	2.27	2.03	1.44	1.48	0.95	42	1779	15:22:10
38	23+00	29+00	SB	2.83	2.35	2.16	1.91	1.76	1.54	1.01	0.79	42	2072	15:23:51
39	21+00	31+00	SB	9.18	8.46	7.91	7.20	6.41	4.97	3.83	2.69	43	616	15:27:12
40	19+00	33+00	SB	3.81	3.35	3.10	2.72	2.51	2.00	1.76	1.62	43	1524	15:28:55
41	17+00	35+00	SB	4.22	3.76	3.53	3.10	3.02	2.46	2.29	2.11	42	1398	15:30:41
42	15+00	37+00	SB	5.00	4.46	4.12	3.55	3.18	2.44	1.91	1.60	42	1174	15:32:11
43	13+00	39+00	SB	4.29	3.87	3.75	3.51	3.26	2.82	2.40	1.98	42	1380	15:34:58
44	11+00	41+00	SB	3.65	3.10	2.87	2.55	2.36	1.91	1.78	1.53	42	1615	15:36:43
45	10+00	42+00	SB	5.61	4.60	4.04	3.43	2.95	2.22	1.77	1.57	43	1038	15:38:14


Normalized Deflections - Stafford Rd, Lake Oswego between SW Pattulo Way and Rosemont Rd
Deflection (mils)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0+00
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
45+00
STA
Rosemont Rd
P-1
Pave Change (2+80)
P-2 and P-2-A
P-3
P-4
P-5
Pave Change (40+10)
SW Pattulo Way
NB D0 Deflections
SB D0 Deflections
NB D7 Deflections
SB D7 Deflections

APPENDIX B

Exploration Logs (S&W)

CORE P-1

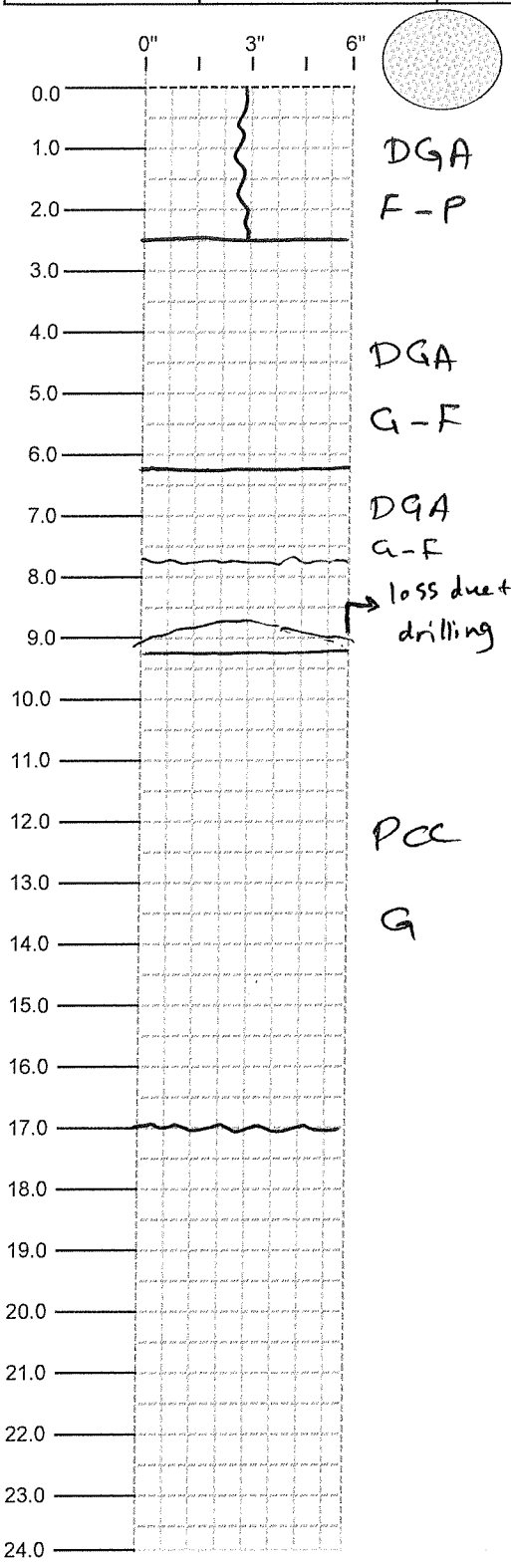
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT ( )	Date: 2-18-21

Depth: 17.00" Note:



EP EP

CORE P-2

PAVEMENTS CORE LOG

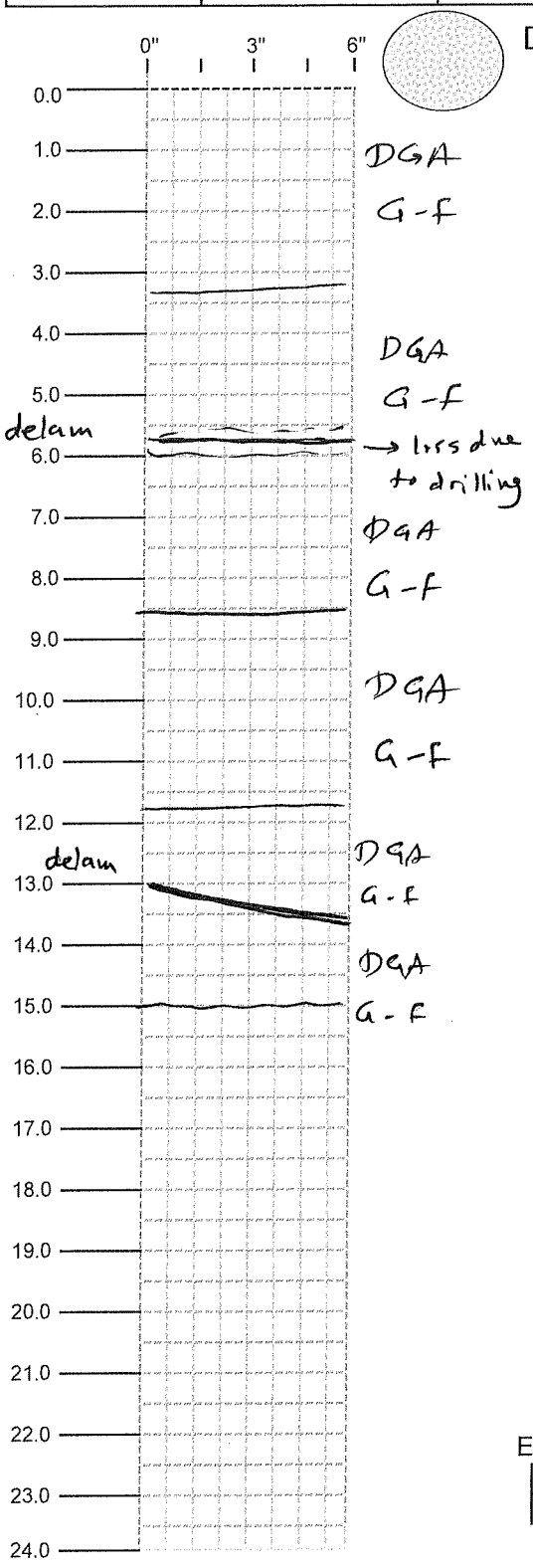
Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT ( )	Date: 2-18-21

Note:

Depth: 15.00"



EP EP

CORE P-2-A

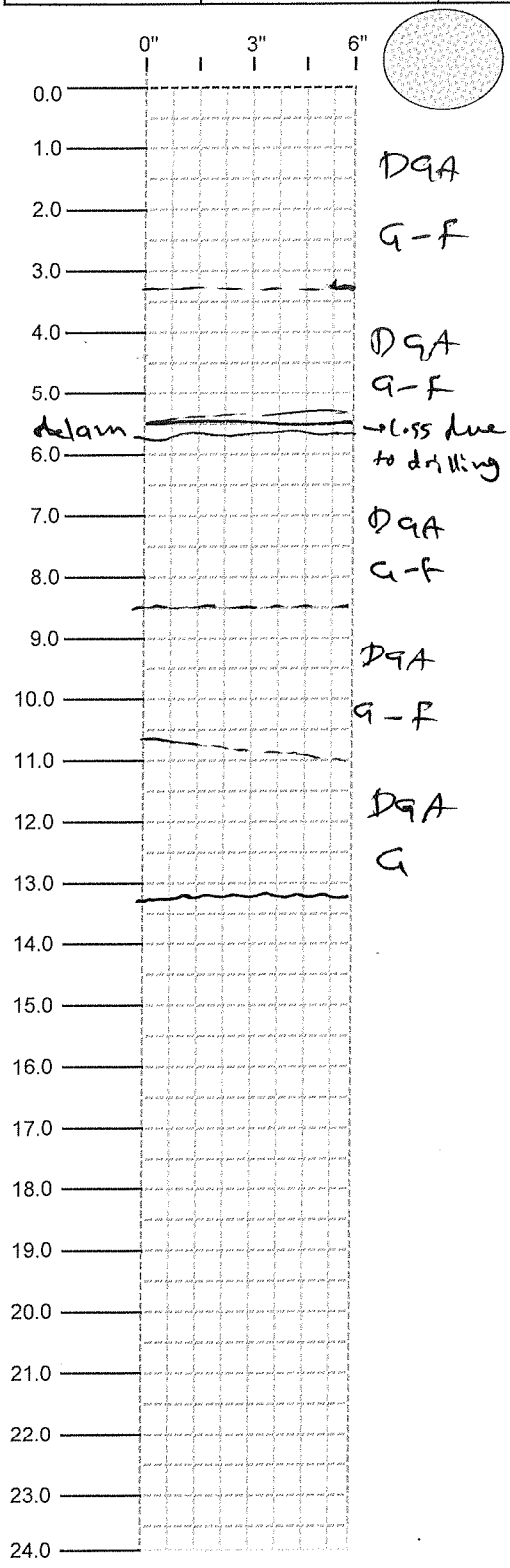
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT ( )	Date: 2-18-21

Depth: 13.25" Note:



EP EP

CORE P-3

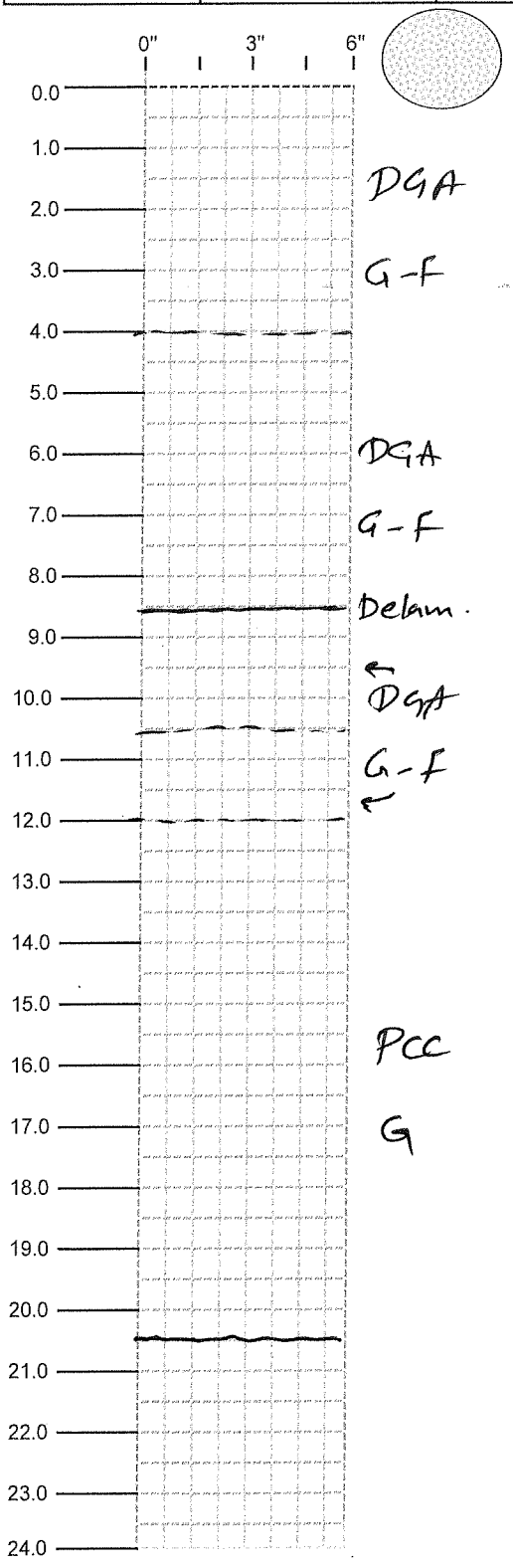
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT ( )	Date: 2-17-21

Depth: 20.50 ≈ Note:



EP EP

CORE P-4

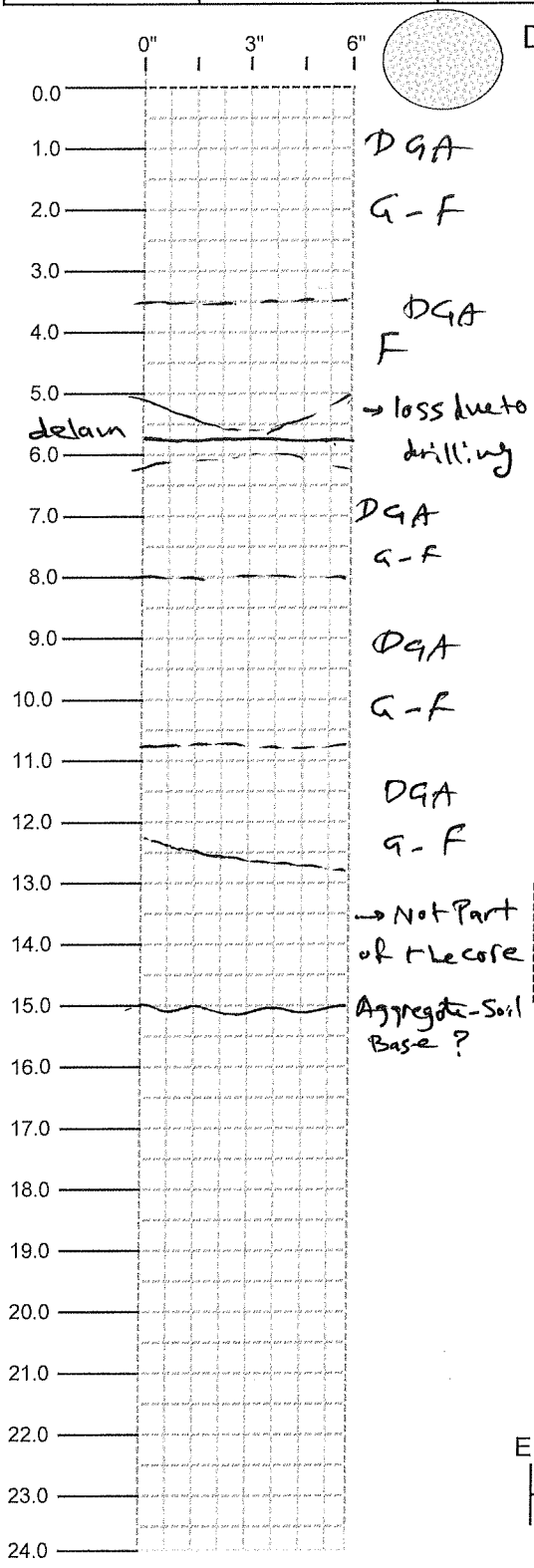
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT ( )	Date: 2-17-21

Depth: 12.50 = Note:



EP EP

CORE P-5

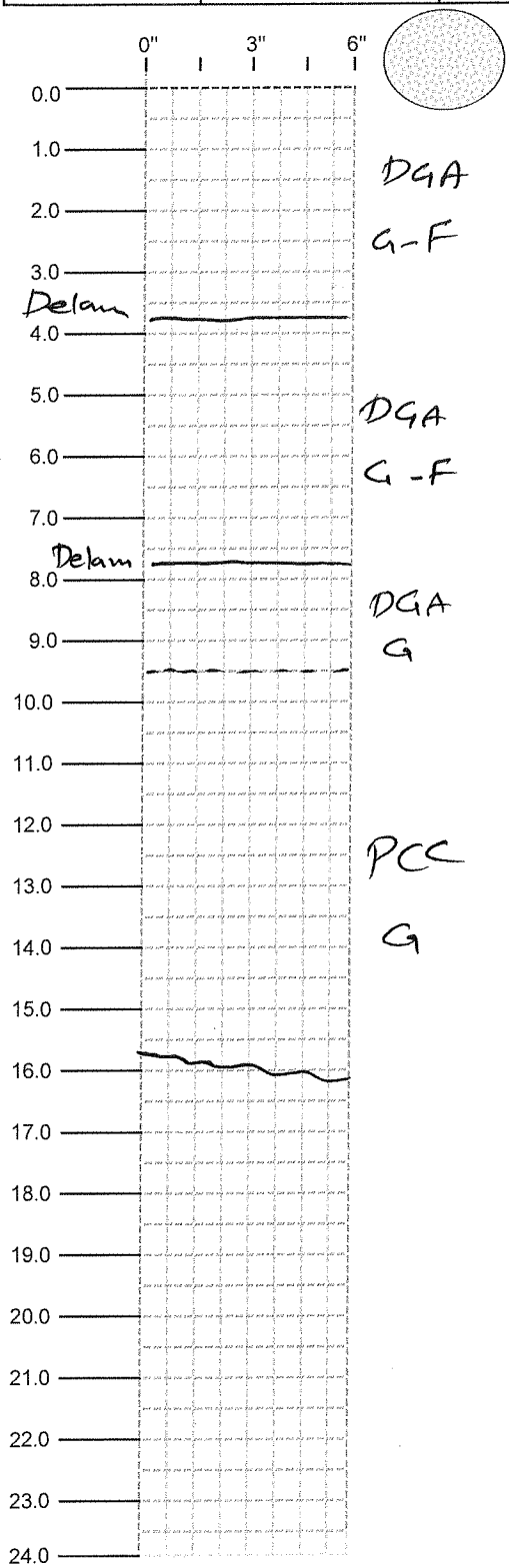
PAVEMENTS CORE LOG

Designer: SHJ
Project Number 105483

Project: Stafford Rd
Location: Stafford Rd
County: Clackamas County

Drilled On Crack (No) (Yes) L M H	Drilled On Patch (No) (Yes) L M H	DIR (EB) (WB) (NB) (SB)	LANE (A) (B) (Other) (C) (D)	LOC IWT ( ) BWT ( ) OWT ( )	Date: 2-17-21

Depth: 16.00' Note:



EP EP

APPENDIX C

Backcalculation Report

Analysis Unit	Lane	Station	68 °F Temp. Adj. D0, in	AC Thickness, in	AB Thickness, in.	Total Pvmt Thickness (D), in	Backcalculation Analysis Results				
							Uncorrected Subgrade Modulus (Mr @ r>=0.7ae), psi	Mr Correction Factor, Cf	Corrected Subgrade Mr, psi	Pavement Modulus (Ep), psi	SNeff
SB	SB	00+00	0.004519	14.50	14.50	29.00	36,795	0.35	12,878	205,903	7.71
SB	SB	01+00	0.006850	14.50	14.50	29.00	25,876	0.35	9,056	174,900	7.30
SB	SB	03+00	0.005163	14.50	14.50	29.00	32,086	0.35	11,230	267,597	8.41
SB	SB	05+00	0.005591	14.50	14.50	29.00	37,413	0.35	13,095	145,903	6.87
SB	SB	07+00	0.005360	14.50	14.50	29.00	38,197	0.35	13,369	199,718	7.63
SB	SB	08+00	0.005491	14.50	14.50	29.00	38,197	0.35	13,369	220,321	7.88
SB	SB	12+00	0.006984	14.50	14.50	29.00	31,531	0.35	11,036	134,001	6.68
SB	SB	13+00	0.006052	14.50	14.50	29.00	43,977	0.35	15,392	103,920	6.14
SB	SB	16+00	0.006796	14.50	14.50	29.00	22,406	0.35	7,842	140,548	6.79
SB	SB	17+00	0.005913	14.50	14.50	29.00	26,561	0.35	9,296	208,713	7.74
SB	SB	19+00	0.004349	14.50	14.50	29.00	39,321	0.35	13,762	277,647	8.51
SB	SB	21+00	0.004453	14.50	14.50	29.00	63,662	0.35	22,282	138,935	6.76
SB	SB	23+00	0.005804	14.50	14.50	29.00	34,105	0.35	11,937	97,106	6.00
SB	SB	25+00	0.003468	14.50	14.50	29.00	51,419	0.35	17,997	243,308	8.15
SB	SB	27+00	0.004470	14.50	14.50	29.00	42,218	0.35	14,776	264,630	8.38
SB	SB	29+00	0.003707	14.50	14.50	29.00	49,637	0.35	17,373	205,798	7.70
SB	SB	31+00	0.010861	14.50	14.50	29.00	14,910	0.35	5,218	105,860	6.17
SB	SB	33+00	0.004848	14.50	14.50	29.00	48,674	0.35	17,036	171,333	7.25
SB	SB	35+00	0.005296	14.50	14.50	29.00	37,695	0.35	13,193	128,374	6.58
SB	SB	37+00	0.006277	14.50	14.50	29.00	25,067	0.35	8,773	162,331	7.12
SB	SB	39+00	0.005318	14.50	14.50	29.00	32,929	0.35	11,525	94,305	5.94
SB	SB	41+00	0.004677	14.50	14.50	29.00	34,575	0.35	12,101	101,780	6.09
SB	SB	42+00	0.007062	14.50	14.50	29.00	28,324	0.35	9,913	124,501	6.52

Statistical Summary - SB

Max	0.007062	14.50	14.50	29.00	51,419		17,997	277,647	8.51
Min	0.003468	14.50	14.50	29.00	22,406		7,842	94,305	5.94
Average	0.005428	14.50	14.50	29.00	36,048		**12,617**	**174,887**	**7.21**
Standard Deviation	0.001030				8,118		2,841	58,788	0.83
CV	19%				23%		23%	34%	11%
80th Percentile Deflection	0.006300								

		AC Layer			Base Layer			Subgrade Layer	
Uncorrected STA, ft	Load, lbf	Layer 1 Type	Layer Thickness, in	Backcalculated	Layer 2 Type	Layer Thickness, in	Backcalculated	Layer 3 Type	Backcalculated
52+00	7,471	User Defined	14.5	911,090	User Defined	14.5	121,510	Low Strength Subgrade	26,980
52+00	9,571	User Defined	14.5	858,824	User Defined	14.5	114,072	Low Strength Subgrade	25,528
52+00	12,923	User Defined	14.5	915,168	User Defined	14.5	121,209	Low Strength Subgrade	26,943
51+00	7,450	User Defined	14.5	480,872	User Defined	14.5	80,777	Low Strength Subgrade	23,095
51+00	9,672	User Defined	14.5	476,073	User Defined	14.5	73,054	Low Strength Subgrade	22,818
51+00	13,008	User Defined	14.5	644,161	User Defined	14.5	84,722	Low Strength Subgrade	19,886
49+00	7,436	User Defined	14.5	913,077	User Defined	14.5	121,640	Low Strength Subgrade	27,010
49+00	9,694	User Defined	14.5	902,223	User Defined	14.5	120,685	Low Strength Subgrade	26,880
49+00	12,889	User Defined	14.5	675,437	User Defined	14.5	127,983	Low Strength Subgrade	28,456
47+00	7,501	User Defined	14.5	889,554	User Defined	14.5	120,677	Low Strength Subgrade	26,790
47+00	9,632	User Defined	14.5	866,439	User Defined	14.5	115,250	Low Strength Subgrade	25,781
47+00	12,906	User Defined	14.5	853,244	User Defined	14.5	113,449	Low Strength Subgrade	25,403
45+00	7,440	User Defined	14.5	974,164	User Defined	14.5	130,016	Low Strength Subgrade	28,720
45+00	9,555	User Defined	14.5	949,719	User Defined	14.5	126,336	Low Strength Subgrade	28,094
45+00	12,898	User Defined	14.5	938,428	User Defined	14.5	125,128	Low Strength Subgrade	27,721
44+00	7,479	User Defined	14.5	932,193	User Defined	14.5	124,314	Low Strength Subgrade	27,549
44+00	9,536	User Defined	14.5	530,145	User Defined	14.5	127,839	Low Strength Subgrade	30,059
44+00	12,799	User Defined	14.5	862,829	User Defined	14.5	115,952	Low Strength Subgrade	25,850
40+00	7,409	User Defined	14.5	502,835	User Defined	14.5	74,816	Low Strength Subgrade	21,393
40+00	9,536	User Defined	14.5	601,612	User Defined	14.5	78,697	Low Strength Subgrade	18,651
40+00	12,760	User Defined	14.5	601,612	User Defined	14.5	78,697	Low Strength Subgrade	18,651
39+00	7,302	User Defined	14.5	787,778	User Defined	14.5	90,899	Low Strength Subgrade	19,449
39+00	9,488	User Defined	14.5	648,147	User Defined	14.5	85,195	Low Strength Subgrade	19,913
39+00	13,028	User Defined	14.5	902,887	User Defined	14.5	105,839	Low Strength Subgrade	17,843
36+00	7,296	User Defined	14.5	497,876	User Defined	14.5	84,625	Low Strength Subgrade	23,607
36+00	9,563	User Defined	14.5	514,329	User Defined	14.5	84,387	Low Strength Subgrade	22,671
36+00	12,948	User Defined	14.5	565,981	User Defined	14.5	83,123	Low Strength Subgrade	21,821
35+00	7,471	User Defined	14.5	790,135	User Defined	14.5	105,007	Low Strength Subgrade	23,744
35+00	9,590	User Defined	14.5	790,662	User Defined	14.5	104,573	Low Strength Subgrade	23,632
35+00	12,932	User Defined	14.5	663,326	User Defined	14.5	89,080	Low Strength Subgrade	24,491
33+00	7,517	User Defined	14.5	1,119,049	User Defined	14.5	151,489	Low Strength Subgrade	32,870
33+00	9,598	User Defined	14.5	1,105,258	User Defined	14.5	149,871	Low Strength Subgrade	32,361
33+00	12,909	User Defined	14.5	1,104,278	User Defined	14.5	149,565	Low Strength Subgrade	32,511
31+00	7,523	User Defined	14.5	1,020,833	User Defined	14.5	136,786	Low Strength Subgrade	30,000
31+00	9,653	User Defined	14.5	1,039,793	User Defined	14.5	140,531	Low Strength Subgrade	30,711
31+00	12,859	User Defined	14.5	995,300	User Defined	14.5	133,463	Low Strength Subgrade	29,392
29+00	7,393	User Defined	14.5	750,216	User Defined	14.5	99,541	Low Strength Subgrade	22,742
29+00	9,587	User Defined	14.5	761,033	User Defined	14.5	100,863	Low Strength Subgrade	22,959
29+00	12,936	User Defined	14.5	744,701	User Defined	14.5	98,489	Low Strength Subgrade	22,461
27+00	7,425	User Defined	14.5	1,524,842	User Defined	14.5	206,774	Low Strength Subgrade	43,935
27+00	9,626	User Defined	14.5	1,532,466	User Defined	14.5	207,748	Low Strength Subgrade	44,185
27+00	12,928	User Defined	14.5	1,427,040	User Defined	14.5	193,177	Low Strength Subgrade	41,210
25+00	6,581	User Defined	14.5	977,442	User Defined	14.5	130,383	Low Strength Subgrade	28,782
25+00	9,580	User Defined	14.5	1,127,498	User Defined	14.5	152,140	Low Strength Subgrade	32,992
25+00	12,874	User Defined	14.5	1,093,258	User Defined	14.5	147,387	Low Strength Subgrade	32,077
23+00	7,554	User Defined	14.5	1,293,250	User Defined	14.5	175,076	Low Strength Subgrade	37,555
23+00	9,701	User Defined	14.5	1,362,767	User Defined	14.5	184,717	Low Strength Subgrade	39,400
23+00	13,004	User Defined	14.5	1,245,618	User Defined	14.5	168,592	Low Strength Subgrade	36,303
21+00	7,379	User Defined	14.5	380,753	User Defined	14.5	48,212	Low Strength Subgrade	12,605
21+00	9,530	User Defined	14.5	369,441	User Defined	14.5	46,656	Low Strength Subgrade	12,263
21+00	12,703	User Defined	14.5	327,060	User Defined	14.5	44,838	Low Strength Subgrade	12,929
19+00	7,451	User Defined	14.5	959,598	User Defined	14.5	128,026	Low Strength Subgrade	28,301
19+00	9,553	User Defined	14.5	915,325	User Defined	14.5	122,049	Low Strength Subgrade	27,080
19+00	12,780	User Defined	14.5	883,360	User Defined	14.5	118,021	Low Strength Subgrade	26,211
17+00	7,432	User Defined	14.5	815,380	User Defined	14.5	107,914	Low Strength Subgrade	24,311
17+00	9,526	User Defined	14.5	790,262	User Defined	14.5	104,549	Low Strength Subgrade	23,658
17+00	12,855	User Defined	14.5	764,649	User Defined	14.5	100,995	Low Strength Subgrade	22,869
15+00	7,395	User Defined	14.5	714,811	User Defined	14.5	94,614	Low Strength Subgrade	21,777
15+00	9,542	User Defined	14.5	700,285	User Defined	14.5	92,376	Low Strength Subgrade	21,324
15+00	12,962	User Defined	14.5	709,403	User Defined	14.5	93,751	Low Strength Subgrade	21,606
13+00	7,429	User Defined	14.5	810,796	User Defined	14.5	106,210	Low Strength Subgrade	24,047
13+00	9,594	User Defined	14.5	778,186	User Defined	14.5	102,948	Low Strength Subgrade	23,309
13+00	12,908	User Defined	14.5	770,588	User Defined	14.5	101,976	Low Strength Subgrade	23,195
11+00	7,483	User Defined	14.5	987,711	User Defined	14.5	132,426	Low Strength Subgrade	29,182
11+00	9,622	User Defined	14.5	974,240	User Defined	14.5	130,007	Low Strength Subgrade	28,717
11+00	12,862	User Defined	14.5	966,937	User Defined	14.5	128,975	Low Strength Subgrade	28,502
10+00	7,494	User Defined	14.5	719,653	User Defined	14.5	95,191	Low Strength Subgrade	21,885
10+00	9,620	User Defined	14.5	692,087	User Defined	14.5	91,441	Low Strength Subgrade	21,189
10+00	12,851	User Defined	14.5	696,944	User Defined	14.5	92,186	Low Strength Subgrade	21,352
			Average	869,924		**Average**	118,428	**Average**	26,726
			StDev	239,880		**StDev**	30,912	**StDev**	5,834
			CoD	28%		**CoD**	26%	**CoD**	22%
						Cf[1]	0.465	**Cf**[2]	0.35
						Corrected Average	55,069	**Corrected Average**	9,354

[1] Base correction factors of 0.62 (typ. Per ODOT PDG Table 10) and 0.75 (seasonal correction per FHWA-HRT-16-011, December 2017)

[2] Subgrade correction factor of 0.35 (typ. Per ODOT PDG Table 10)

Test Section:	**Stafford Rd between SW Pattulo Way and Rosemont Rd - Northbound**									
Start Point:	10+00									
Test Date:	2/18/2021									
Test File:										
Load Plate Radius, in:	5.91									
Sensor Distance, in:	0	8	12	18	24	36	48	60		
AC Thickness, in:	10.25									
PCC Thickness, in:	7.50									

				Deflections Normalized to 9000 lbf Basis												FWD Backcalculation Summary								
Test No.	Index No.	Test Station	Analysis Unit	D 0, mils	D 1, mils	D 2, mils	D 3, mils	D 4, mils	D 5, mils	D 6, mils	D 7, mils	Surface Temp., °F	Mid Depth Temp.,°F	Pavement Modulus, psi	Time	$D_{0\ Compress}$, in	$D_{0\ PCC}$, in	$AREA_{PCC}$	Average $D_{0\ PCC}$, mils	Average $AREA_{PCC}$	$K_{Dynamic}$	K_{Static}	ED^3	E, psi	S'c, psi
1	1	42+00	NB	3.99	3.40	3.15	2.82	2.67	2.15	1.95	1.75	44	43.8	1,633,413	14:16:49	0.000260	0.004	28							
2	2	40+00	NB	5.24	4.78	4.60	4.31	4.08	3.64	3.21	2.45	45	44.3	1,614,490	14:18:22	0.000264	0.005	31							
3	3	38+00	NB	3.04	2.71	2.61	2.44	2.30	1.78	1.77	1.57	44	43.8	1,630,924	14:19:53	0.000261	0.003	31							
4	4	36+00	NB	2.90	2.56	2.48	2.29	2.24	1.93	1.65	1.55	43	43.4	1,647,389	14:21:25	0.000258	0.003	32							
5	5	34+00	NB	4.60	4.12	3.88	3.48	3.11	2.47	2.10	1.52	44	43.9	1,628,462	14:22:54	0.000261	0.004	29							
6	6	32+00	NB	3.99	3.70	3.57	3.31	3.04	2.34	2.06	1.73	44	43.9	1,627,191	14:24:27	0.000262	0.004	31							
7	7	29+95	NB	4.16	3.69	3.51	3.22	2.99	2.65	2.20	1.76	43	43.6	1,642,174	14:27:50	0.000259	0.004	30							
8	8	27+85	NB	5.14	4.37	3.99	3.31	2.81	2.06	1.52	1.24	44	44.0	1,623,113	14:29:24	0.000262	0.005	25							
9	9	26+00	NB	4.14	3.63	3.35	3.00	2.69	2.15	1.51	1.26	44	44.1	1,621,926	14:30:50	0.000263	0.004	28							
10	10	24+00	NB	6.00	5.52	5.09	4.34	3.72	2.78	2.15	1.72	44	44.1	1,620,667	14:32:21	0.000263	0.006	27							
11	11	22+00	NB	4.39	3.82	3.64	3.36	3.12	2.67	2.38	1.93	44	44.1	1,619,365	14:33:55	0.000263	0.004	30							
12	12	20+00	NB	3.78	3.33	3.09	2.73	2.40	1.91	1.49	1.18	43	43.7	1,635,679	14:35:44	0.000260	0.004	28	3.783	29	350	175	3.2E+09	7,585,185	818
13	13	17+95	NB	2.71	2.31	2.15	1.95	1.79	1.15	1.17	1.05	43	43.8	1,634,424	14:37:15	0.000260	0.002	28							
14	14	15+99	NB	2.81	2.37	2.22	2.16	1.97	1.54	1.53	1.36	43	43.8	1,633,139	14:38:48	0.000260	0.003	29							
15	15	14+00	NB	2.73	2.30	2.19	2.00	1.95	1.73	1.49	1.31	42	43.4	1,649,479	14:40:40	0.000257	0.002	30							
16	16	12+00	NB	3.05	2.65	2.53	2.37	2.22	1.90	1.59	1.19	42	43.4	1,648,063	14:42:23	0.000258	0.003	30							
17	17	9+95	NB	2.34	1.93	1.75	1.62	1.51	1.28	1.06	0.89	43	43.9	1,628,086	14:44:52	0.000261	0.002	29							
18	18	8+00	NB	2.65	2.16	1.98	1.79	1.64	1.30	1.00	0.83	43	43.9	1,626,873	14:46:19	0.000262	0.002	27							
19	19	5+90	NB	2.56	2.09	1.95	1.83	1.66	1.39	1.17	0.93	43	44.0	1,625,561	14:47:53	0.000262	0.002	28							
20	20	4+00	NB	3.27	2.89	2.73	2.45	2.26	1.87	1.62	1.35	42	43.6	1,642,039	14:49:39	0.000259	0.003	30							
21	21	1+95	NB	10.47	10.52	10.47	9.23	6.81	2.93	1.64	1.24	42	43.6	1,640,735	14:51:13	0.000259	0.010	28							
22	22	0+00	NB	5.00	4.43	4.10	3.59	3.32	2.67	2.19	1.70	41	43.2	1,657,394	14:52:50	0.000256	0.005	28							

APPENDIX D: LABORATORY TESTING RESULTS

Appendix D

LABORATORY TEST RESULTS

CONTENTS

Figures

Attachments

APPENDIX D: LABORATORY TEST RESULTS

D.1 GENERAL

The soil and rock samples obtained during the Shannon & Wilson field explorations were described and identified in the field. The samples were then reviewed in the laboratory. Physical characteristics of the samples were noted, and field descriptions and identifications were modified as necessary. During the course of the examination, some samples were selected for further testing. We refined our descriptions and identifications based on the results of the laboratory tests, in accordance with the ODOT Soil and Rock Classification Manual (1987).

The soil testing program for the Shannon & Wilson borings included moisture content tests, Atterberg limits tests, particle-size analyses, and consolidation testing. The rock testing program for the Shannon & Wilson borings included uniaxial compressive strength of intact rock core specimens. Laboratory testing was performed by Northwest Testing, Inc. (NTI), of Wilsonville, Oregon, and by Shannon & Wilson, Inc. All test procedures were performed in accordance with applicable ASTM International standards.

D.2 SOIL TESTING

D.2.1 Moisture (Natural Water) Content

Natural moisture content tests were performed, in accordance with ASTM D2216, on selected soil samples. The natural moisture content is a measure of the amount of moisture in the soil at the time of exploration. It is defined as the ratio of water weight to dry soil weight, expressed as a percentage. Moisture content tests for this project were performed by NTI and Shannon & Wilson. Results of all moisture content tests are presented on the Drill Logs in Appendix B. Results of the NTI moisture content tests are also presented in their report, which is attached to the end of this appendix.

D.2.2 Particle-Size Analyses

Particle-size analyses were conducted on selected samples to determine their grain-size distributions. Grain size distributions were determined in accordance with ASTM D6913 and ASTM D1140, as applicable. For all samples, a wet sieve analysis was performed to determine the percentage (by weight) of each sample passing the No. 200 (0.075 mm) sieve. For select samples, the material retained on the No. 200 sieve was shaken through a series of sieves to determine the distribution of the plus No. 200 fraction (ASTM D6913). For some samples, only the percentage of the sample passing the No. 200 (0.075mm) sieve was determined (ASTM D1140). Particle-size analyses were performed by NTI and Shannon &

Wilson. Results of all particle-size analyses are presented on Figure D1, Grain Size Distribution. The percentage of each sample passing the No. 200 sieve is also shown on the Drill Logs in Appendix B. Results of the NTI sieve analyses are also presented in their report, which is attached to the end of this appendix.

D.2.3 Atterberg Limits

Atterberg limits were determined for selected samples in accordance with ASTM D4318. This analysis yields index parameters of the soil that are useful in soil identification, as well as in engineering analyses. An Atterberg limits test determines a soil's liquid limit (LL) and plastic limit (PL). These are the maximum and minimum moisture contents at which the soil exhibits plastic behavior. A soil's plasticity index (PI) can be determined by subtracting PL from LL. Atterberg limits tests for the Shannon & Wilson borings were performed by NTI and Shannon & Wilson and are plotted on Figure D2, Atterberg Limits Results. The results are also shown on the Shannon & Wilson Drill Logs in Appendix B. Results of the NTI Atterberg limit tests are also presented in their report, which is attached to the end of this appendix.

D.2.4 One Dimensional Consolidation Testing

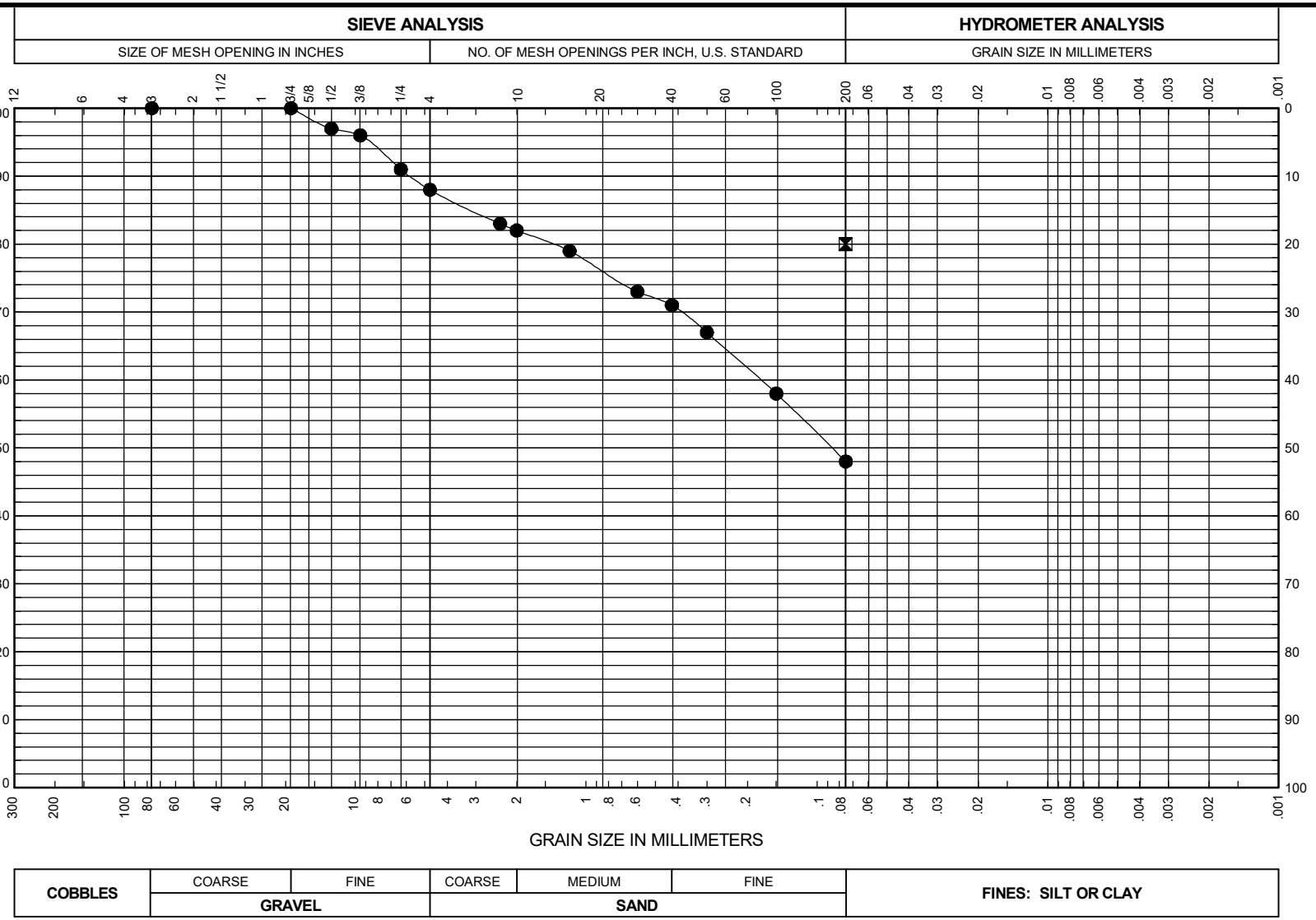
One-dimensional incremental consolidation tests were performed on selected undisturbed samples in accordance with ASTM D2435, Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading. Consolidation tests measure the volume change and rate of volume change of the soil sample under predetermined loads. The tests were performed by NTI, and the results are presented in their reports, which are attached to the end of this appendix.

D.3 ROCK TESTING

D.3.1 Uniaxial Compressive Strength

Selected rock core samples were tested using ASTM D7012 (Method C), the Uniaxial Compressive Strength of Intact Rock Core Specimens. The test consists of placing a trimmed rock core specimen between two bearing plates and applying and measuring an axial load which increases at a constant rate until failure. During the application of increasing axial load, strain of the core sample is continuously measured with a dial indicator placed between the two bearing blocks, measuring the decreasing length of the rock core. The highest load achieved, and the length of the rock core at failure, are recorded. Measurements made during the test are used to calculate the uniaxial compressive strength,

in pounds per square inch (psi). Results are presented on the Shannon & Wilson Drill Logs in Appendix B, and in the NTI reports attached to the end of this appendix.



NOTES:
1) Sieve analyses were performed in general accordance with ASTM D6913, sieve with hydrometer analyses were performed in general accordance with ASTM D422, and amount finer than #200 sieve analyses were performed in general accordance with ASTM D1140 unless otherwise noted in the report.
2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	GRAVEL %	SAND %	FINES %	NAT. W.C. %	DRY DENSITY PCF
● B-6, N1	2.5	*ML*	*Sandy SILT with trace gravel*	12	40	48		
⊠ B-7, N2	5.0	*ML*	*SILT with some sand*	-	-	80	28	

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

GRAIN SIZE DISTRIBUTION

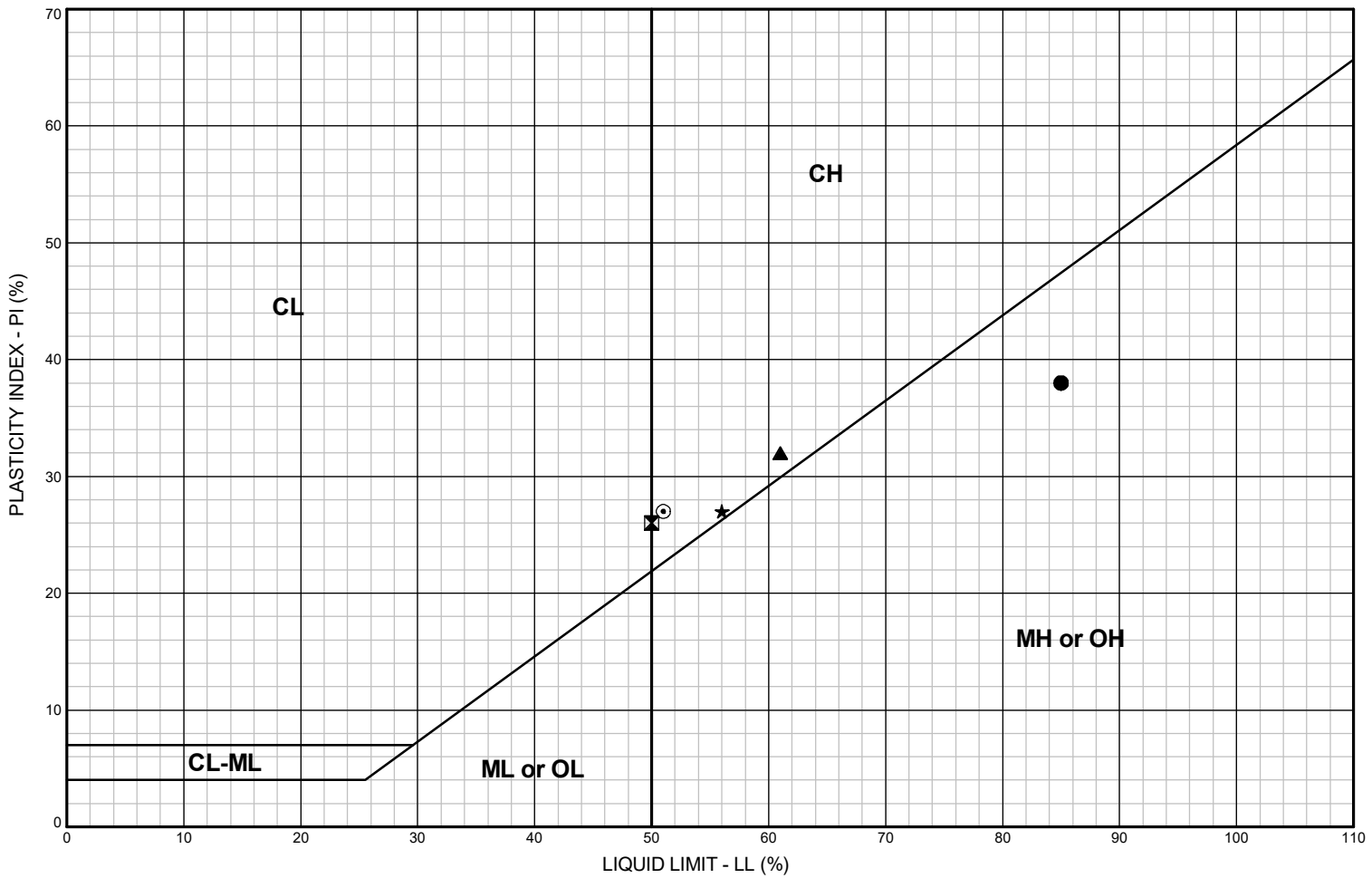
February 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. D1

FIG. D1

GSA_MAIN_105483.GPJ_SHAN_WIL.GDT_12/9/21



NOTES

1) Atterberg limits tests were performed in general accordance with ASTM D4318 unless otherwise noted in the report.

2) Group Name and Group Symbol are in accordance with ASTM D2488 and are refined in accordance with ASTM D2487 where appropriate laboratory tests are performed.

3) Plasticity adjectives used in sample descriptions correspond to plasticity index as follows:
- Nonplastic (NP) (< 3%)
- Low Plasticity (3 to 15%)
- Medium Plasticity (15 to 30%)
- High Plasticity (> 30%)

BORING AND SAMPLE NO.	DEPTH (feet)	GROUP SYMBOL[2]	GROUP NAME[2]	LL %	PL %	PI %[3]	NAT. W.C. %	FINES %
● B-4, N3	7.5	*MH*	*Clayey SILT with some gravel and trace sand*	85	47	38	53	
⊠ B-5, U2	7.5	*CL/CH*	*Silty CLAY to CLAY with some sand and gravel*	50	24	26	26	
▲ B-6, N4	15.0	*CH*	*CLAY with some sand*	61	29	32	35	
★ P-3, N2	5.0	*CH*	*CLAY with trace sand*	56	29	27	32	
⊙ P-3, N3	7.5	*CH*	*CLAY with trace sand*	51	24	27	28	

Stafford Road (Pattulo Way to Rosemont Road)
Improvements Project
Clackamas County, Oregon

ATTERBERG LIMITS RESULTS

February 2021 105483

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. D2

FIG. D2

ATT MAIN 105483.GPJ SHAN WIL.GDT 12/9/21

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	10/27/2021 21-453
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1

Report of: Moisture content, liquid limit, plastic limit, and plasticity index

Sample Identification

NTI completed moisture content, liquid limit, plastic limit, and plasticity index testing of soil samples delivered to our laboratory on October 15, 2021. Testing was performed in accordance with the standards indicated. Our laboratory test results are summarized on the following table and pages.

Laboratory Testing

Moisture Content of Soil (ASTM D2216 & AASHTO T265)	
Sample ID	**Moisture Content (%)**
B1 N3 @ 7.5 – 9.0 Ft.	25.4
B21 N5 @ 15.0 – 16.5 Ft.	61.9

Atterberg Limits (ASTM D4318 & AASHTO T89/T90)			
Sample ID	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
B-1 N3 @ 7.5 – 9.0 Ft.	27	19	8
B-2 N5 @ 15.0 – 16.5 Ft.	73	51	22

Attachments: Laboratory Test Results

Copies: (1) Addressee

This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	11/24/2021 21-472
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1

Report of: Unconfined compression testing of rock cores, moisture content, liquid limit, plastic limit, and plasticity index, consolidation, sieve analysis and amount of material finer than 75µm (No. 200 wash).

Sample Identification

NTI completed unconfined compression testing of rock cores, moisture content, liquid limit, plastic limit, plasticity index, consolidation, sieve analysis and amount of material finer than 75µm (No. 200 wash) of soil samples delivered to our laboratory on November 5, 2021. Testing was performed in accordance with the standards indicated. Our laboratory test results are summarized on the following table and pages.

Laboratory Testing

Moisture Content of Soil (ASTM D2216)	
Sample ID	**Moisture Content (%)**
B-4 N-3 @ 7.5 – 9 Ft.	53.2
B-5 U-2 @ 7.5 – 9.5 Ft.	26.3
B-6 N-1/N-2 @ 2 – 5 Ft.	36.3
B-6 N-4 @ 15 – 16.5 Ft.	35.2
B-7 N-2 @ 5 – 6.5 Ft.	27.9

Atterberg Limits (ASTM D4318)			
Sample ID	**Liquid Limit**	**Plastic Limit**	**Plasticity Index**
B-4 N-3 @ 7.5 – 9 Ft.	85	47	38
B-5 U-2 @ 7.5 – 9.5 Ft.	50	24	26
B-6 N-4 @ 15 – 16.5 Ft.	61	29	32

Attachments: Laboratory Test Results

Copies: (1) Addressee

This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:** **Lab No.:**	11/24/2021 21-472
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1

Amount of Material Finer than the No. 200 Sieve (ASTM D1140)	
Sample ID	**Percent Passing the No. 200 Sieve**
B-7 N-2 @ 5 – 6.5 Ft.	80.0

Sieve Analysis & Material Finer than the No. 200 Sieve by Washing (ASTM D6913 / D1140)	
Sieve Size	**B-6 N-1, N-2 @ 2.5 – 5.0 Ft. Percent Passing**
¾”	100
½”	97
⅜”	96
¼”	91
#4	88
#8	83
#10	82
#16	79
#30	73
#40	71
#50	67
#100	58
#200	48

This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.

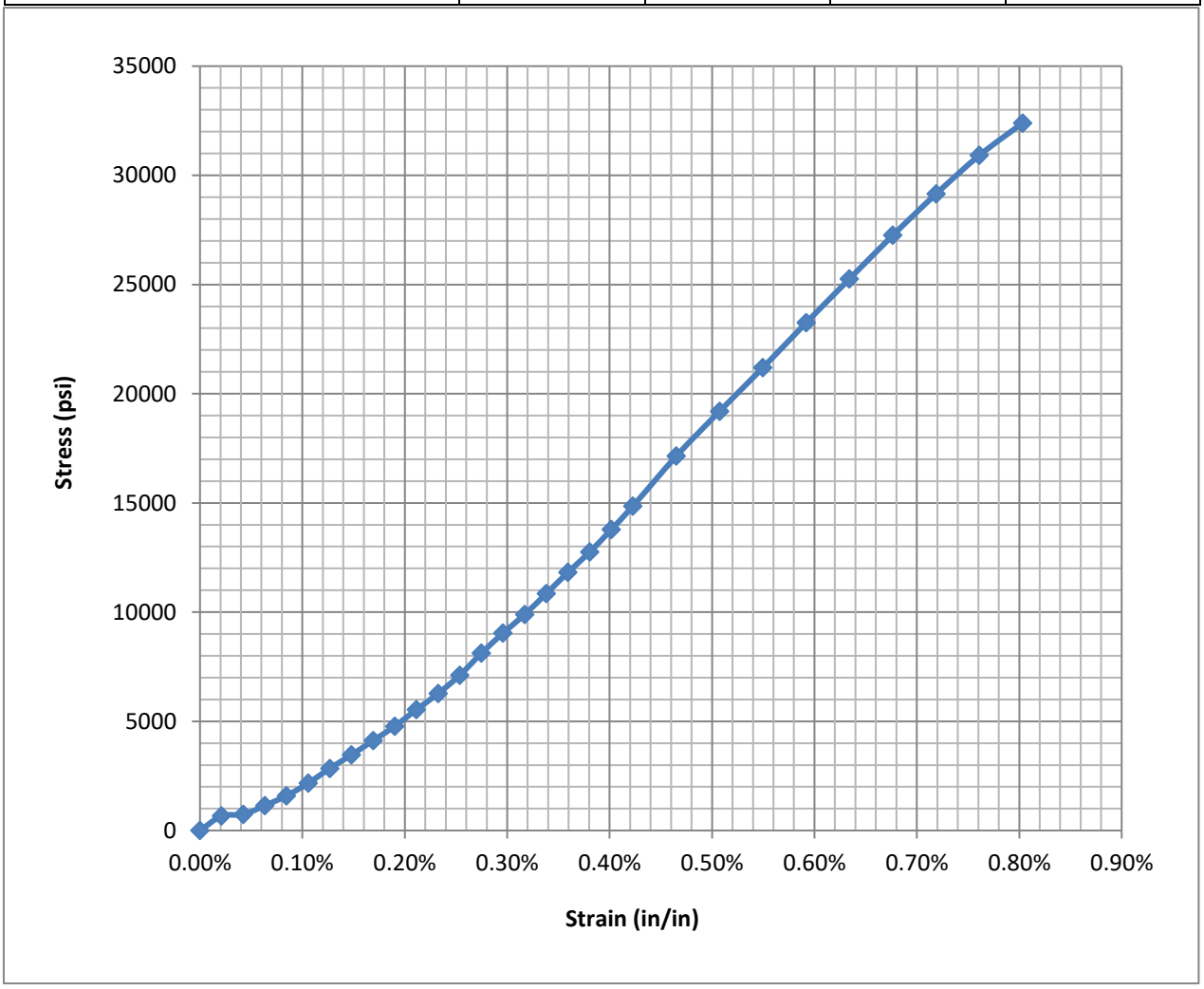
Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:**	11/24/2021
		Lab No.:	21-472
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1

Compressive Strength of Intact Rock Core Specimens (ASTM D7012 Method C)

Sample ID	Diameter (inches)	Height (inches)	Rate of Loading (lbs/s)	Uniaxial Compressive Strength (psi)
B-3 C-2 @ 25.3 – 26 Ft.	2.37	4.73	177	32,521



This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.

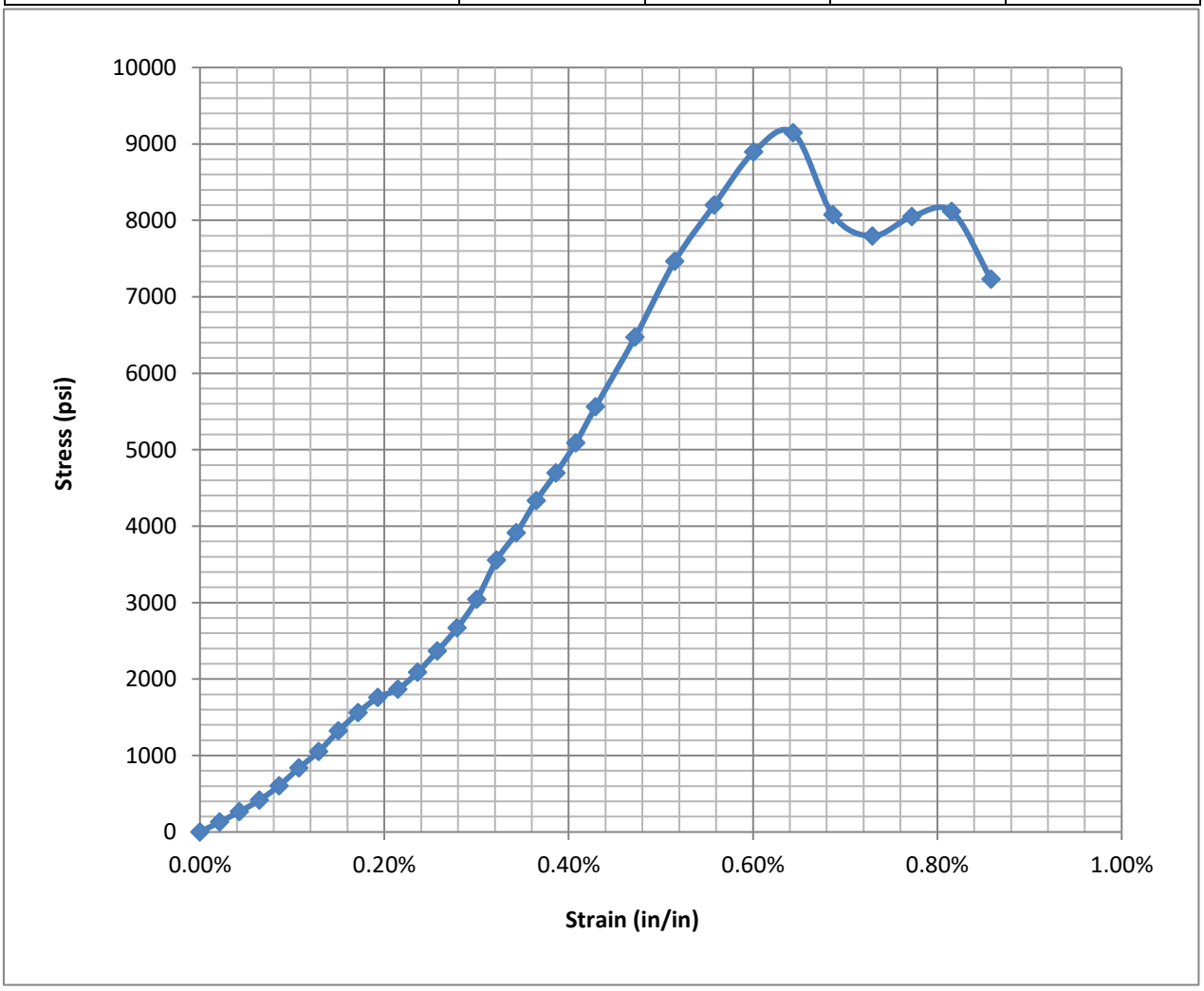
Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:**	11/24/2021
		Lab No.:	21-472
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1

Compressive Strength of Intact Rock Core Specimens (ASTM D7012 Method C)

Sample ID	Diameter (inches)	Height (inches)	Rate of Loading (lbs/s)	Uniaxial Compressive Strength (psi)
B-4 C-3 @ 23.7 – 24.3 Ft.	2.33	4.66	99	9,375



This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

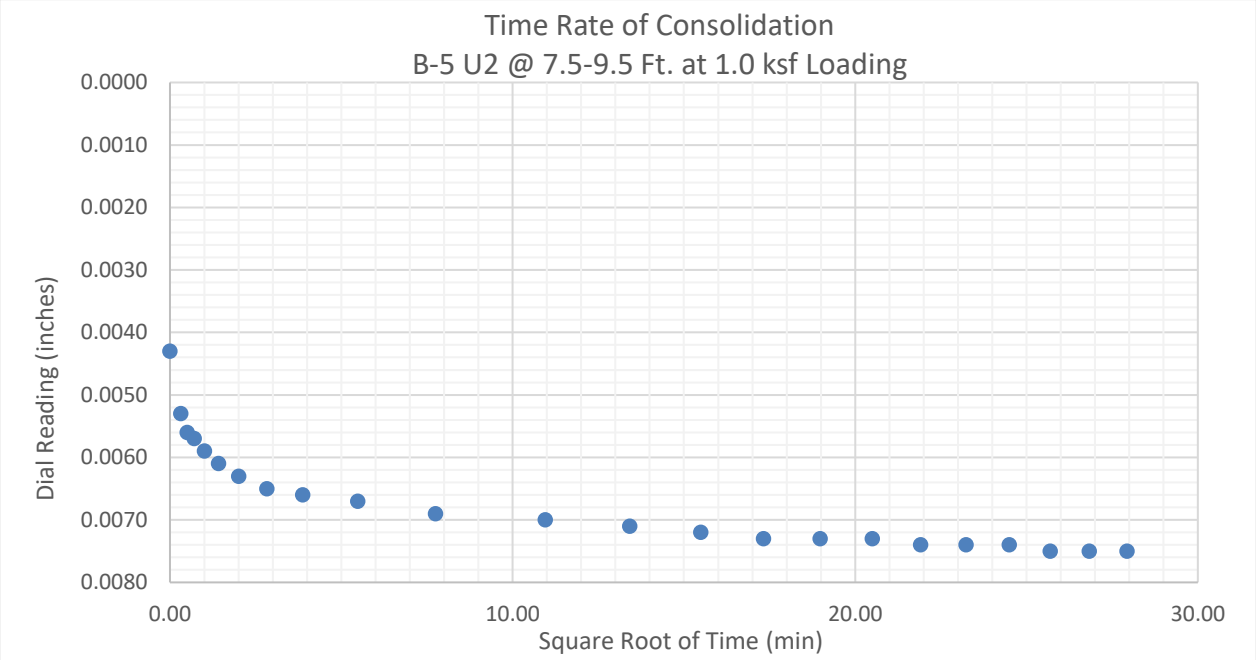
Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:**	11/24/2021
		Lab No.:	21-472
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1

Sample ID: B5, U-2 @ 7.5 - 9.5

One Dimensional Consolidation of Soil (ASTM D2435)

Test	Initial Conditions	Final Conditions
Moisture Content, (%)	26.3	26.7
Dry Unit Weight, (pcf)	94.5	100.5
Height of Specimen, (inches)	1.00	0.93

Load (ksf)	Dial Reading (inches)	Load (ksf)	Dial Reading (inches)
Initial	0.0003	0.25	0.0093
0.25	0.0005	1.0	0.0125
0.5	0.0028	2.0	0.0166
1.0	0.0077	4.0	0.0274
2.0	0.0158	8.0	0.0438
1.0	0.0112	16.0	0.0703

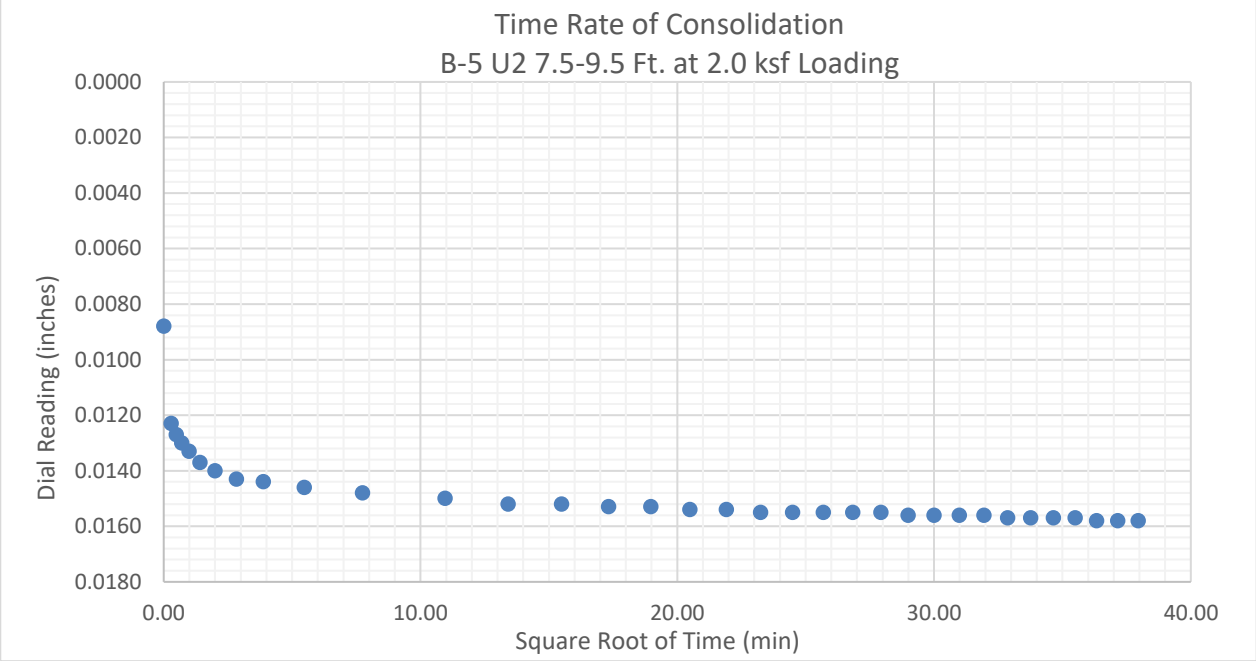


This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.

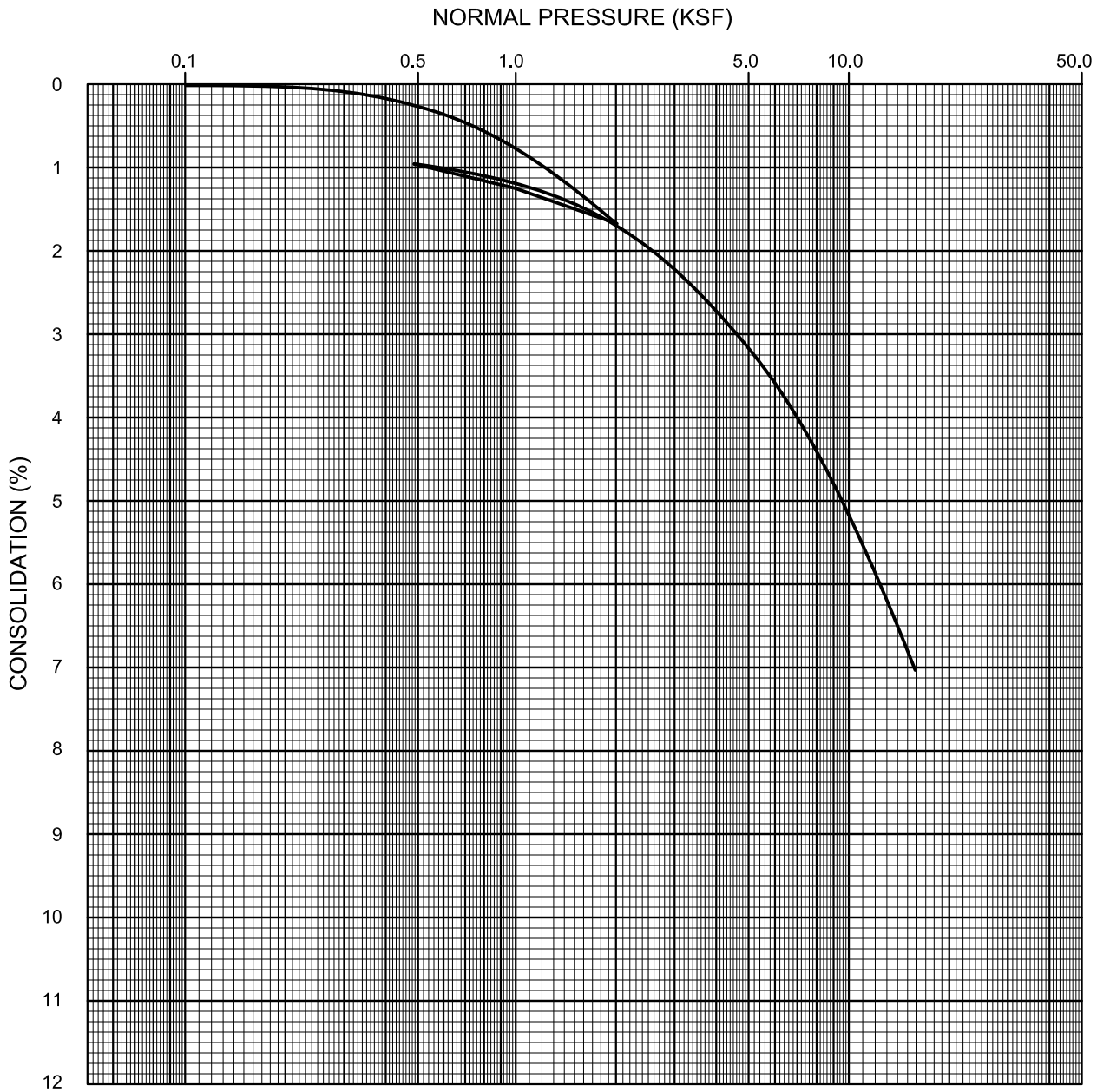
Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.
9120 SW Pioneer Court, Suite B, Wilsonville, Oregon 97070 | ph: 503.682.1880 fax: 503.682.2753 | www.nwgeotech.com

TECHNICAL REPORT

Report To:	Ms. Veronica Biesiada Shannon & Wilson, Inc. 3990 SW Collins Way, Suite 203 Lake Oswego, Oregon 97035	**Date:**	11/24/2021
		Lab No.:	21-472
Project:	Stafford Road (105483)	**Project No.:**	3638.1.1



This report shall not be reproduced except in full, without written approval of Northwest Testing, Inc.



SYMBOL	SAMPLE LOCATION	NORMAL PRESSURE AT SATURATION (KSF)
———	B-5 U-2 @ 7.5 - 9.5 FT.	0.25

CONSOLIDATION TEST RESULTS - ASTM D2435

PROJECT NO. 3638.1.1	SHANNON & WILSON LABORATORY TESTING	LAB NO. 21-472

Northwest Testing, Inc.
A Division of Northwest Geotech, Inc.

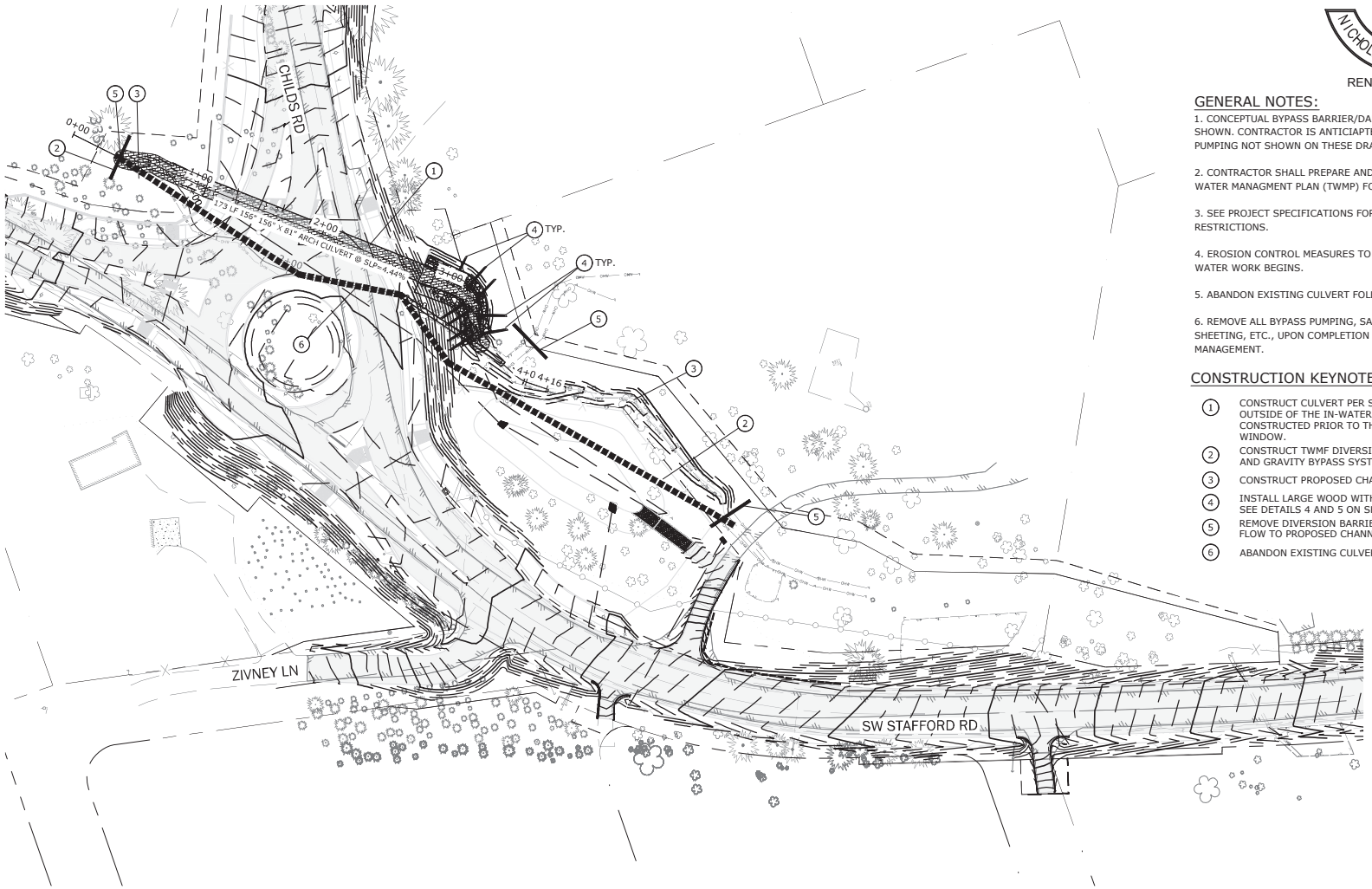
APPENDIX E: FINAL DRAWINGS FOR CULVERT AND WALL

Appendix E

Final Drawings for Culvert and Wall

CONTENTS

100 percent drawings for culvert (Sheets 106 - 115) and MSE wall (Sheets 116 - 118), Stafford Road: Pattulo Way to Rosemont Road, Consor, dated October 2023.



PLAN
SCALE: 1"=80'

40 20 0 40 80
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

GENERAL NOTES:

1. CONCEPTUAL BYPASS BARRIER/DAM CONFIGURATION SHOWN. CONTRACTOR IS ANTICIAPTED TO PROVIDE BYPASS PUMPING NOT SHOWN ON THESE DRAWINGS.

2. CONTRACTOR SHALL PREPARE AND SUBMIT A TEMPORARY WATER MANAGMENT PLAN (TWMP) FOR REVIEW AND APPROVAL.

3. SEE PROJECT SPECIFICATIONS FOR IN WATER WORK RESTRICTIONS.

4. EROSION CONTROL MEASURES TO BE IN PLACE BEFORE IN WATER WORK BEGINS.

5. ABANDON EXISTING CULVERT FOLLOWING FISH SALVAGE.

6. REMOVE ALL BYPASS PUMPING, SANDBAGS, PLASTIC SHEETING, ETC., UPON COMPLETION OF TEMPORARY WATER MANAGEMENT.

CONSTRUCTION KEYNOTES:

1. CONSTRUCT CULVERT PER SHEET BC01. CULVERT IS OUTSIDE OF THE IN-WATER-WORK AREA AND MAY BE CONSTRUCTED PRIOR TO THE IN-WATER-WORK WINDOW.
2. CONSTRUCT TWMF DIVERSION BARRIERIS/DAMS AND GRAVITY BYPASS SYSTEM
3. CONSTRUCT PROPOSED CHANNEL.
4. INSTALL LARGE WOOD WITH VEGETATED RIP RAP. SEE DETAILS 4 AND 5 ON SHEET BC05.
5. REMOVE DIVERSION BARRIERS/DAMSAND DIRECT FLOW TO PROPOSED CHANNEL AND CULVERT.
6. ABANDON EXISTING CULVERT.

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

TEMP WATER MANAGEMENT PLAN

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

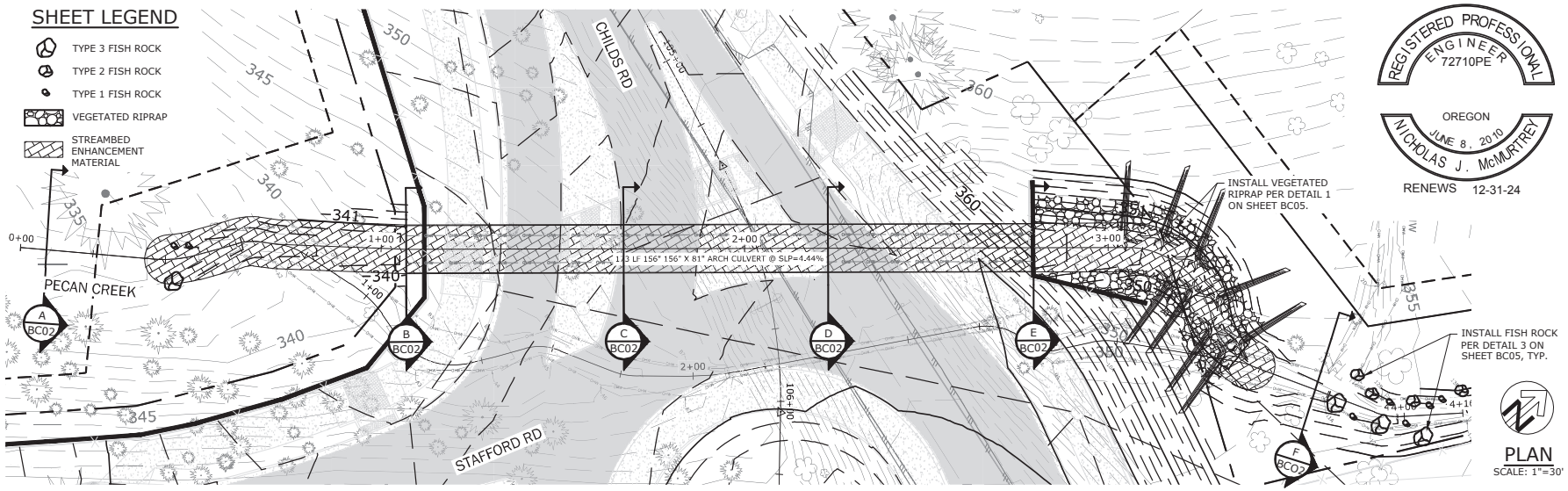
DESIGNED BY: RP-W/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

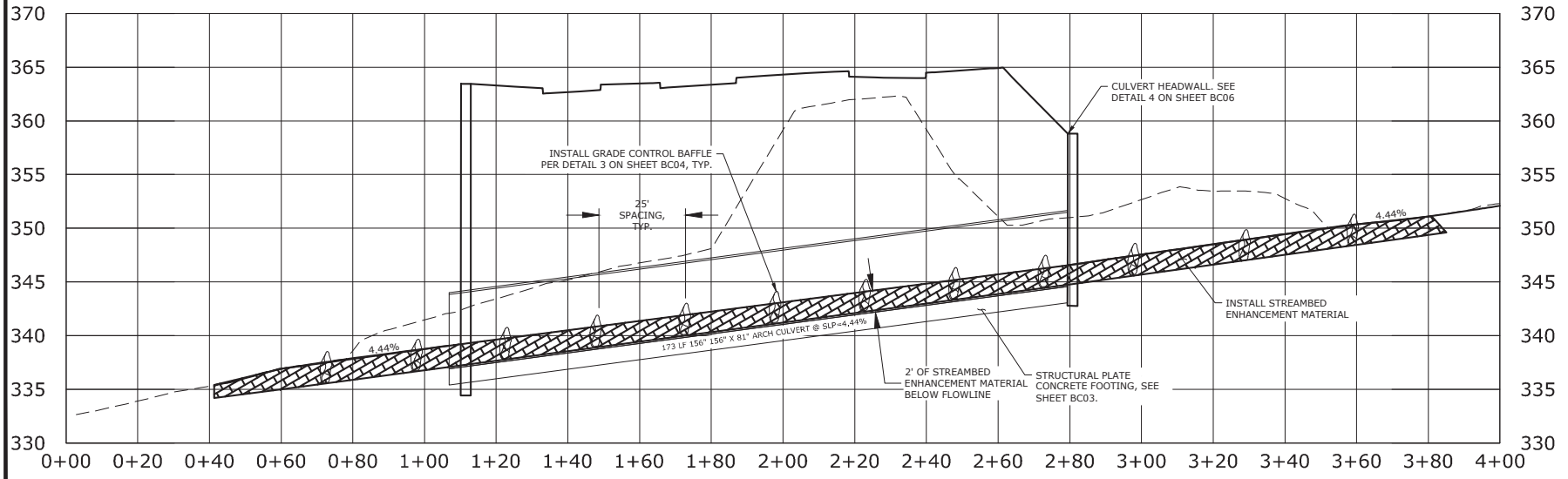
REVISIONS

NO.	DATE:

Sheet No.
BC00
106 of 157

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC00 9/24/2023 11:16 PM RILEY.WIGGINS 23.0s (LMS Tech)





PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
72710PE
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT PLAN AND PROFILE
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD
DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

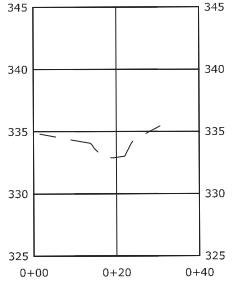
DESIGNED BY: RP-W/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS
NO. | DATE:

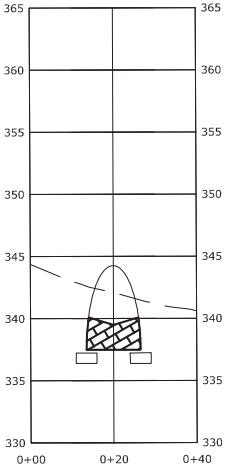
Sheet No.
BC01

107 of 157

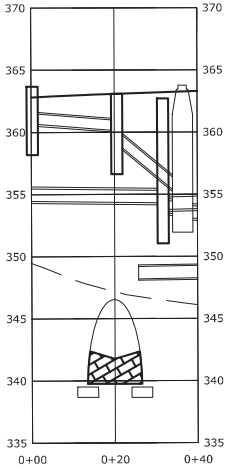
\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC01 9/24/2023 10:00 PM RILEY.WIGGINS 23.0s (LMS Tech)



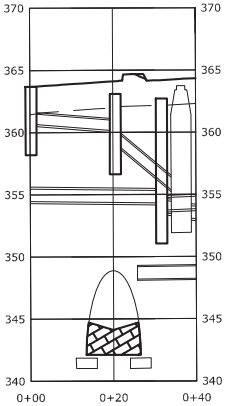
SECTION A BC01
SCALE: 1"=30' HORIZ, 1"=10' VERT



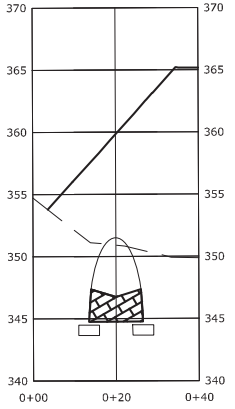
SECTION B BC01
SCALE: 1"=30' HORIZ, 1"=10' VERT



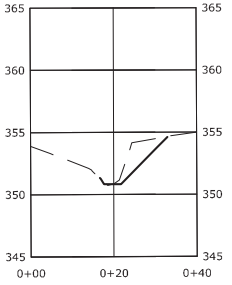
SECTION C BC01
SCALE: 1"=30' HORIZ, 1"=10' VERT



SECTION E BC01
SCALE: 1"=30' HORIZ, 1"=10' VERT



SECTION D BC01
SCALE: 1"=30' HORIZ, 1"=10' VERT



SECTION F BC01
SCALE: 1"=30' HORIZ, 1"=10' VERT

HYDRAULIC DATA

ITEM	ORDINARY HIGH WATER	STREAMBED DESIGN	DESIGN FLOOD
DISCHARGE (CFS)	33	86	89
RECURRENCE INTERVAL (YEARS)	2	50	100
WATER SURFACE DEPTH AT UPSTREAM INLET	1.04	1.97	2.02
WATER SURFACE DEPTH AT DOWNSTREAM OUTLET	0.74	1.40	1.44
VELOCITY (FPS)	2.85	3.92	3.97

STREAM ENHANCEMENT MATERIAL

REGISTERED PROFESSIONAL ENGINEER
72710PE
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT CHANNEL GRADING DETS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

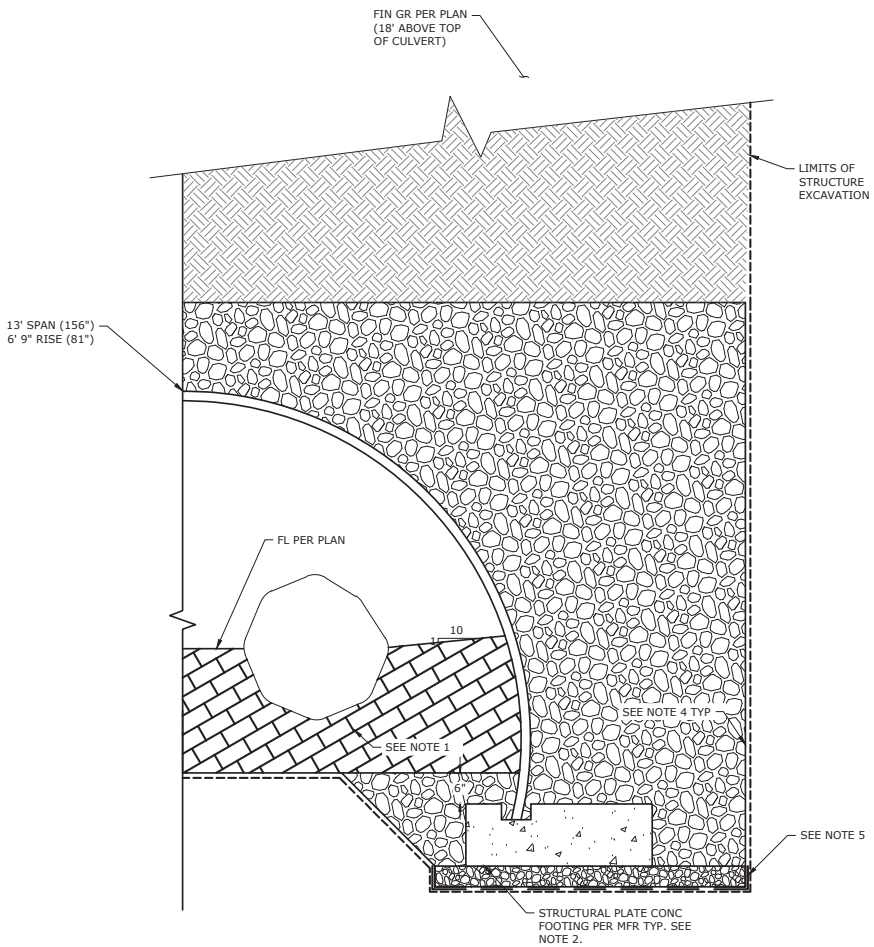
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
BC02

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC02 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



CULVERT SECTION
SCALE: NTS

NATIVE MATERIAL

BEDDING MATERIAL

STREAMBED ENHANCEMENT MATERIAL

GRANULAR STRUCTURE BACKFILL

NOTES:

1. PROVIDE FISH ROCKS AS SHOWN ON PLANS. SEE SHEET BC01.

2. COORDINATE WITH THE ENGINEER TO APPROVE PREPARED SUBGRADE PRIOR TO PLACEMENT OF CONC FOOTINGS.

3. COORDINATE WITH ENGINEER TO FIELD INSPECT FOUNDATION SOIL CONDITIONS PRIOR TO COMPLETING STRUCTURE EXCAVATION AND BACKFILL BELOW ELEVATIONS SHOWN.

4. VERTICAL TRENCH IDENTIFIED DEFINES PAY LIMITS OF STRUCTURE EXCAVATION, AND GRANULAR STRUCTURE BACKFILL. USE OF LAYBACK SLOPE OR SHORING SHALL BE INCIDENTAL TO STRUCTURE EXCAVATION.

5. PROVIDE A SINGLE LAYER OF NON-WOVEN SUBGRADE GEOTEXTILE BETWEEN UNDISTURBED NATIVE SOIL AND BEDDING OR GRANULAR STRUCTURE BACKFILL. EXTEND GEOTEXTILE VERTICALLY FROM NATIVE SOIL TO BOTTOM OF FOOTING ELEVATION.

REGISTERED PROFESSIONAL ENGINEER
72710PE
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT DETAILS - 1

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

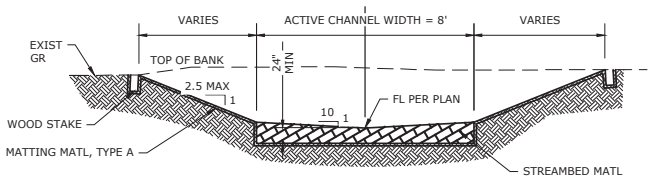
DESIGNED BY: RPW/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
BC03

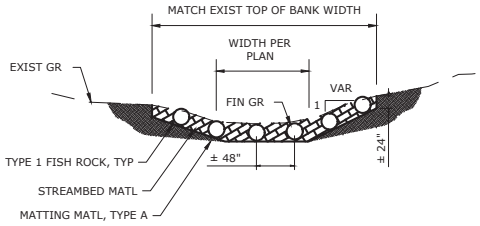
\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC03 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



CHANNEL DETAIL

SCALE: NTS

1 / BC04



NOTE:

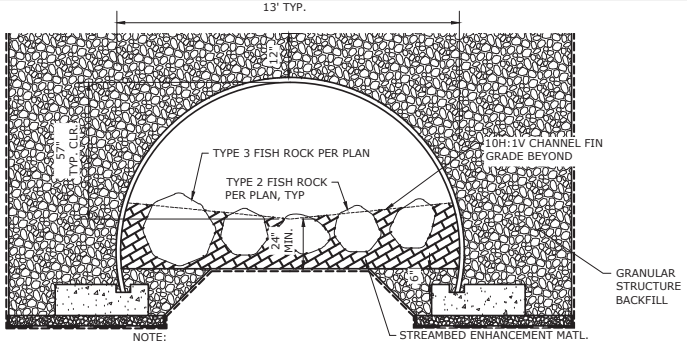
1. FINAL PLACEMENT AND ELEVATIONS OF FISH ROCKS TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

2. ROCK BAND IS INCIDENTAL TO STREAM ENHANCEMENT.

GRADE CONTROL ROCK BAND

SCALE: NTS

2 / BC01



NOTE:

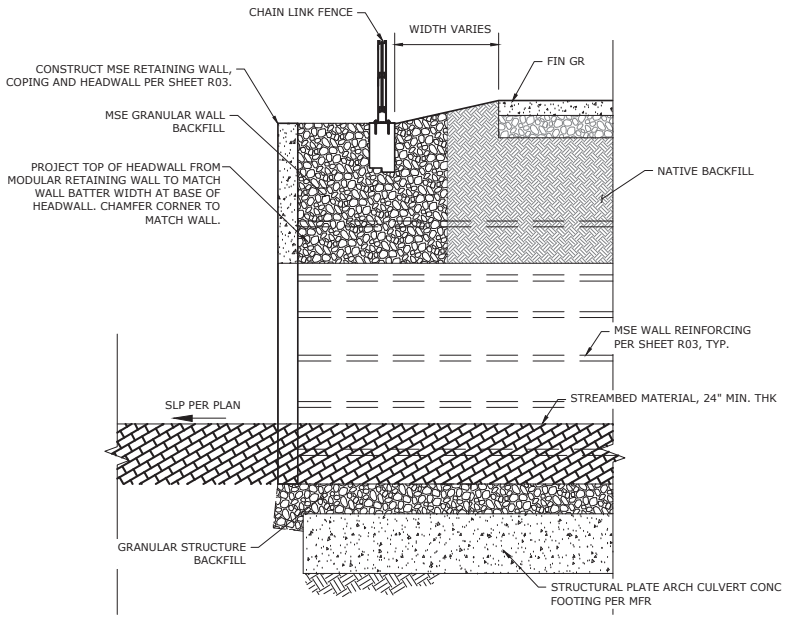
1. FULLY EMBED TYPE 2 FISH ROCKS.

2. EMBED TYPE 3 FISH ROCKS SO THAT 6" TO 12" REMAINS EXPOSED ABOVE STREAMBED ENHANCEMENT MATERIAL.

GRADE CONTROL BAFFLE

SCALE: NTS

3 / BC01



CULVERT HEADWALL DETAIL

SCALE: NTS

4 / BC01

REGISTERED PROFESSIONAL ENGINEER
72710PE
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT DETAILS - 2

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

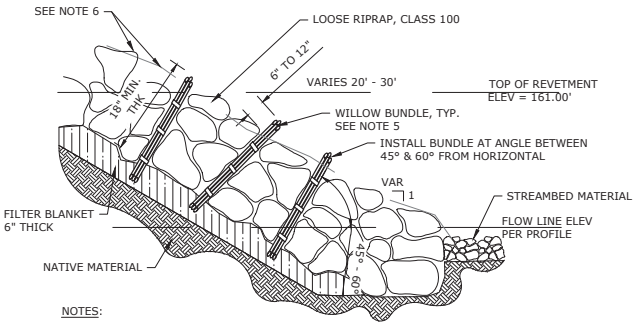
DESIGNED BY: RP-W/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

NO.	DATE:

Sheet No.
BC04

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC04 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



NOTES:

1. WILLOW BUNDLES SHALL BE INSTALLED AT TIME OF RIPRAP CONSTRUCTION.

2. SPACING SHALL BE APPROXIMATELY 36" ON CENTER AS RIPRAP ALLOWS.

3. APPROXIMATELY 80% OF BUNDLE LENGTH TO BE BELOW SURFACE OF RIPRAP.

4. BURIED ENDS OF BUNDLES SHOULD BE IN CONTACT WITH NATIVE SOIL, STANDING WATER OR MOIST ZONE NEAR BOTTOM OF RIPRAP REVETMENT EXCAVATION.

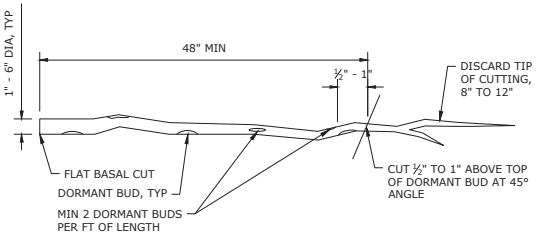
5. PROVIDE 3 TO 5 STAKE CUTTINGS PER BUNDLE, SECURED W/ BIODEGRADABLE COIR TWINE AT 3 POINTS, AS SHOWN, INSERT W/ BUDS POINTING UP. PROVIDE STAKE CUTTINGS PER DET 2, THIS SHT.

6. FINISH GRADE OF RIPRAP SHALL GENERALLY MATCH EXISTING GRADE AND SLOPE OUTSIDE OF FINISH GRADE CONTOURS. EXCAVATE BELOW EXISTING GRADE 18" MIN. AND BACKFILL WITH RIPRAP. EXCAVATION IS INCIDENTAL TO RIPRAP.

WILLOW BUNDLES IN RIPRAP

SCALE: NTS

1 BC01



NOTES:

1. HARVEST AREA TO BE WITHIN SAME ECO-REGION AS PROJECT AREA.

2. CUT FROM VIGOROUS 1 - 3 YEAR OLD WOOD ON PLANTS GROWING IN FULL SUNLIGHT.

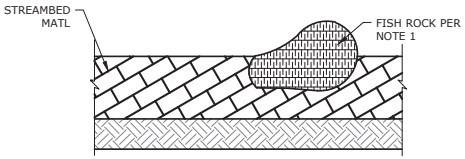
3. IMMEDIATELY REMOVE ALL LATERAL BRANCHES AND CUT LEADER (APICAL STEM) APPROXIMATELY 8" - 12" DOWN STEM FROM TIP LEADER.

4. STORE PROTECTED AT 32° - 42° FAHRENHEIT FOR UP TO 4 MONTHS, OR BEFORE DORMANT BUD DEVELOPMENT.

STAKE CUTTING

SCALE: NTS

2 BC05



NOTES:

1. FISH ROCKS SHALL BE RANDOMLY PLACED WITHIN THE ACTIVE CHANNEL OF CULVERT AND ITS UPSTREAM/DOWNSTREAM CHANNEL.

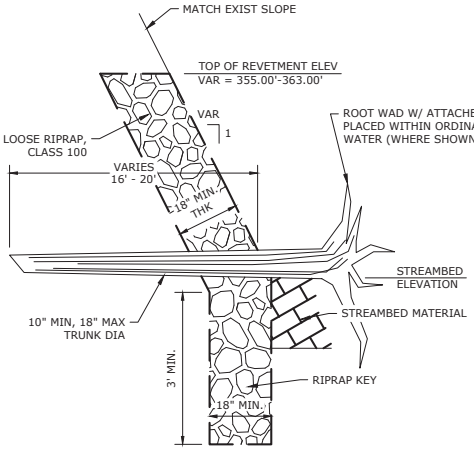
2. PROVIDE FISH ROCKS AT LOCATIONS APPROVED BY THE ENGINEER.

3. DIMENSION 'H' IS TYPICAL FISH ROCK HEIGHT. FISH ROCK TO BE EMBEDDED IN STREAMBED MATERIAL TO ⅓ OF 'H'.

FISH ROCK DETAIL

SCALE: NTS

3 BC01



SECTION

NOTE:

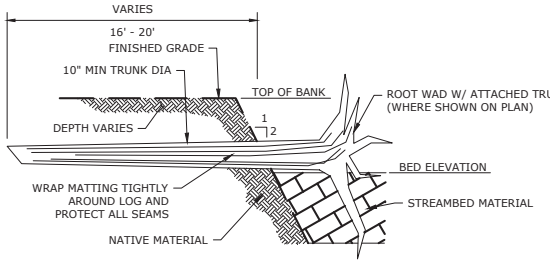
1. FINAL PLACEMENT FISH LOG TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

2. FISH LOG IS INCIDENTAL TO STREAM ENHANCEMENT.

VEGETATED RIPRAP WTH LARGE WOOD

SCALE: NTS

4 BC01



SECTION

NOTE:

1. FINAL PLACEMENT FISH LOG TO BE DETERMINED BY COUNTY REPRESENTATIVE IN THE FIELD.

2. FISH LOG IS INCIDENTAL TO STREAM ENHANCEMENT.

LARGE WOOD IN NATIVE BANK

SCALE: NTS

5 BC01

REGISTERED PROFESSIONAL ENGINEER
72710PE
OREGON
JUNE 8, 2010
NICHOLAS J. McMURTREY
RENEWS 12-31-24

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT DETAILS - 3

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

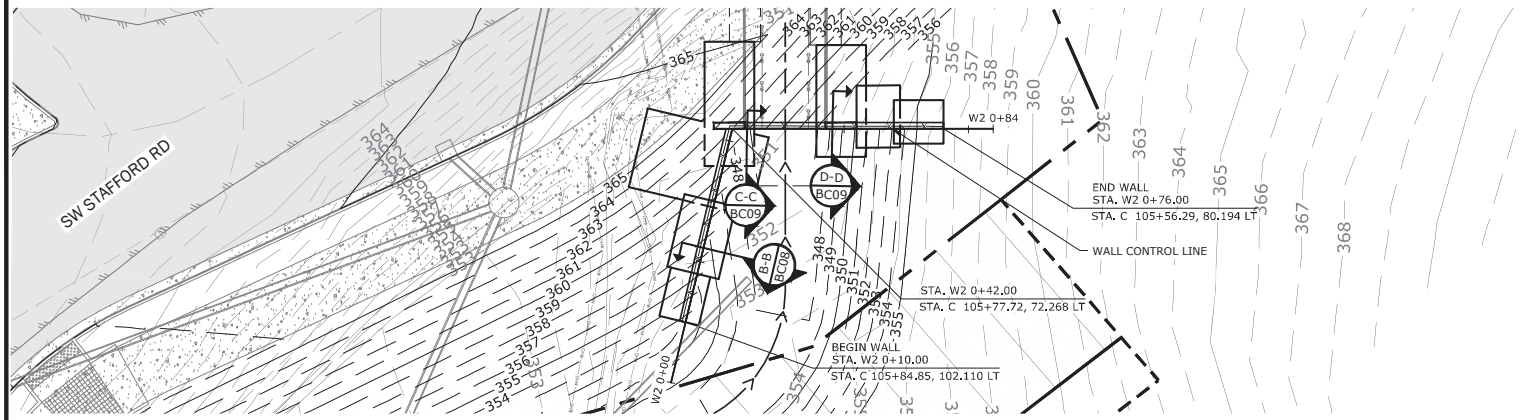
DESIGNED BY: RP-W/AJR
DRAFTED BY: JSD
CHECKED BY: NJM

REVISIONS

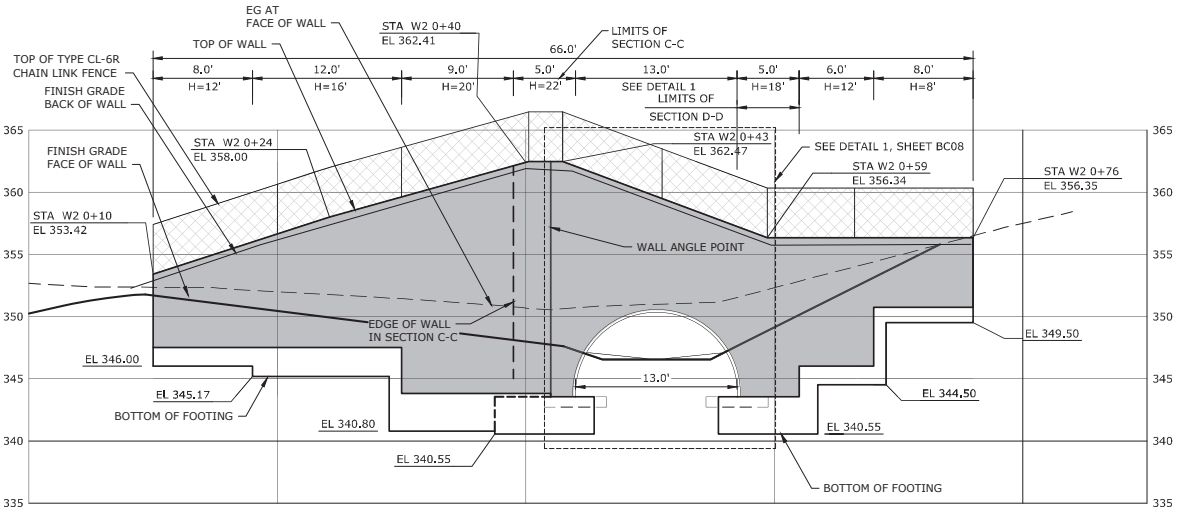
NO.	DATE:

Sheet No.
BC05

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-BC.dwg BC05 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



PLAN
SCALE: 1"=20'



PROFILE
SCALE: 1"=10' HORIZ, 1"=10' VERT

20 10 0 20 40
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT HEADWALL PLAN & PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

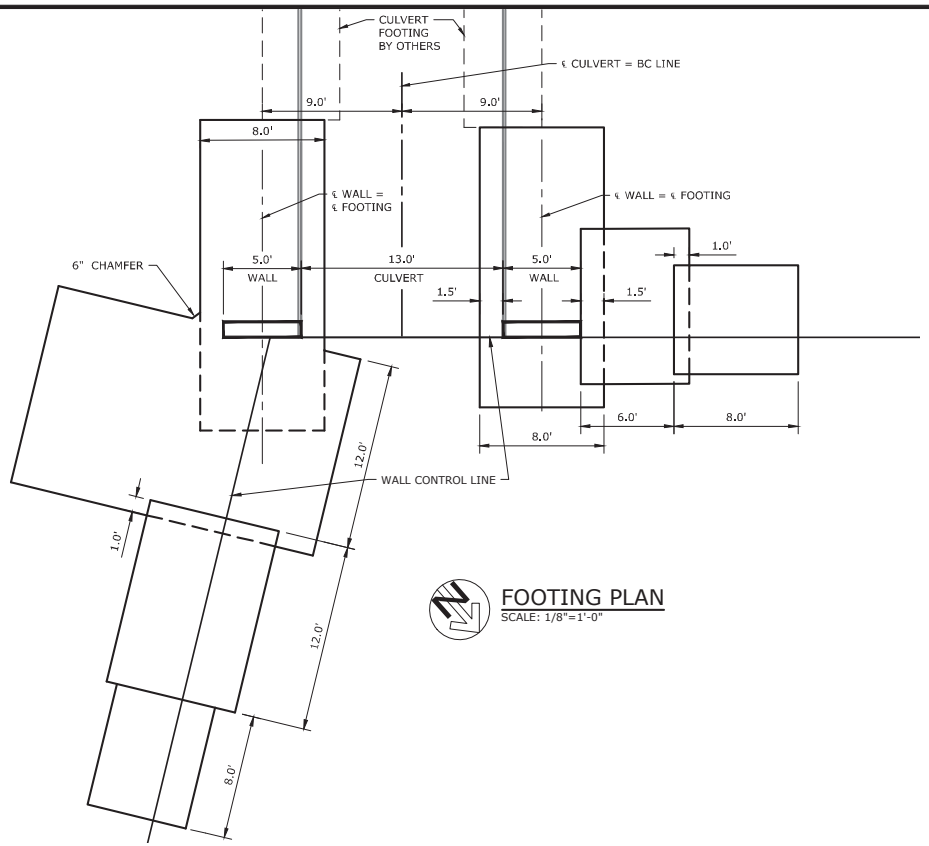
DESIGNED BY: RP-W/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

REVISIONS
NO. | DATE:

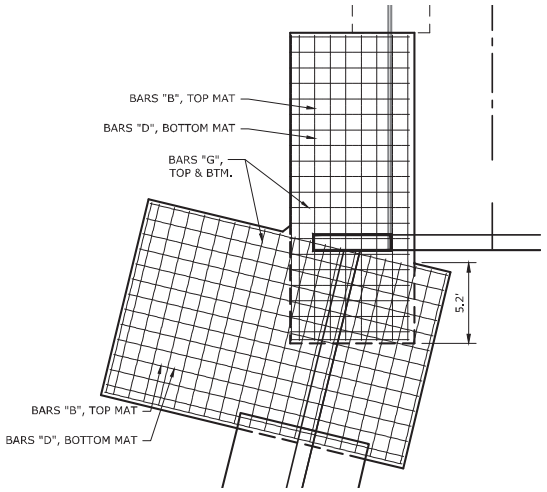
Sheet No.
BC06

112 of 157

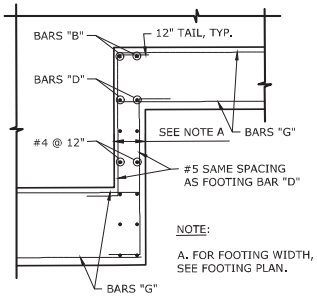
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC06 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



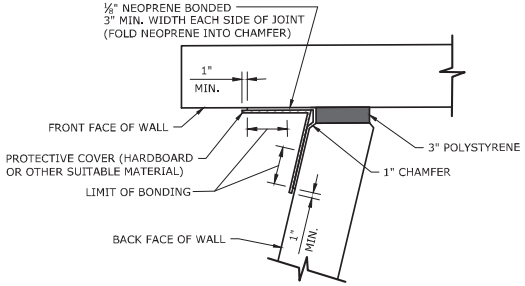
FOOTING PLAN
SCALE: 1/8"=1'-0"



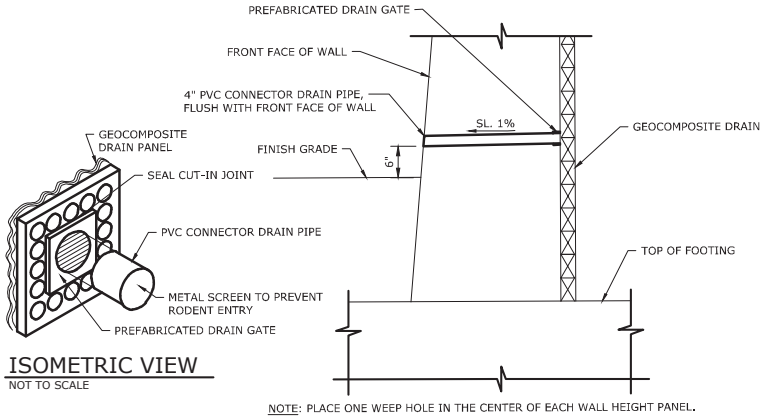
FOOTING REINFORCEMENT PLAN
SCALE: 1/8"=1'-0"



FOOTING STEP DETAIL
SCALE: 1/8"=1'-0"



STRIP WATERSTOP CORNER DETAIL
NOT TO SCALE



ISOMETRIC VIEW
NOT TO SCALE

WEEP HOLE DETAIL
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT HEADWALL DETAILS
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD
DATE: OCT 2023 | PROJECT NO.: 20350

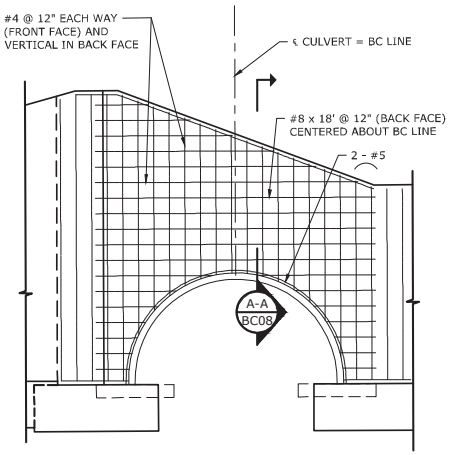
CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RP-W/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

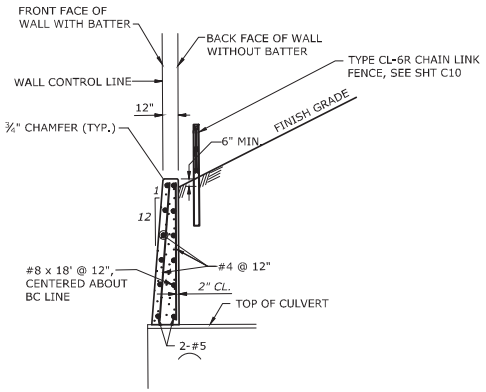
REVISIONS
NO. | DATE:

Sheet No. BC07
113 of 157

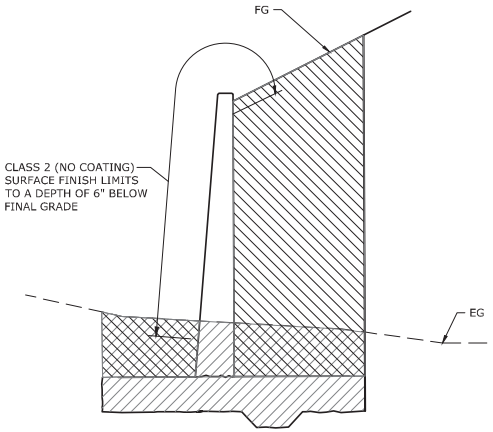
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC07 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



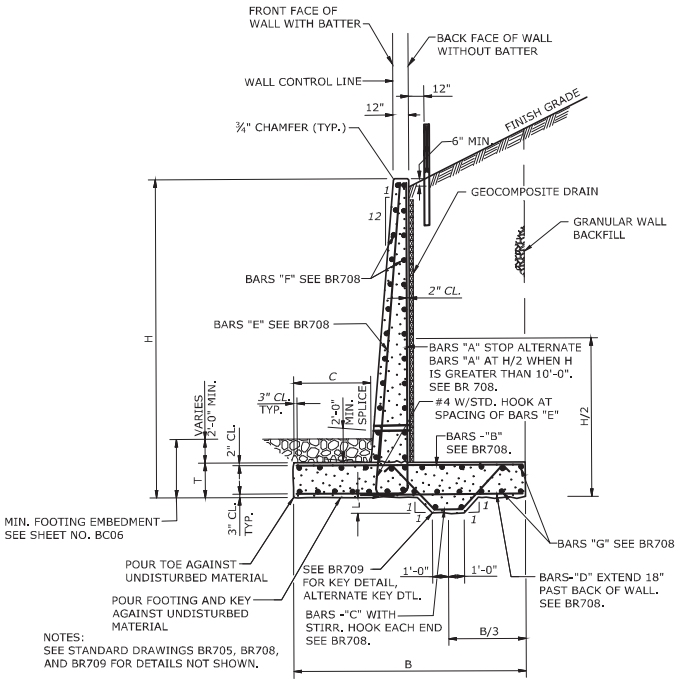
DETAIL 1
SCALE: 1/8"=1'-0"



SECTION A-A
SCALE: 1/8"=1'-0"
A
BC08



EXCAVATION AND BACKFILL DIAGRAM
No Scale



TYPICAL SECTION
SCALE: 1/8"=1'-0"
B-B
BC08

8 4 0 8 16
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT HEADWALL DETAILS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

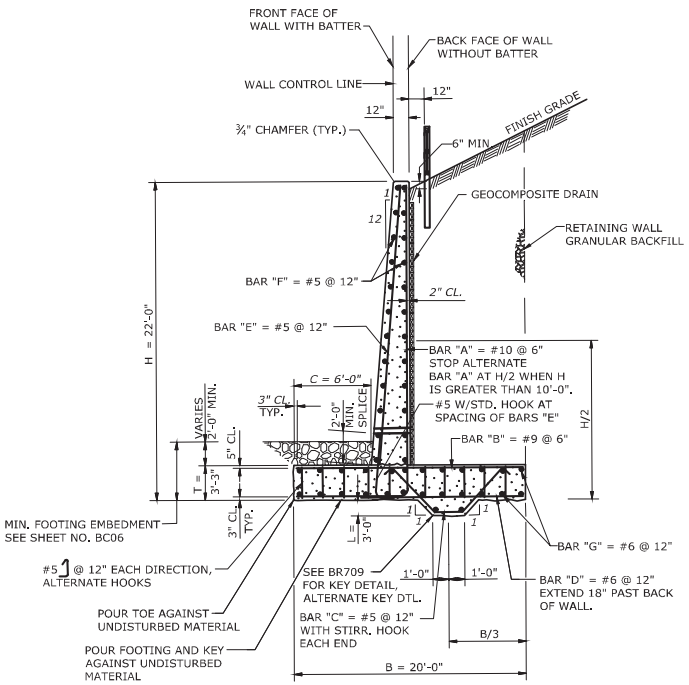
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RP/W/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

REVISIONS
NO. | DATE:

Sheet No.
BC08
114 of 157

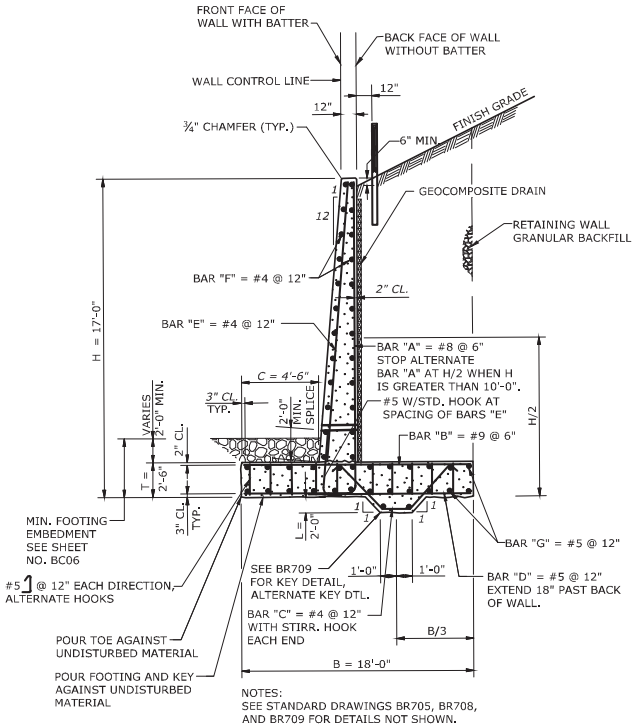
G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC08 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



SECTION C-C

SCALE: 1/8"=1'-0"

C-C BC09



SECTION D-D

SCALE: 1/8"=1'-0"

D-D BC09

8 4 0 8 16

SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

CULVERT HEADWALL DETAILS

STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: RP-W/AJR
DRAFTED BY: SHC
CHECKED BY: NJM

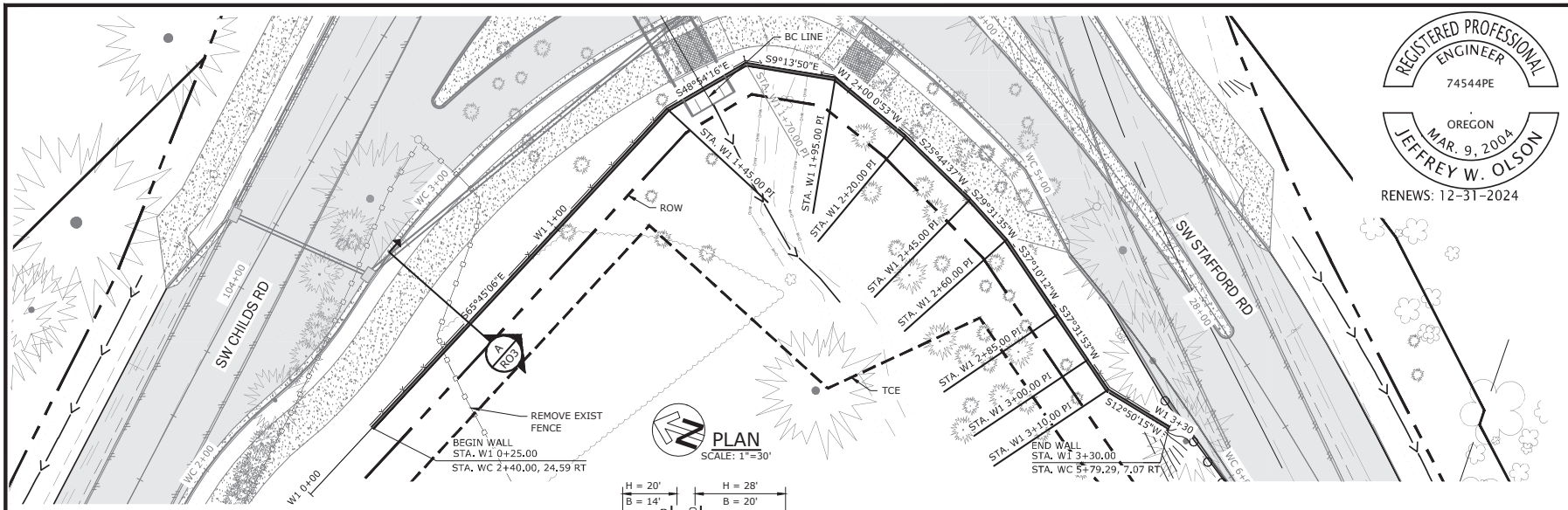
REVISIONS

NO.	DATE:

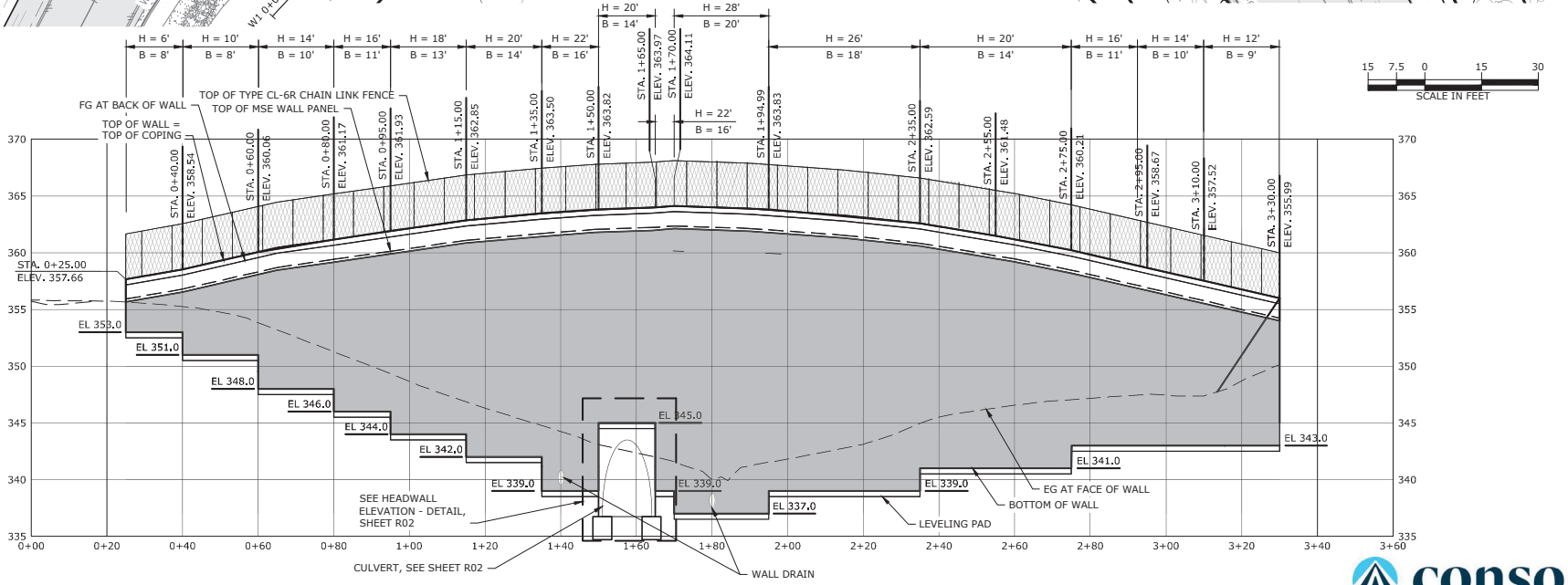
Sheet No. BC09

115 of 157

G:\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R-2.dwg BC09 9/24/2023 9:30 PM RILEY.WIGGINS 23.0s (LMS Tech)



PLAN
SCALE: 1"=30'



PROFILE
SCALE: 1"=30' HORIZ, 1"=10' VERT

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

RET WALL "W1" PLAN AND PROFILE

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: SC
DRAFTED BY: JSD
CHECKED BY: JWO

REVISIONS

NO.	DATE:

Sheet No.
R01

116 of 157

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R.dwg R01 9/24/2023 9:31 PM RILEY.WIGGINS 23.0s (LMS Tech)

GENERAL NOTES:

DESIGN IN CONFORMANCE WITH THE REQUIREMENTS OF THE 2017 AASHTO LRFD BRIDGE DESIGN SPECIFICATION - EIGHTH EDITION (INCLUDING 2016 INTERIM REVISIONS) AND THE ODOT GEOTECHNICAL DESIGN MANUAL (GDM).

SEISMIC DESIGN IS FOR 1000-YEAR RETURN PERIOD (LIFE SAFETY) CRITERIA.

PROVIDE A MINIMUM SERVICE LIFE OF 75 YEARS FOR ALL COMPONENTS.

EXTERNAL STABILITY HAS BEEN ANALYZED. REFER TO LENGTH OF REINFORCEMENT, B, ON DWG. R01 THAT PROVIDES MSE RETAINING WALL REINFORCEMENT LENGTHS WITH ACCEPTABLE SAFETY FACTORS FOR SLIDING AND BEARING CAPACITY. REINFORCEMENT LENGTH MAY BE INCREASED IF REQUIRED FOR INTERNAL STABILITY OF THE WALL SYSTEM.

PROVIDE CLASS 4000 -¾" CONCRETE FOR THE PRECAST WALL PANELS, HEADWALL, AND THE COPING.

PROVIDE MINIMUM CONCRETE COVER OF 2" FOR REINFORCING BARS, UNLESS NOTED OTHERWISE.

PROVIDE REINFORCING STEEL COMPLYING WITH ASTM A615 OR A706, GRADE 60. COLD-BEND ALL BARS. SPLICE REINFORCING AT ALTERNATE BARS, STAGGERED AT LEAST ONE SPLICE LENGTH.

CONSTRUCT MSE WALL FACING VERTICAL (ZERO BATTER).

PROVIDE CLASS 2 (NO COATING) SURFACE FINISH TO OUTER FACE OF PRECAST WALL PANELS.

ASSUME THE FOLLOWING SOIL PARAMETERS:

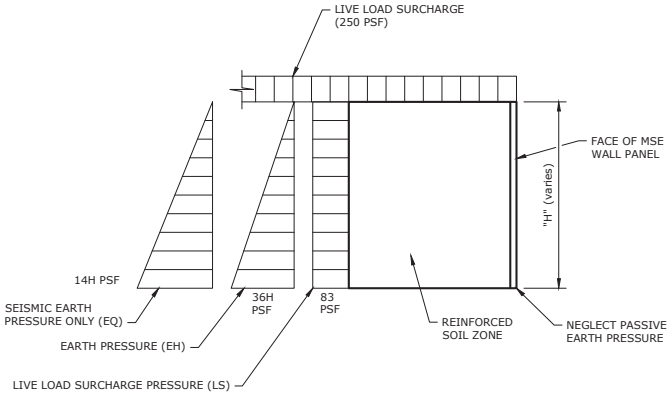
	DENSITY (PCF)	FRICTION ANGLE (DEGREES)	COHESION (PSF)
MSE GRANULAR BACKFILL	130	34	0
FOUNDATION SOIL - MSE RETAINING WALL	120	28	100
RETAINED SOIL	110	30	0

ASSUME THE FOLLOWING LOAD FACTORS:

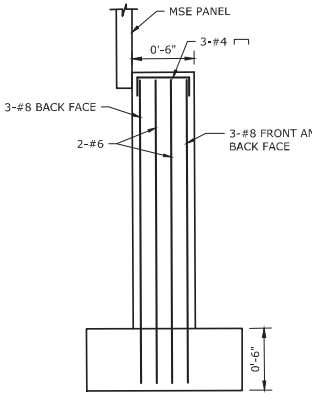
	STRENGTH I-A	STRENGTH I-B	EXTREME EVENT I
HORIZONTAL ACTIVE EARTH PRESSURE, EH	1.5	0.90	1.0
VERTICAL EARTH PRESSURE, EV	1.0	1.35	1.0
LIVE LOAD (TRAFFIC) SURCHARGE, LS	1.75	1.75	1.0

ASSUME THE FOLLOWING RESISTANCE FACTORS:

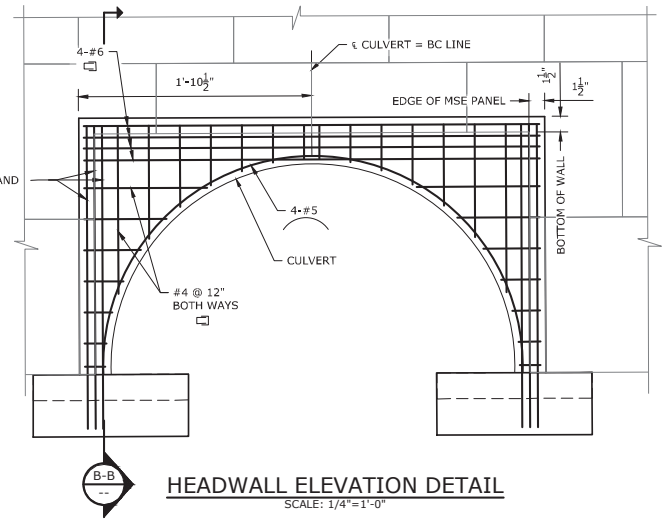
	STRENGTH I-A	STRENGTH I-B	EXTREME EVENT I
SLIDING RESISTANCE	1.0	1.0	1.0
BEARING RESISTANCE	0.65	0.65	0.9



WALL LOADING CONDITIONS
NOT TO SCALE



SECTION B-B
SCALE: 1/4"=1'-0"
A R02



HEADWALL ELEVATION DETAIL
SCALE: 1/4"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

15 7.5 0 15 30
SCALE IN FEET

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

RETAINING WALL SECTIONS
STAFFORD ROAD: PATTULO WAY TO ROSEMONT ROAD
DATE: OCT 2023 | PROJECT NO.: 20350

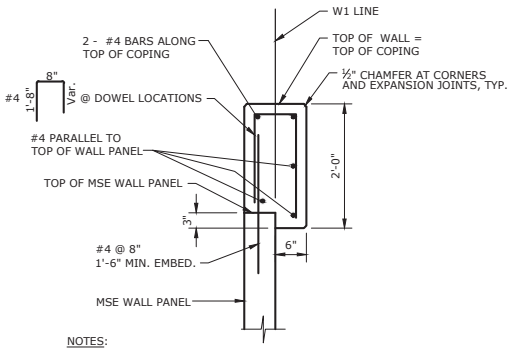
CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: SC
DRAFTED BY: JSD
CHECKED BY: JWO

REVISIONS
NO. | DATE:

Sheet No. R02
117 of 157

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R.dwg R02 9/24/2023 9:31 PM RILEY.WIGGINS 23.0s (LMS Tech)

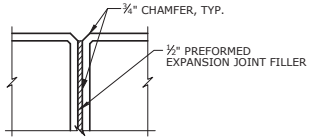


NOTES:

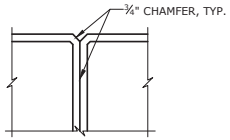
1. PROVIDE COPING CONTRACTION JOINTS AT 15'-0" MAXIMUM SPACING AND COPING EXPANSION JOINTS AT 45'-0" MAXIMUM SPACING. STOP HORIZONTAL BARS 2" CLEAR OF EXPANSION JOINTS. PROVIDE EXTRA BENT BARS ON EACH SIDE OF JOINTS. ALIGN COPING JOINTS WITH VERTICAL WALL JOINTS.

2. PROVIDE CLASS 2 (NO COATING) SURFACE FINISH TO COPING TO A DEPTH OF 6" BELOW FINAL GRADE.

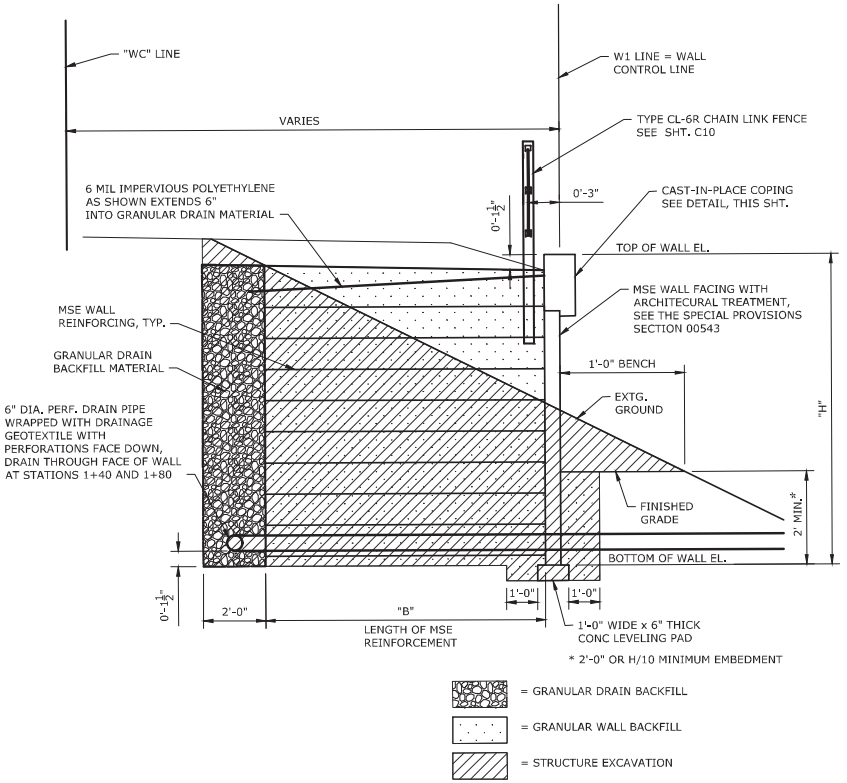
COPING DETAIL
SCALE: 1/2" = 1'-0"



COPING EXPANSION JOINT DETAIL
NOT TO SCALE



COPING CONTRACTION JOINT DETAIL
NOT TO SCALE



TYPICAL SECTION
SCALE: 1/4"=1'-0"

A
R01

15 7.5 0 15 30
SCALE IN FEET

REGISTERED PROFESSIONAL ENGINEER
74544PE
OREGON
MAR. 9, 2004
JEFFREY W. OLSON
RENEWS: 12-31-2024

consor
1 SW COLUMBIA STREET, SUITE 1700
PORTLAND, OREGON 97204
P 503.225.9010

RETAINING WALL SECTIONS

STAFFORD ROAD:
PATTULO WAY TO ROSEMONT ROAD

DATE: OCT 2023 | PROJECT NO.: 20350

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

JONATHAN HANGARTNER PROJECT MANAGER

DESIGNED BY: SC
DRAFTED BY: JSD
CHECKED BY: JWO

REVISIONS

NO.	DATE:

Sheet No.
R03

\\ad.msa-ep.com\Portland\PDX_Projects\20\2965 - Clackamas County Stafford Road Imp\CAD\Sheets\20-2965-OR-R.dwg R03 9/24/2023 9:31 PM RILEY.WIGGINS 23.0s (LMS Tech)

APPNDIX F: TRAFFIC DATA

Appendix F

Traffic Data

CONTENTS

Intersection Control Evaluation Report – Final SW Stafford Road at SW Childs Road & Johnson Road, Clackamas County, Oregon, Kittelson & Associates, dated May 2021.

INTERSECTION CONTROL EVALUTION REPORT

SW Stafford Road at SW Childs Road & Johnson Road

Clackamas County, Oregon

Prepared for:
Clackamas County

Prepared by:
KITTELSON & ASSOCIATES, INC.
851 SW 6th Avenue, Suite 600
Portland, OR 97204
(503) 535-7440

Project Manager:
Fred Wismer, P.E.

Project Principal:
Hermanus Steyn, P.E.

Project Team
Dimitryan Shadrin, E.I.
Caleb Cox, E.I.

County Project No. 22297

Kittelson Project No. 25094.000

May 2021

KITTELSON & ASSOCIATES

TABLE OF CONTENTS

INTRODUCTION

In 2017, Kittelson & Associates (Kittelson), in partnership with Clackamas County, completed a road safety audit (RSA) for the Stafford Road corridor between the Wilsonville city limits on the south end to the Lake Oswego city limits at the north end. The RSA identified several potential improvements along the corridor including the improvements at the existing side-street stop-controlled intersections of SW Stafford Rd/SW Childs Rd and SW Stafford Rd/Johnson Rd to enhance safety, bicycle connectivity, and traffic operations.

Kittelson worked collaboratively with Murraysmith and Clackamas County, and evaluated the recommendations from the 2017 RSA and developed a range of intersection alternatives. At SW Stafford Rd/SW Childs Rd intersection the alternatives included: (1) a traffic signal, (2) a single-lane roundabout, and (3) a multilane roundabout. At SW Stafford Rd/Johnson Rd intersection the alternatives included: (1) a modified right-in/right-out/left-in side-street stop-control and (2) a traffic signal.

The purpose of an intersection control evaluation is to consider multiple context-sensitive control strategies when planning a new or modified intersection. This evaluation consists of the following elements:

- Existing transportation facilities summary;
- Operational analysis of a "no-build" and two "build" alternatives under weekday existing (2021) and future 2040 peak hours for each study intersection;
- An analysis of safety performance;
- Conceptual designs for the alternatives;
- Construction cost estimates that incorporate environmental, utility, and right-of-way impacts; and
- A life-cycle cost analysis for each intersection alternative.

EXISTING CONDITIONS

The existing conditions analysis identifies current field conditions, traffic volumes, and crash trends of the study intersections.

Site Conditions and Adjacent Land Uses

SW Stafford Rd is a 2-lane roadway that connects Lake Oswego to Wilsonville and Tualatin and provides a critical connection to Interstate 205 (I-205).

The intersection of SW Stafford Rd and SW Childs Rd (Figure 1) operates as a side-street stop-controlled 3-leg intersection located in Clackamas County south of Lake Oswego. Figure 1 below shows the project location and current lane configuration of the intersection. The southbound approach has a yield-controlled right turn slip-lane, the eastbound and northbound approaches both have a single lane.

The intersection is in a rural area south of Lake Oswego. Metro owns the property to the southwest of the intersection and the intersection is adjacent to privately owned property to the southeast and north. There is a creek running north to south that crosses underneath SW Childs Rd through a culvert.

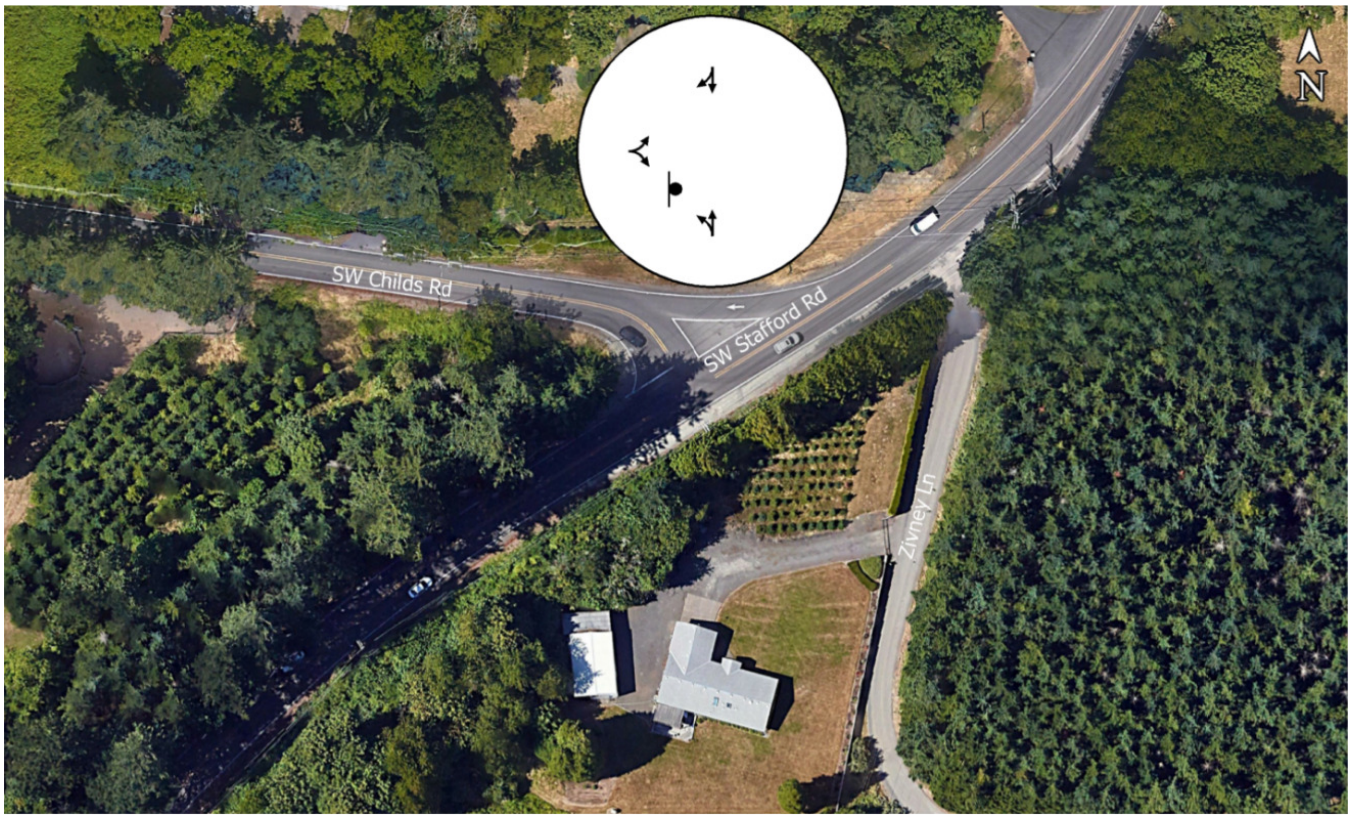


Figure 1: Project Location: Stafford Rd/Childs Rd Intersection (Image source: Google Earth)

The intersection of SW Stafford Rd and Johnson Rd (Figure 2) also operates as a side-street stop-controlled 3-leg intersection. It is located approximately 1,500 feet south of the SW Childs Rd intersection. Figure 2 below shows the current lane configuration of the intersection. Johnson Rd approaches the intersection on a steep downgrade and is connected to SW Stafford Rd at an undesirable skewed angle. Each approach has a single lane to accommodate all movements.

The adjacent property to the west of the intersection is owned by Metro and has a steep grade dropping down into a creek that flows parallel to SW Stafford Rd. The intersection is also bordered by private property to the east and south.

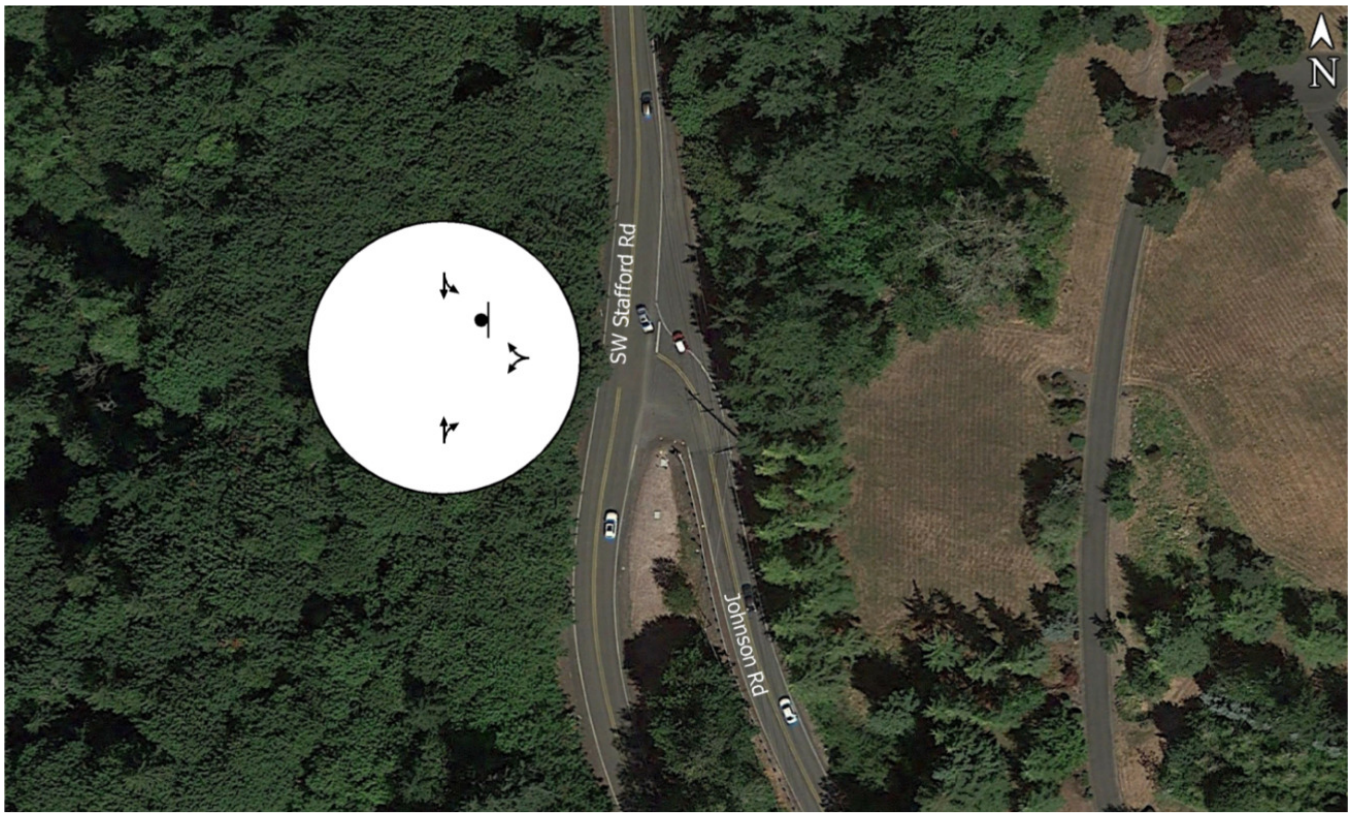


Figure 2: Project Location: Stafford Rd/Johnson Rd Intersection (Image source: Google Earth)

Transportation Facilities

Table 1 summarizes the Clackamas County functional classification and the existing road characteristics of SW Stafford Rd, SW Childs Rd, and Johnson Rd[1]. As shown in the table there are no sidewalks, bicycle lanes, or on-street parking present on these roadways today.

Table 1: Existing Transportation Roadway Facilities and Roadway Designation

Roadway	Classification[1]	Number of Lanes	Posted Speed	Sidewalks	Bicycle Lanes	On-Street Parking
SW Stafford Road	Major Arterial	2	40 mph	No	No	No
SW Childs Road	Minor Arterial	2	35 mph	No	No	No
Johnson Road	Collector	2	40 mph	No	No	No

[1] Classifications are based on Clackamas County's Urban Road Functional Classification[1]

Transit Facilities

There are no public transit services that operate along SW Stafford rd.

Traffic Data

24-hour tube counts were collected on SW Stafford Rd between SW Childs Rd and Johnson Rd from December 12, 2020 to December 18, 2020. Additionally, weekday AM and PM peak hour turning movement counts were collected on SW Stafford Rd at the intersections of SW Childs Rd and Johnson Rd on Thursday December 17, 2020. The 2020 traffic data is included in Appendix A.

The 2020 traffic counts were compared to 2017 historic traffic data (turning movements and tube counts) provided by the City of Lake Oswego and Clackamas County and were found to show an approximate 30% reduction in traffic, most likely due to the COVID-19 pandemic. While this reduction in traffic may persist for a few years as the pandemic subsides, it is not likely to be permanent. In collaboration with County staff, this study will use the 2017 historic traffic data as the "Existing Year 2021" volumes. This approach is consistent with Oregon Department of Transportation (ODOT) guidance detailed in *Appendix 3E of the Analysis Procedures Manual* (1) and has been confirmed with Clackamas County Traffic Engineering staff. The historic traffic data is included in Appendix B.

The existing daily traffic profile for SW Stafford Rd is shown in Figure 4. There are peaks in traffic flow during the weekday AM and PM peak hour, with the southbound direction slightly higher for both AM and PM peak hours. The weekday average daily traffic (ADT) for Stafford Rd is approximately 13,700 vehicles per day.

Existing year 2021 intersection turning movement volumes are discussed in greater detail in the "*Existing and Future Intersection Volumes*" section below.

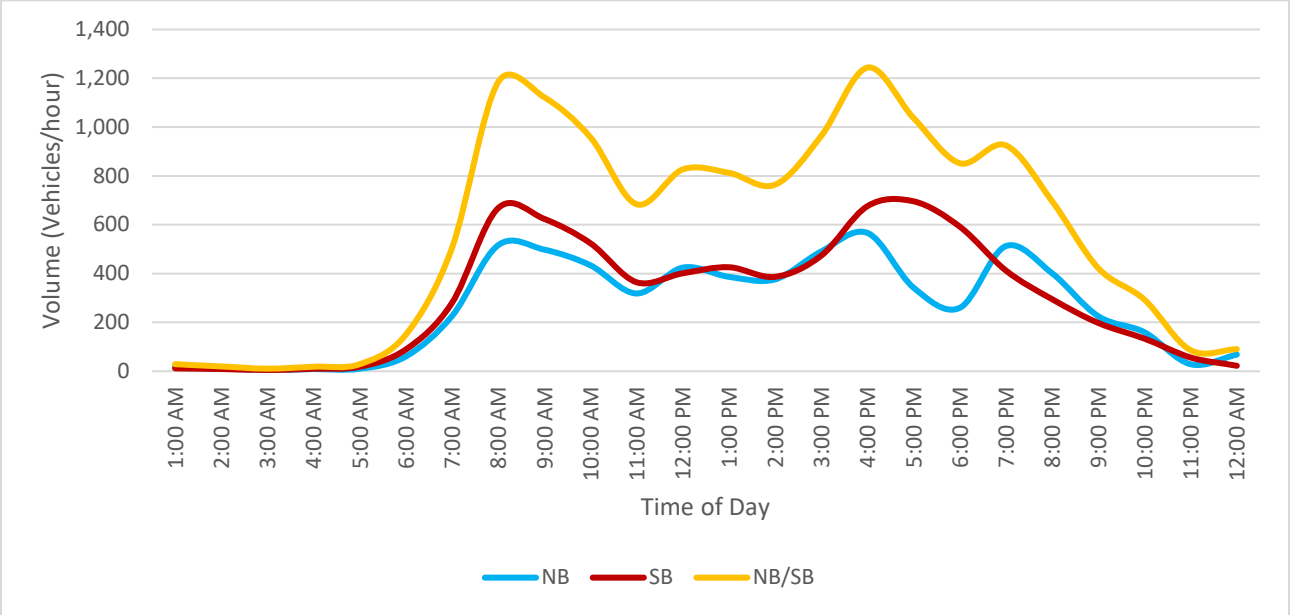


Figure 3: Existing Year 2021 Stafford Road Daily Traffic Profile

Heavy Vehicle Data

The 2017 tube counts from the City of Lake Oswego do not include vehicle classifications; however, the 2020 tube counts indicate that the heavy vehicle percentage on SW Stafford Rd is approximately 0.7% of the daily traffic volume. The 2020 traffic data is included in Appendix A.

Speed Data

Table 2 provides a summary of the speed characteristics observed from the 24-hour tube counts along SW Stafford Rd. The speed data was obtained from the 2020 traffic counts because the 2017 traffic counts did not include speed data.

Table 2. Stafford Rd Speed Data Summary

	Speed limit (mph)	85th percentile (mph)
SW Stafford Rd Southbound[1]	40	43
SW Stafford Rd Northbound[1]	40	42

[1]From 2020 traffic counts collected on Stafford Rd between SW Childs Rd and Johnson Rd.

Appendix A includes the detailed speed data sheets from the 2020 traffic counts.

Crash Data

The Oregon Department of Transportation (ODOT) provided crash records for the intersections of SW Stafford Rd with SW Childs Rd and Johnson Rd for the five-year period from January 1, 2014 through December 31, 2018. Table 3 and 4 summarize the crash data over the five-year reporting period for SW Stafford Rd/SW Childs Rd and SW Stafford Rd/Johnson Rd intersections, respectively. Appendix C contains the ODOT crash data for SW Stafford Rd and SW Childs Rd. Appendix D contains the ODOT crash data for SW Stafford Rd and Johnson Rd.

Table 3: Crash Summary (January 2014 – December 2018): Stafford Rd/Childs Rd Intersection

	Crash Type						Crash Severity		Total Crashes
	Angle	Fixed Object	Pedestrian	Backing	Rear-End	Turning Movements	Property Damage Only	Injury	
2014	0	0	0	0	0	3	0	3	3
2015	0	0	0	0	1	5	2	4	6
2016	0	0	0	0	2	1	2	1	3
2017	0	0	0	0	1	0	0	1	1
2018	0	0	0	0	0	2	1	1	2
TOTAL:	0	0	0	0	4	11	5	10	15

Table 3 shows 15 crashes were reported at the intersection of SW Stafford Rd and SW Childs Rd over the 5-year period from 2014 to 2018, for an average of 3 crashes annually. Ten of the crashes resulted in injuries, with a total of 14 people injured. The most frequent crash type was turning movement crashes, with 73% of the reported crashes falling into this category.

Table 4: Crash Summary (January 2014 – December 2018): Stafford Rd/Johnson Rd Intersection

	Crash Type						Crash Severity		Total Crashes
	Angle	Fixed Object	Pedestrian	Backing	Rear-End	Turning Movements	Property Damage Only	Injury	
2014	0	0	0	0	1	1	1	1	2
2015	0	0	0	1	0	1	2	0	2
2016	0	0	0	0	3	1	1	3	4
2017	0	0	0	0	1	2	1	2	3
2018	0	0	0	0	6	3	3	6	9
TOTAL:	0	0	0	1	11	8	8	12	20

Table 4 shows 20 crashes were reported at the intersection of SW Stafford Rd and Johnson Rd over the 5-year period from 2014 to 2017, for an average of 4 crashes annually. 12 of the crashes resulted in injuries,

with a total of 14 people injured. The most frequent crash type was rear-end crashes, with 55% of the reported crashes falling into this category.

Existing and Future Intersection Volumes

Under existing conditions, the weekday AM and PM peak hour for the intersection of SW Stafford Rd and SW Childs Rd is 7:15 AM to 8:15 AM and 4:15 PM to 5:15 PM, respectively. The weekday AM and PM peak hour for the intersection of SW Stafford Rd and Johnson Rd is 7:15 AM to 8:15 AM and 4:30 PM to 5:30 PM, respectively. Figure 4 and Figure 5 below illustrate the existing weekday peak hour traffic volumes for each study intersection.

Kittelson estimated future 2040 traffic volumes for these intersections by applying a 1.7% growth rate derived from the regional travel demand model provided by Metro. The model provided base year 2015 and future year 2040 link volumes within the study area. There are no additional in-process trips associated with these intersections. The Future Year 2040 peak hour volumes are shown below in Figures 4 and 5 below.

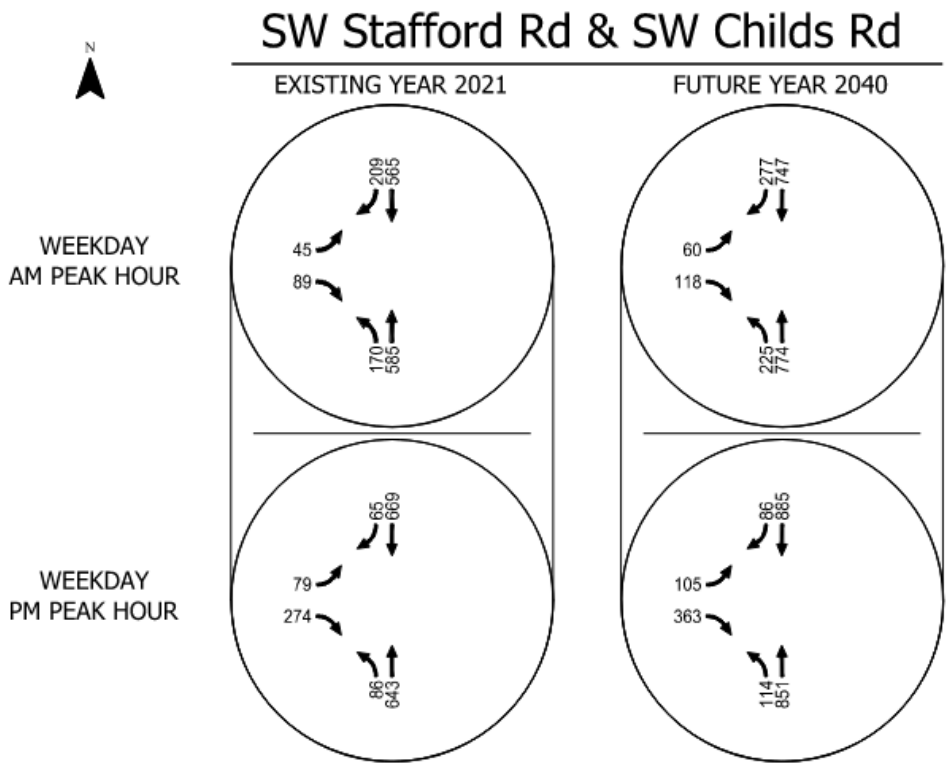


Figure 4: SW Stafford Rd & SW Childs Rd Weekday Existing and Future Year 2040 Peak Hour Traffic Volumes.

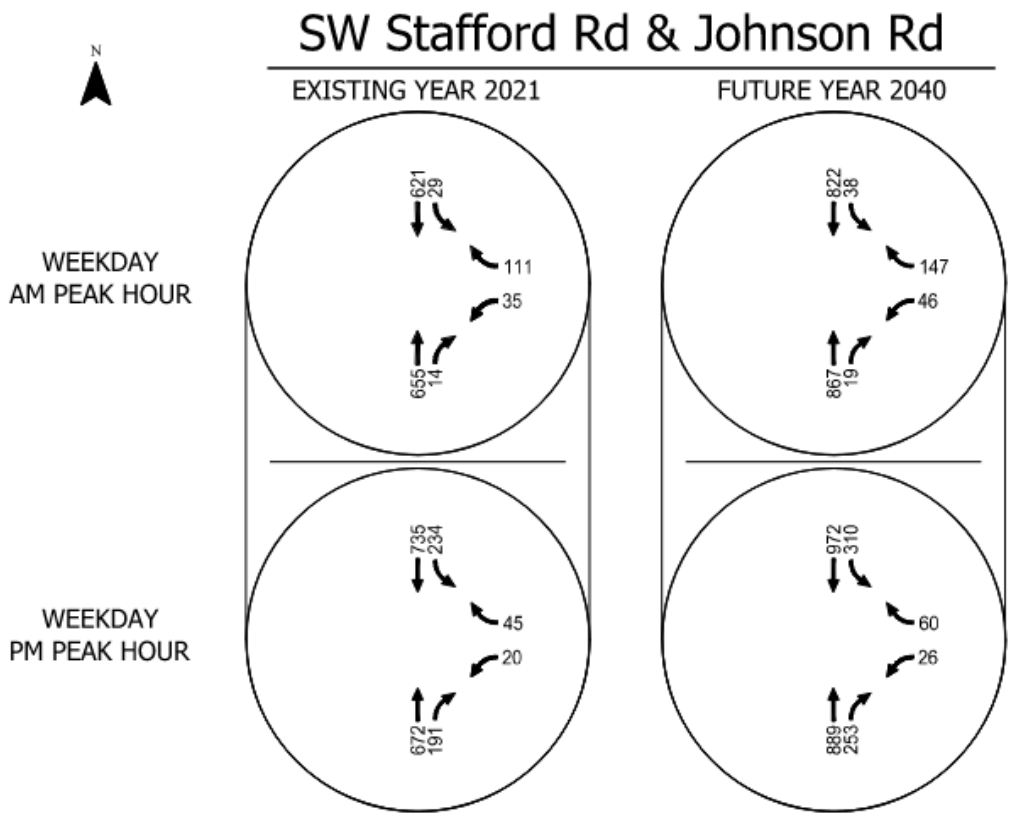


Figure 5: SW Stafford Rd & Johnson Rd Weekday Existing and Future Year 2040 Peak Hour Traffic Volumes.

DESCRIPTION OF ALTERNATIVES

There were three alternatives evaluated at SW Stafford Rd/SW Childs Rd intersection to replace the existing side-street stop-controlled intersection. The alternatives are: (1) a traffic signal, (2) a single-lane roundabout with right-turns, and (3) a multilane roundabout. Additionally, three alternatives were evaluated at the SW Stafford Rd/Johnson Rd intersection to replace the existing side-street stop-controlled intersection. The alternatives are: (1) an expanded side-street stop-control, (2) a restricted right-in/right-out/left-in side-street stop-control, and (3) a traffic signal. Each alternative is discussed in further detail below.

SW Stafford Road & SW Childs Road

Alternative 1: Traffic Signal

This concept includes adding: a northbound left-turn lane on SW Stafford Rd, a southbound right-turn lane on SW Stafford Rd, and an eastbound left-turn lane on SW Childs Rd. The proposed lane configurations of the traffic signal are shown in Figure 6 below, and the concept design is shown in Figure 7. The concept reflects key design features, including:

- Left- and right-turn lanes designed to accommodate both weekday 2040 AM and 2040 PM peak hour projected queue lengths.

- 12-foot wide through lanes and 14-foot wide left- and right-turn lanes.
- 8-foot bicycle lanes on Stafford Rd and 6-foot bicycle lanes on Childs Rd.
- Curb radii and relevant striping to accommodate the WB-67 design vehicle on SW Stafford Rd and the WB-50 and Firetruck design vehicles on SW Childs Rd. Refer to Appendix E for turning templates.
- Americans with Disabilities Act (ADA) compliant curb ramps and signalized crosswalks on the north and east legs of the intersection.
- SW Childs Rd intersects with SW Stafford Rd at a 90-degree angle with a 75-foot tangent roadway on the approach.
- Additional treatments associated with a traffic signal in a rural setting such as advanced actuated flashers for vehicles stopped ahead, curbs to alert drivers of a change ahead, and street lighting.

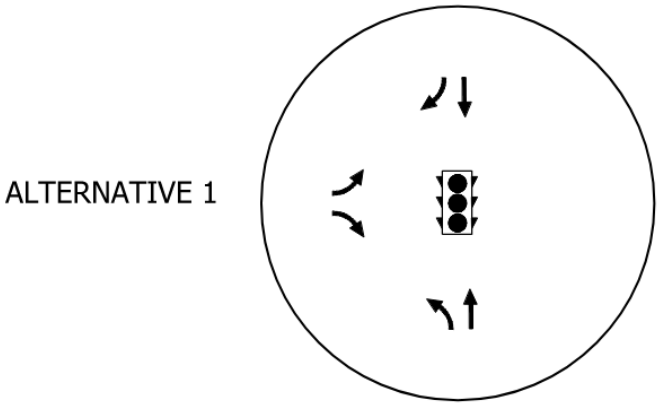
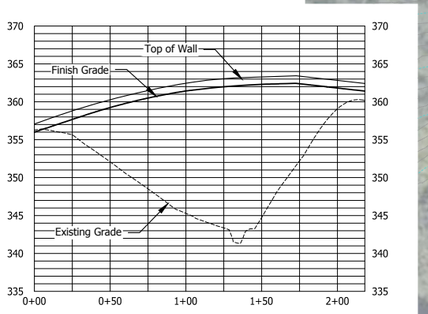


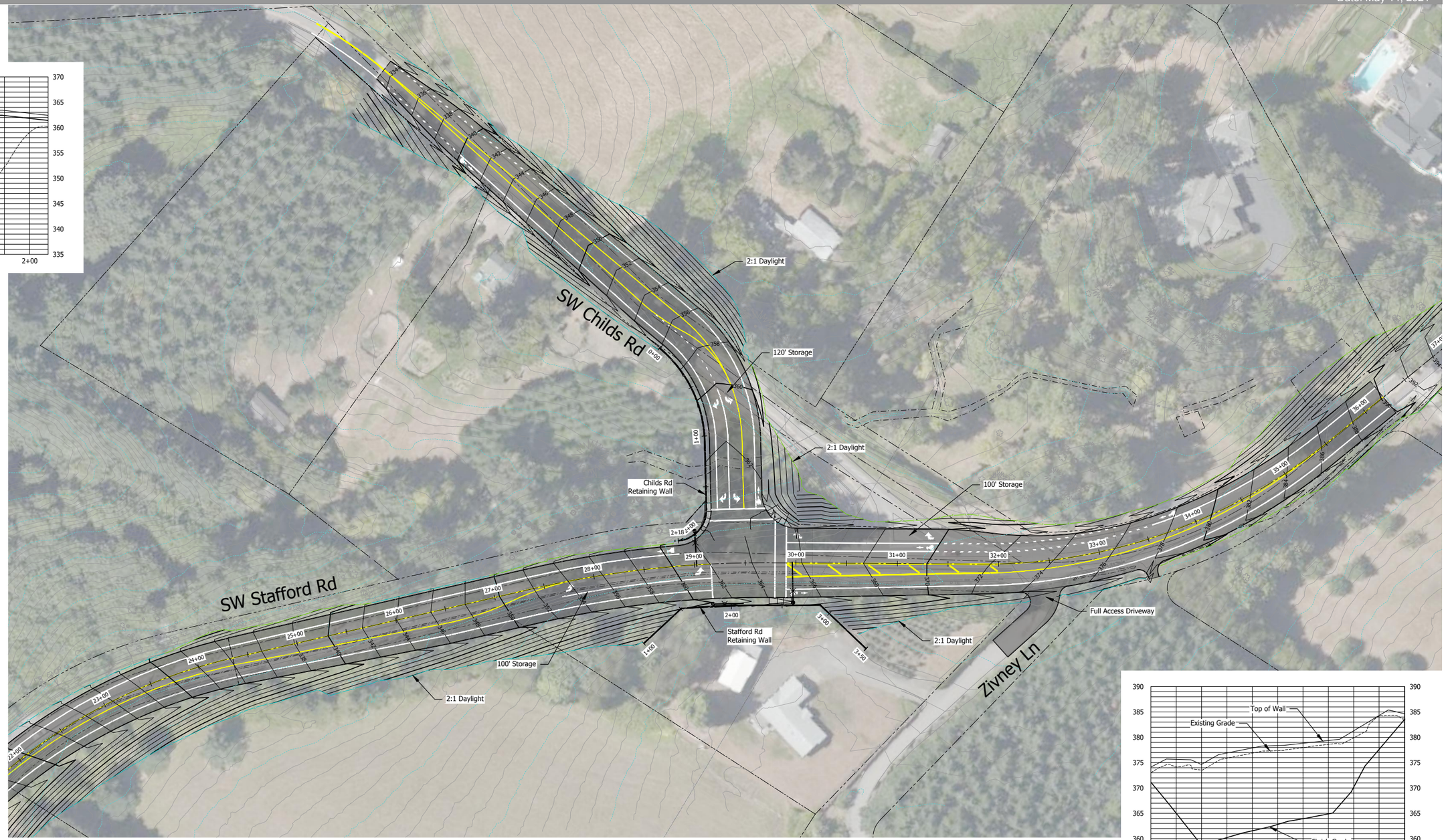
Figure 6: SW Stafford Road & SW Childs Road Alternative 1 – Traffic Signal Lane Configuration

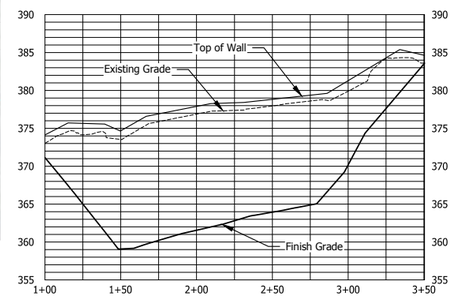
Figure 7: SW Childs Rd Alternative 1.1 - Traffic Signal

Preliminary Design Subject to Change
Date: May 14, 2021



Childs Rd Wall Profile
SCALE: 1"=50' (Horz.) & 1"=10' (Vert.)





Stafford Rd Wall Profile
SCALE: 1"=50' (Horz.) & 1"=10' (Vert.)

Scale: 1" = 50'
50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, PE

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25\25094 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-02 Concept Designs\EXHIBIT-Childs Rd Alt 1 Signal-25094.dwg May 14, 2021 - 3:06pm - ccox Layout Tab: 1.1

Alternative 2: Single-Lane Roundabout with Right-turns

In addition to single lane approaches on all 3 legs, this design would require a southbound right-turn lane (yield controlled) and an eastbound right-turn lane (yield controlled). The proposed lane configuration for the single lane roundabout with right-turns is shown in Figure 8 below. Two roundabout concepts with this configuration are under evaluation, one centered in the north quadrant of the existing intersection and the other centered in the southwest quadrant of the existing intersection (referred to as Alternative 2.1 and 2.2 respectively). Both concepts are shown in Figure 9 and Figure 10. The roundabout concepts reflect key design features, including:

- An inscribed Circle Diameter (ICD) of 140 feet with a mountable central truck apron to accommodate the WB-67 design vehicle on SW Stafford Rd and the WB-50 and Firetruck design vehicles on SW Childs Rd. Refer to Appendix F for turning templates.
- Approaches that are designed to limit roundabout entry and circulating speeds to no more than 25 mph.
- Approach travel lanes widen from 12 feet to 18 feet at the roundabout entry. The circulatory roadway with is 20 feet.
- 10-foot multi-use path on all three legs of the roundabout to accommodate bicycles and pedestrians.
- 8-foot bicycle lanes on SW Stafford Rd and 6-foot bicycle lanes on SW Childs Rd that will terminate approximately 50 feet in advance of the crosswalks. Bicycle ramps are included to provide the option for bicyclists to exit the roadway and navigate the roundabout using the multi-use path and crosswalks. Bicyclists who are comfortable riding in traffic may merge into the vehicle lane and circulate the roundabout as a vehicle would.

For more information about roundabouts, refer to *NCHRP Report 672 Roundabouts: An Informational Guide* (2).

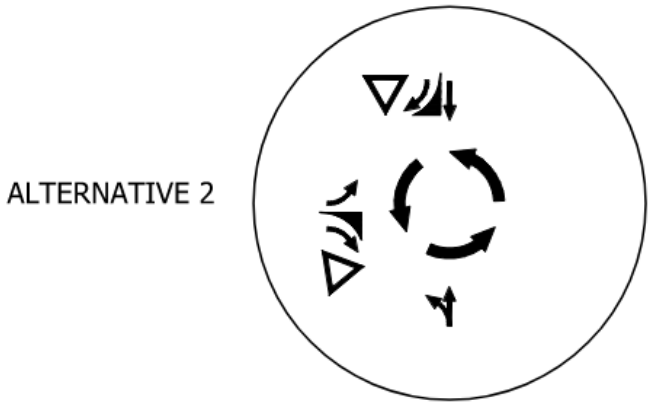
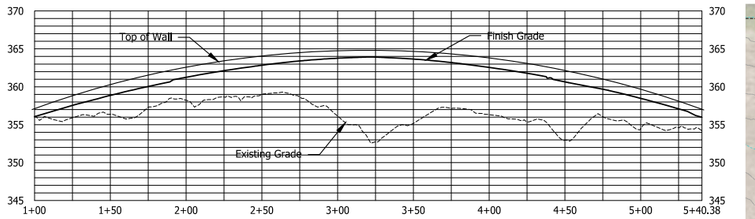


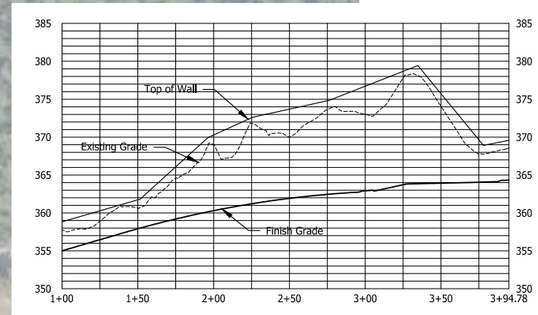
Figure 8: **SW Stafford Road & SW Childs Road Alternative 2 – Single Lane Roundabout Lane Configuration**

Figure 9: SW Childs Rd Alternative 2.1 - Roundabout

Preliminary Design Subject to Change
Date: May 14, 2021



Childs Rd Wall Profile
SCALE: 1"=50' (Horz.) & 1"=10' (Vert.)



Stafford Rd Wall Profile
SCALE: 1"=50' (Horz.) & 1"=10' (Vert.)

Scale: 1" = 50'
50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, PE

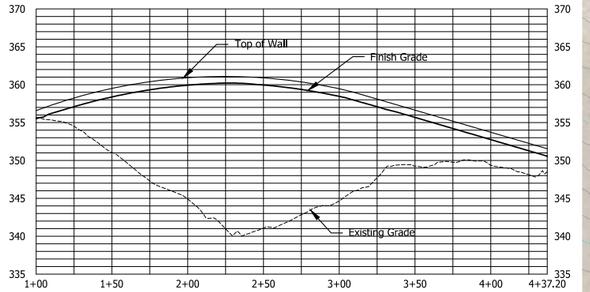
Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

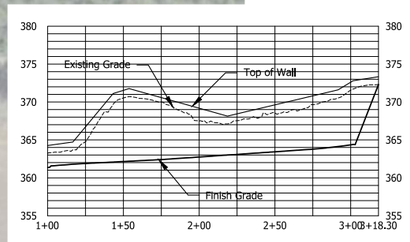
H:\25\25094 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-02 Concept Design\EXHIBIT-Childs Rd Alt 2 Single Lane RBT-25094.dwg May 14, 2021 - 3:48pm - ccox Layout Tab: 2.1

Figure 10: SW Childs Rd Alternative 2.2 - Roundabout

Preliminary Design Subject to Change
Date: May 14, 2021



Childs Rd Wall Profile
SCALE: 1"=50' (Horz.) & 1"=10' (Vert.)



Stafford Rd Wall Profile
SCALE: 1"=50' (Horz.) & 1"=10' (Vert.)

Scale: 1" = 50'
50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, PE

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25\25094 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-02 Concept Designs\EXHIBIT-Childs Rd Alt 2 Single Lane RB\T-25094.dwg May 14, 2021 - 3:32pm ccox Layout Tab: 2.2

Alternative 3: Multilane Roundabout

The third alternative is a multilane roundabout design assuming SW Stafford Rd is a 4-lane facility. A multilane roundabout would include two through lanes for the northbound and southbound movements on SW Stafford Rd. It would also include separated right and left turn lanes for the SW Childs Rd eastbound approach. The roundabout would have an inscribed circle diameter between 160 feet and 190 feet. The multilane roundabout could be completed in phases where an interim single-lane configuration is constructed initially but it is designed in a way that allows it to be converted to a multi-lane configuration in the future should future traffic growth justify the need. The proposed lane configurations for the multi-lane roundabout are also shown in Figure 11 below.

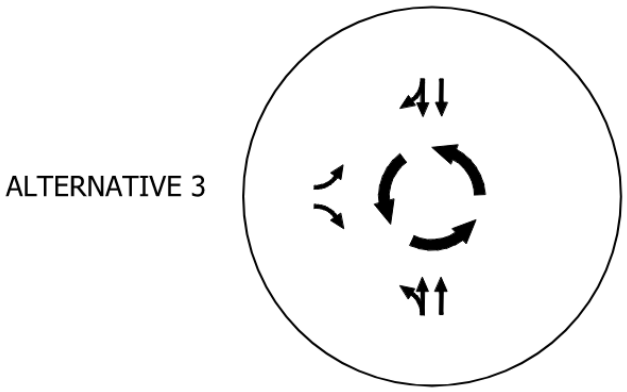


Figure 11. SW Stafford Road & SW Childs Road Alternative 3 – Multilane Roundabout Lane Configuration

An operational analysis was completed for the multilane roundabout and is included in the "Traffic Operational Analysis" section below. However, after discussions with stakeholders and the project team, further analysis and design of the multilane roundabout was halted. This was due to several factors, including the following:

- The traffic analysis shows that Alternative 2: Single-Lane Roundabout with Right-Turns will operate acceptably through the 2040 design year, which contradicts the need for a larger roundabout. In addition, none of the Clackamas County's Transportation System Plan or other planning documents indicate that SW Stafford Rd is envisioned to become a 5-lane facility.
- National research (NCHRP Report 672) indicates that multi-lane roundabouts have a lower reduction in crashes compared to single-lane roundabouts. It is more challenging to control and manage the entry speeds at multilane entries.
- The additional construction cost and right-of-way acquisition needs for a larger multilane roundabout cannot be justified for a design that is not necessary from traffic operations and safety perspectives.

SW Stafford Road & Johnson Road

Alternative 1: Expanded Side-street Stop-control.

The first alternative evaluated at the intersection of SW Stafford Rd and Johnson Rd is a modified side-street stop-controlled intersection with an added southbound left-turn lane. The proposed lane configurations are shown in Figure 12 below, and the concept design is shown in Figure 13. The concept reflects key design features including:

- 90 degree intersection angle to improve intersection sight distance for vehicles approach the intersection of SW Johnson Rd.
- Widen SW Stafford Rd to implement a southbound left-turn lane with 100 feet of storage length
- 8-foot bicycle lanes on SW Stafford Rd and 6-foot bicycle lanes on SW Johnson Rd that taper back to the existing edge of pavement at the construction limits.
- Curb return radii and relevant striping to accommodate the WB-67 design vehicle on SW Stafford Rd and the WB-50 and Firetruck design vehicles on SW Johnson Rd. Refer to Appendix G for the turning templates.

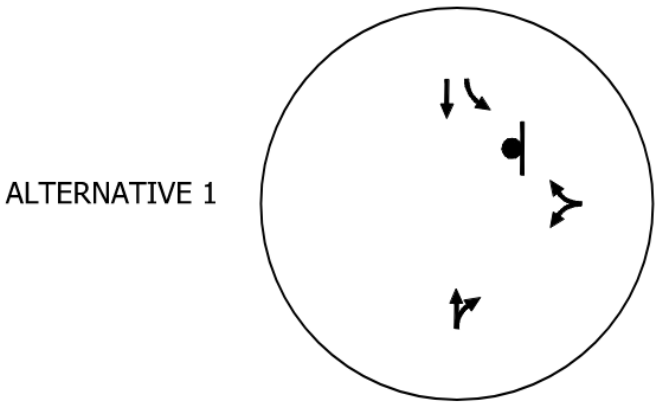
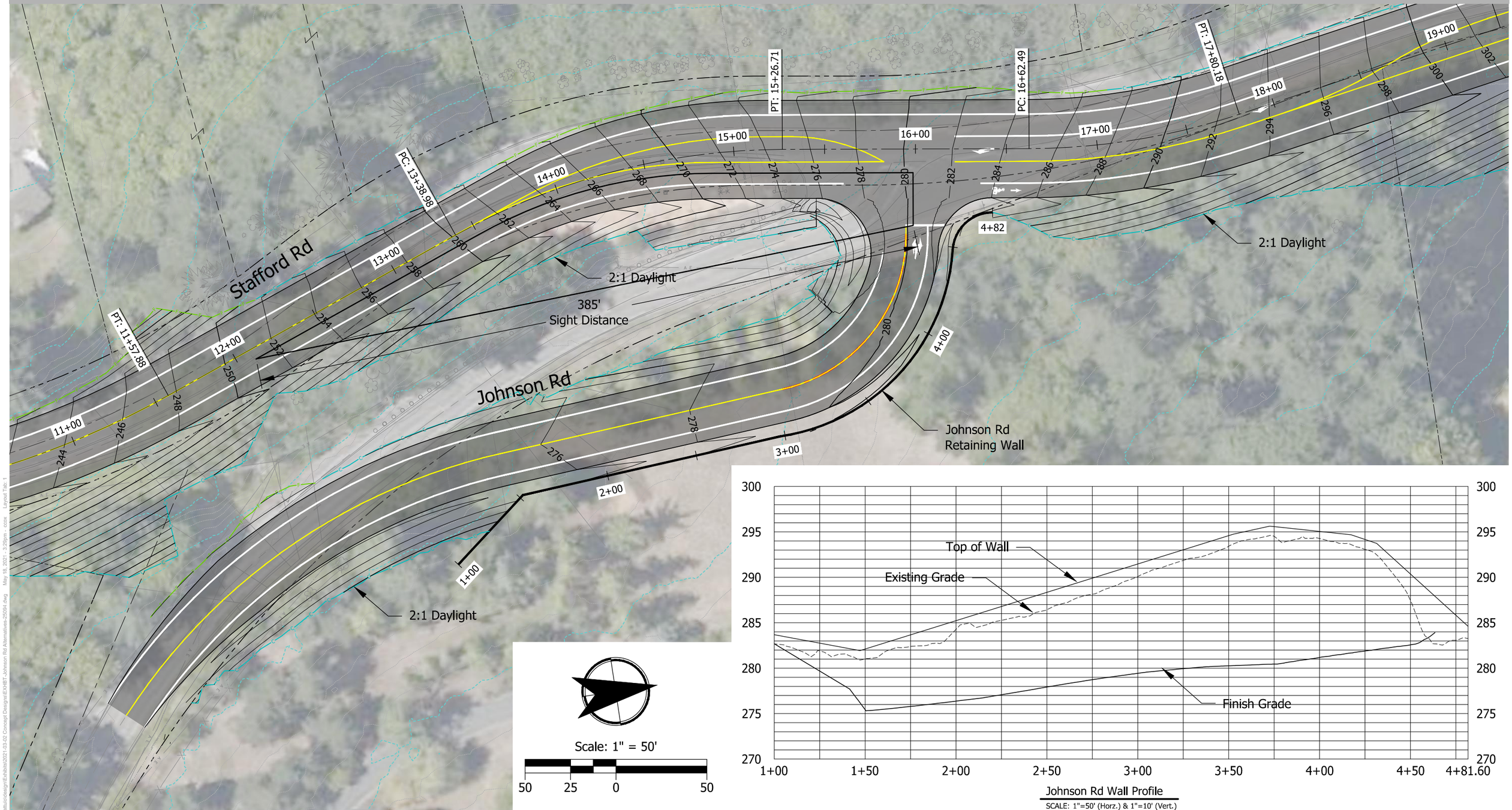


Figure 12. SW Stafford Road & Johnson Road Alternative 1- Expanded Side-Street Stop-Control Lane Configuration

Figure 13: Johnson Road Alternative 1 - Expanded Stop-Control

Preliminary Design Subject to Change
Date: May 18, 2021



KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, PE

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25\25094 - Stafford Road - Rosemont to Pattulo\Design\Exhibits\2021-03-02 Concept Design\EXHIBIT-Johnson Rd Alternative-25094.dwg May 18, 2021 - 3:29pm cozx Layout Tab: 1

Alternative 2: Restricted Right-in/Right-out/Left-in (RI/RO/LI)

The second alternative evaluated at the intersection of SW Stafford Rd and Johnson Rd is a modified side-street stop-controlled intersection with right-in, right-out, and left-in access to Johnson Rd. Westbound left-turns from Johnson Rd would not be allowed and vehicles would instead travel north and make a U-turn at the SW Stafford Rd/SW Childs Rd intersection. This concept also includes adding a southbound left-turn lane on Stafford Rd. The proposed lane configurations are shown in Figure 14 below, and the concept design is shown in Figure 15. The concept reflects key design features including:

- 90-degree intersection angle to improve intersection sight distance for vehicles approach the intersection of SW Johnson Rd.
- Widen SW Stafford Rd to implement a southbound left-turn lane with 100 feet of storage length
- 8-foot bicycle lanes on SW Stafford Rd and 6-foot bicycle lanes on SW Johnson Rd that taper back to the existing edge of pavement at the construction limits.
- Curb return radii and relevant striping to accommodate the WB-67 design vehicle on SW Stafford Rd and the WB-50 and Firetruck design vehicles on SW Johnson Rd.
- If this concept is advanced, it would be best paired with the roundabout concept at the intersection of SW Stafford Rd and SW Johnson Rd so that U-turns can be easily accommodated.

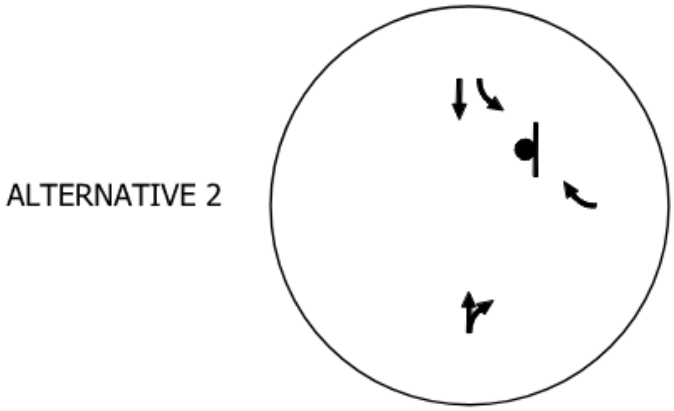
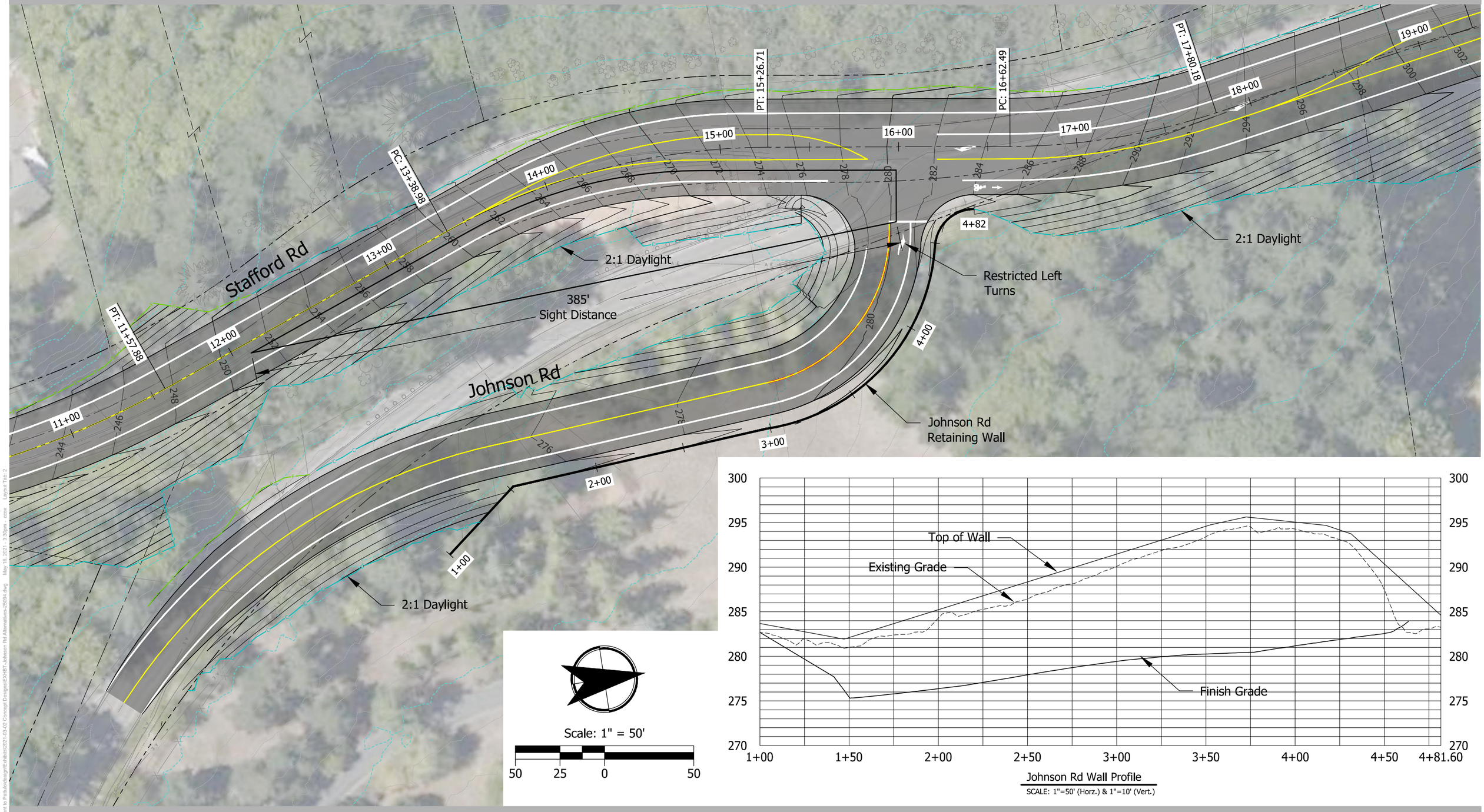


Figure 14. SW Stafford Road & Johnson Road Alternative 2- Restricted (RI/RO/LI) Side-Street Stop-Control Lane Configuration

Figure 15: Johnson Road Alternative 2 - RI/RO/LI

Preliminary Design Subject to Change
Date: May 18, 2021



KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, PE

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25\25094 - Stafford Road - Rosemont to Pattulo\Design\Exhibits\2021-03-02 Concept Designs\EXHIBIT-Johnson Rd Alternative-25094.dwg May 18, 2021 - 3:30pm cook Layout Tab: 2

Other Options Considered

A traffic signal was also evaluated at the intersection of SW Stafford Rd and Johnson Rd as a third option. The signal would be centered on the existing intersection and would include adding a southbound left-turn lane on SW Stafford Rd and a northbound right-turn lane on SW Stafford Rd and maintaining the westbound left/right-turn lane on Johnson Rd. The proposed lane configurations are shown in Figure 16 below.

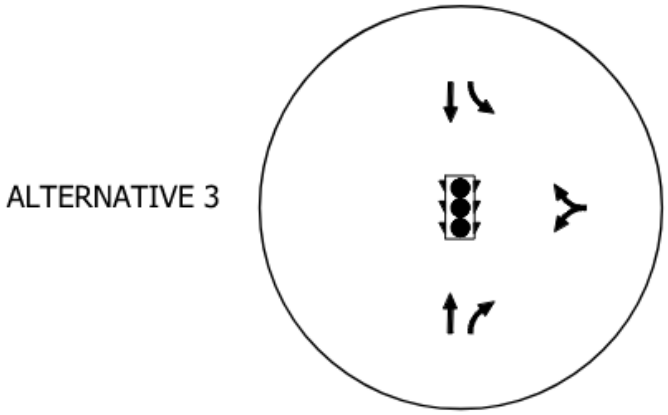


Figure 16. SW Stafford Road & Johnson Road Alternative 3 – Traffic Signal Lane Configuration

An operational analysis was completed for the traffic signal at SW Johnson Rd and is included in the "Traffic Operational Analysis" section below. However, after discussions with stakeholders and the project team, further analysis and design of the signal was halted and this option is not included in the remainder of the report as a viable alternative. This was due to several factors, including the following:

- The project goals state that the primary objective at SW Johnson Rd is to improve safety, not traffic operations.
- A change of intersection control type at SW Johnson Rd has not been included or proposed in any of Clackamas County's Transportation System Plan or other planning documents.
- Installing a signal at SW Johnson Rd does not fit within the County's current scope and budget for the project.

TRAFFIC OPERATIONAL ANALYSIS

This section focuses on the operational performance of each intersection alternative. The operational performance relates to the ability of the intersection to serve the existing year 2021 traffic and future year 2040 traffic. For this analysis, the ability of the intersection to serve the traffic volumes was measured by Level of Service (LOS), delay, volume-to-capacity (v/c) ratio, and 95th percentile queues.

Applicable Operating Standards

Analysis Methodology

The intersection operations analyses described in this report was performed in accordance with the procedures stated in the *Highway Capacity Manual 6th Edition* (HCM 6th) (3) Using the Synchro 10 and HCS7 software, with the exception of overall intersection level of service which was calculated using Synchro 10 with the 2000 *Highway Capacity Manual* (HCM 2000) (4).

Intersection Performance Measures

Several performance measures are used to assess the overall quality of the travel experience through an intersection or roadway segment as it is perceived by the traveler. A brief description of each performance measure is provided below.

Level of service (LOS) has been the most commonly used performance measure. LOS uses an "A" to "F" ranking based on the average control delay experienced by motorists. LOS "A" conditions show very low vehicle delay times (10 seconds or less), while LOS "F" conditions have high delay times (over 80 seconds per vehicle at a signalized intersection.

Level of service for signalized intersections is based on a weighted average per-vehicle control delay for the intersection while the analyses for two-way stop-controlled intersections are based on the delay at minor approaches and the major street left-turn movements. No delay is assumed on the major street through movements; levels of service and volume-to-capacity ratios are only calculated for each minor street lane.

Volume-to-capacity ratio (v/c) compares the volume of traffic to the theoretical capacity of the facility to accommodate traffic. A v/c Ratio of 1.0 indicates an intersection is operating at capacity. A v/c ratio over 1.0 indicates the intersection's capacity is exceeded, meaning that the vehicle may have to wait more than one signal cycle length at a signalized intersection before moving through the intersection.

All intersection evaluations in this study used the peak 15-minute flow rates occurring at each study intersection during each of the peak hour analysis periods. Using the peak 15-minute flow rates ensures that the analysis is based on worst-case conditions. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour.

Intersection Level of Service Standards

Clackamas County performance measures for rural areas are defined in Chapter 5 of the *2013 Clackamas County Comprehensive Plan* (5). Table 5-2b of the Comprehensive Plan states that County rural road intersections shall not exceed a v/c ratio of 0.90 and LOS E during peak hours.

Operational Analysis Results

This section summarizes the operational performance of the study intersections under the existing year 2021 "no-build" and "build" alternatives, as well as future 2040 "no-build" and "build" alternatives for both study intersections.

SW Stafford Road & SW Childs Road

Table 5 and Table 6 provide summaries of the operational performance for the existing year 2021 weekday AM and PM peak hours, respectively. Table 7 and Table 8 provide summaries of the operational performance for the future year 2040 weekday AM and PM peak hours, respectively. Details of the analysis for each alternative are discussed in the following sections, and all Synchro and HCS7 worksheets are included in Appendix H.

Table 5: SW Stafford Rd & SW Childs Rd Existing Year 2021 Weekday AM Peak Period Operations Comparison

Approach	2021 Weekday AM Peak Hour			
	No-Build	Alt 1: Traffic Signal	Alt 2: Single-Lane Roundabout	Alt 3: Multi-Lane Roundabout
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Eastbound	0.84	0.28	0.14	0.12
Northbound	0.20	0.50	0.64	0.33
Southbound	N/A	0.75	0.56	0.38
Overall Intersection	N/A	0.57[1]	N/A	N/A
Average Delay (sec/veh)				
Eastbound	85.1	14.0	6.4	5.7
Northbound	2.2	4.2	11.0	5.5
Southbound	0	10.5	8.7	6.7
Overall Intersection	N/A	7.5	9.6	6.1
Level of Service (LOS)				
Eastbound	F	B	A	A
Northbound	A	A	B	A
Southbound	A	B	A	A
Overall Intersection	F	A	A	A
95th Percentile Queue by Lane (feet)[2] (LTR except where noted)				
Eastbound	150	L = 25, R = 100	L = 25, R= 25	L = 25, R = 50
Northbound	25	L = 25, T = 25	T = 125	L = 50, T = 50
Southbound	0	T = 125, R = 0	T = 100, R = 25	T = 50, R = 50

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right.

Table 6: SW Stafford Rd & SW Childs Rd Existing Year 2021 Weekday PM Peak Period Operations Comparison

Approach	2021 Weekday PM Peak Hour			
	No-Build	Alt 1: Traffic Signal	Alt 2: Single-Lane Roundabout	Alt 3: Multi-Lane Roundabout
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Eastbound	1.43	0.61	0.48	0.41 (R)
Northbound	0.10	0.57	0.65	0.33 (T)
Southbound	N/A	0.82	0.60	0.33 (TR)
Overall Intersection	N/A	0.64[1]	N/A	N/A
Average Delay (sec/veh)				
Eastbound	249.2	18.1	12.0	9.6
Northbound	1.1	6.8	11.4	5.7
Southbound	0	14.5	9.7	5.8
Overall Intersection	N/A	12.1	10.8	6.5
Level of Service (LOS)				
Eastbound	F	B	B	A
Northbound	A	A	B	A
Southbound	A	B	A	A
Overall Intersection	F	B	B	A
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Eastbound	525	L = 50, R = 325	L = 25, R = 75	L = 25, R = 50
Northbound	250	L = 25, T = 125	T = 125	T = 50, L = 50
Southbound	0	T = 250, R = 25	T = 125	T = 50, R = 50

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right
4. 95th percentile queue volume exceeds capacity.

Table 7: SW Stafford Rd & SW Childs Rd Future Year 2040 Weekday AM Peak Period Operations Comparison

Approach	2040 Weekday AM Peak Hour			
	No-Build	Alt 1: Traffic Signal	Alt 2: Single-Lane Roundabout	Alt 3: Multi-Lane Roundabout
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Eastbound	3.37	0.38	0.22	0.19
Northbound	0.31	0.62	0.85	0.44
Southbound	N/A	0.81	0.76	0.54
Overall Intersection	N/A	0.69[1]	N/A	N/A
Average Delay (sec/veh)				
Eastbound	1216.6	18.6	8.4	7.4
Northbound	2.6	5.5	20.4	6.9
Southbound	0.0	11.6	14.3	9.2
Overall Intersection	N/A	9.1	16.6	8.0
Level of Service (LOS)				
Eastbound	F	B	A	A
Northbound	B	A	C	A
Southbound	A	B	B	A
Overall Intersection	F	A	C	A
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Eastbound	525	L = 50, R = 25	T = 25, R = 25	L = 25, R = 25
Northbound	50	L = 50, T = 50	T = 300	L = 50, R = 75
Southbound	0	T = 200, R = 25	T = 200, R = 50	T = 75, R = 100

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right

Table 8: SW Stafford Rd & SW Childs Rd Future Year 2040 Weekday PM Peak Period Operations Comparison

Approach	2040 Weekday PM Peak Hour			
	No-Build	Alt 1: Traffic Signal	Alt 2: Single-Lane Roundabout	Alt 3: Multi-Lane Roundabout
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Eastbound	3.75	0.81	0.78	0.66
Northbound	0.16	0.73	0.86	0.45
Southbound	N/A	0.90	0.80	0.46
Overall Intersection	N/A	0.82[1]	N/A	N/A
Average Delay (sec/veh)				
Eastbound	1306.9	36.9	26.9	18.1
Northbound	10.8	12.3	22.3	7.2
Southbound	0.0	22.6	16.5	7.3
Overall Intersection	N/A	21.3	20.8	9.4
Level of Service (LOS)				
Eastbound	F	D	D	C
Northbound	B	B	C	A
Southbound	A	C	C	A
Overall Intersection	F	C	C	A
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Eastbound	1225[4]	L = 100, R = 625[4]	L = 25, R = 175	L = 25, R = 125
Northbound	25	L = 75, T = 375	T = 300	L = 50, T = 75
Southbound	0	T = 575[4], R = 50	T = 250, R = 25	T = 50, R = 75

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right
4. 95th percentile queue volume exceeds capacity.

As shown in the tables above the current intersection configuration operates unacceptably under existing and future year 2040 no-build. All three of the build alternatives meet the County's operational thresholds.

SIGNAL WARRANT ANALYSIS

A signal warrant analysis for the intersection of SW Stafford Rd and SW Childs Rd was completed based on existing year 2021 and is shown in Appendix I. According to the study a traffic signal is warranted based

upon Warrant 1, Warrant 2, and Warrant 3. These warrants are based upon a methodology in the *Manual on Uniform Traffic Control Devices (MUTCD)* (6). Warrant 1 is based upon the highest eight-hour vehicular volume, warrant 2 is based on the highest four-hour vehicular volume, and warrant 3 is based on the peak hour volume.

SW Stafford Road & SW Johnson Road

Table 9 and Table 10 provide summaries of the operational performance for the existing year 2021 weekday AM and PM peak hours, respectively. Table 11 and Table 12 provide summaries of the operational performance for the future year 2040 weekday AM and PM peak hours, respectively. Details of the analysis for each alternative are discussed in the following sections, and all Synchro and HCS7 worksheets are included in Appendix J.

Table 9: SW Stafford Rd & SW Johnson Rd Existing Year 2021 Weekday AM Peak Period Operations Comparison

Approach	2021 Weekday AM Peak Hour			
	No-Build	Alt 1: Expanded	Alt 2: RI/RO/LI	Other: Traffic Signal
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Westbound	0.60	0.52	0.27	0.79
Northbound	0.00	0.00	0.00	0.75
Southbound	0.04	0.03	0.03	0.54
Overall Intersection	N/A	N/A	N/A	0.59[1]
Average Delay (sec/veh)				
Westbound	36.3	29.3	16.1	23.2
Northbound	0.0	0.0	0	9.1
Southbound	9.3	9.2	0.4	4.2
Overall Intersection	N/A	N/A	N/A	8.3
Level of Service (LOS)				
Westbound	E	D	C	C
Northbound	A	A	A	A
Southbound	A	A	A	A
Overall Intersection	E	E	C	A
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Westbound	100	75	50	L = 75
Northbound	0	0	0	T = 125, R = 25
Southbound	25	L = 25	25	L = 25, T = 25

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right

Table 10: SW Stafford Rd & SW Johnson Rd Existing Year 2021 Weekday PM Peak Period Operations Comparison

Approach	2021 Weekday PM Peak Hour			
	No-Build[5]	Alt 1: Expanded	Alt 2: RI/RO/LI	Other: Traffic Signal
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Westbound	0.79	0.65	0.12	0.64
Northbound	0.00	0.00	0.00	0.76
Southbound	0.31	0.33	0.33	0.58
Overall Intersection	N/A	N/A	N/A	0.65[1]
Average Delay (sec/veh)				
Westbound	133.3	88.2	15.8	25.2
Northbound	0.0	0.0	0.0	8.9
Southbound	11.8	12.1	2.9	4.3
Overall Intersection	N/A	N/A	N/A	7.1
Level of Service (LOS)				
Westbound	F	F	C	C
Northbound	A	A	A	A
Southbound	B	B	B	A
Overall Intersection	F	F	C	A
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Westbound	100	100	25	L = 50
Northbound	0	0	0	T = 150, R = 50
Southbound	50	50	50	L = 25, T = 25

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right
4. results calculated manually due to software limitations for over-capacity minor-street left turn movements.

Table 11: SW Stafford Rd & SW Johnson Rd Future Year 2040 Weekday AM Peak Period Operations Comparison

Approach	2040 Weekday AM Peak Hour			
	No-Build	Alt 1: Expanded	Alt 2: RI/RO/LI	Other: Traffic Signal
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Westbound	1.38	1.11	0.62	0.83
Northbound	0.00	0.00	0.00	0.85
Southbound	0.06	0.05	0.05	0.67
Overall Intersection	N/A	N/A	N/A	0.74[1]
Average Delay (sec/veh)				
Westbound	258.6	151.6	32.5	39.6
Northbound	0.0	0.0	0.0	12.0
Southbound	0.5	10.2	10.2	5.8
Overall Intersection	N/A	N/A	N/A	12.0
Level of Service (LOS)				
Westbound	F	F	D	D
Northbound	A	A	A	B
Southbound	B	B	B	A
Overall Intersection	F	F	D	B
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Westbound	350	275	100	L = 175
Northbound	0	0	0	T = 300, R = 25
Southbound	25	L = 25	25	L = 25, T = 150

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right

Table 12: SW Stafford Rd & SW Johnson Rd Future Year 2040 Weekday PM Peak Period Operations Comparison

Approach	2040 Weekday PM Peak Hour			
	No-Build[5]	Alt 1: Expanded	Alt 2: RI/RO/LI	Other: Traffic Signal
Critical Lane Volume-to-Capacity (v/c) Ratio (LTR except where noted)				
Westbound	27[5]	3.02	0.34	0.80
Northbound	0.00	0.00	0.00	0.83
Southbound	0.53	0.56	0.56	0.83
Overall Intersection	N/A	N/A	N/A	0.83[1]
Average Delay (sec/veh)				
Westbound	>300[5]	1186.4	25	38.8
Northbound	0.0	0.0	0.0	9.9
Southbound	4.2	18.8	4.6	7.9
Overall Intersection	N/A	N/A	N/A	9.9
Level of Service (LOS)				
Westbound	F[5]	F	D	D
Northbound	A	A	A	A
Southbound	C	C	C	A
Overall Intersection	F	F	D	A
95th Percentile Queue by Lane (feet)[1] (LTR except where noted)				
Westbound	N/A[4]	275[4]	50	L = 75
Northbound	0	0	0	T = 275, R = 50
Southbound	100	L = 100	100	L = 150, T = 50

1. Based upon HCM 2000 Analysis
2. Queues rounded up to the nearest 25 feet.
3. L = Left, LT = Left-through, R = right, TR = through-right, T = through, LTR = Left-Through-Right
4. 95th percentile queue volume exceeds capacity.
5. results calculated manually due to software limitations for over-capacity minor-street left turn movements.

As shown in the tables above the current intersection configuration operates unacceptably under existing year 2021 and future year 2040 no-build. Additionally, Alternative 1: Expanded Side-street Stop-Control is not projected to meet the County's traffic operational thresholds. Alternative 2 meets the County's operational threshold through the 2040 design year. The Traffic Signal option was screened out for other reasons as described in the "Description of Alternatives" section above.

SAFETY PERFORMANCE EVALUATION

The safety performance of each alternative for both intersections were evaluated and compared to that of the existing side-street stop-control.

SW Stafford Road & SW Childs Road

Alternative 1: Traffic Signal

The safety performance for the traffic signal alternative was estimated based on crash prediction methods from the *Highway Safety Manual (HSM*) and local calibration coefficients developed by ODOT (7). The evaluation was performed using the Federal Highway Administration (FHWA) *Safety Performance for Intersection Control Evaluation (SPICE) Tool* (8).

Crash prediction results for converting the minor road stop to a signal are shown in Table 13. The 5-year crash reduction totals are calculated as the percent reduction applied to the no-build crash frequency.

The results for the 5-year totals are based on the assumption that daily volumes remain relatively similar to 2024 and 2040 levels.

Table 13: Crash Prediction Results for Traffic Signal Alternative (Stafford Rd/Childs Rd)

	No-Build		Traffic Signal		Change in Crashes		Percent Change	
	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes
Opening Year (2024)								
Annual	1.6	0.7	3.0	1.2	+1.4	+0.5	+82%	+79%
5-year Total	8.2	3.4	14.9	6.1	+6.7	+2.7		
Design Year (2040)								
Annual	1.9	0.8	3.5	1.5	+1.6	+0.7	+80%	+78%
5-year Total	9.7	4.1	17.5	7.3	+7.8	+3.2		

Alternative 2: Single-Lane Roundabout

The safety performance for the single-lane roundabout alternative was estimated based on crash prediction methods from the HSM and local calibration coefficients developed by ODOT (9). The evaluation was performed using the FHWA SPICE Tool.

Crash prediction results for converting the minor road stop to a single-lane roundabout are shown in Table 14. The results for the 5-year totals are based on the assumption that daily volumes remain relatively similar to 2024 and 2040 levels.

Table 14: Crash Prediction Results for Single-Lane Roundabout Alternative (Stafford Rd/Childs Rd)

	No-Build		Single-Lane Roundabout		Change in Crashes		Percent Change	
	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes
Opening Year (2024)								
Annual	1.6	0.7	0.3	0.1	-1.3	-0.6	-82%	-85%
5-year Total	8.2	3.4	1.5	0.5	-6.7	-2.9		
Design Year (2040)								
Annual	1.9	0.8	0.4	0.1	-1.5	-0.7	-81%	-88%
5-year Total	9.7	4.1	1.8	0.5	-7.9	-3.6		

The safety performance results indicate that the signal is expected to increase crash frequency, while the single-lane roundabout is expected to reduce the frequency of crashes at the intersection of SW Stafford Rd and SW Childs Rd.

These safety performance results will be used as inputs for determining each alternative's safety benefit based on monetary values for the different types of crashes.

Alternative 1: Expanded Side-Street Stop-Control

The safety performance for expanding the intersection of SW Stafford Rd and Johnson Rd with a channelized southbound left-turn lane was estimated based on crash prediction methods from the HSM. The evaluation was performed using the FHWA SPICE Tool.

Crash prediction results for adding a channelized left turn lane are shown in Table 15. The results for the 5-year totals are based on the assumption that daily volumes remain relatively similar to 2024 and 2040 levels.

Table 15: Crash Prediction Results for Expanded Side-Street Stop-Control Alternative (Stafford Rd/Johnson Rd)

	No-Build		Expanded		Change in Crashes		Percent Change	
	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes	Total Crashes	Fatal and Injury Crashes
Opening Year (2024)								
Annual	1.1	0.4	0.6	0.3	-0.5	-0.1	-44%	-41%
5-year Total	5.4	2.2	3.0	1.3	-2.4	-0.9		
Design Year (2040)								
Annual	1.3	0.5	0.7	0.3	-0.6	-0.2	-44%	-42%
5-year Total	6.3	2.6	3.5	1.5	-2.8	-1.1		

Alternative 2: Restricted Right-In/Right-Out/Left-In Side-Street Stop-Control

Crash prediction results for Alternative 2 were not able to be calculated as there is no usable crash modification factor (CMF) for converting a 3-leg minor road stop-controlled intersection into a restricted right-in/right-out/left-in intersection. This alternative will include a southbound left-turn lane like Alternative 1 (associated CMF of 0.56), as well as restrict the westbound left-turn traffic. There is no CMF for converting a 3-leg minor road stop-controlled intersection into a restricted right-in/right-out (RI/RO) intersection in a rural environment; however, there is a CMF of 0.55 for this conversion to a RI/RO in an urban environment. Considering both the addition of the southbound left-turn and the restriction of the westbound left (i.e., RI/RO) it is reasonable to expect that Alternative 2 may be more effective at crash reduction then Alternative 1.

FREIGHT MOBILITY

Each of the traffic signal, roundabout, and stop-controlled alternatives can be designed to accommodate the WB-67 design vehicle along SW Stafford Road and the WB-50 and Firetruck design vehicles for the SW Childs Road and SW Johnson Road turning movements on and off SW Stafford Road.

MULTIMODAL ACCOMMODATIONS

The concept designs for both intersections includes 8-foot bicycle lanes along SW Stafford Road and 6-foot bicycle lanes on SW Johnson Road and SW Childs Rd.

The SW Childs Road traffic signal alternative would include signalized pedestrian crossings and ADA ramps at the north and west legs of the intersection. The SW Childs Road roundabout concepts would include

bicycle ramps, multi-use paths, and crosswalks on all legs of the intersection that can be used by both bicyclists and pedestrians.

The SW Johnson Road concept designs do not include pedestrian facilities and there are no connecting sidewalks or pedestrian generators in the immediate area. This approach fits within the rural context of the SW Stafford Road Corridor.

COST ESTIMATES

The project design team prepared planning-level cost estimates for the entire proposed Stafford Road Corridor. The cost estimates include an itemized breakdown of major earthwork, pavement structure, and other identifiable major components, (e.g., signing, striping, street lighting, signals). Groups of items (such as work zone traffic control) are presented as lump sum items, and the estimates are based on similar work from other recent projects. The Corridor cost estimate was then broken out into intersection level cost estimates to show an accurate cost comparison between each intersection alternative. The assumed unit costs, estimated quantities, and calculations were completed by others and are provided in Appendix K. A summary of the cost breakdown is shown below in Table 16.

Other assumptions used in developing the cost estimates are as follows:

- Roadway rehabilitation where possible would consist of a 2-inch grind and inlay.
- Roadway widening would include full-depth pavement construction consistent with the project geotechnical report.
- Sidewalks, curbs, and ramps would be constructed as shown on the concept design drawings.
- Construction cost excludes cost for engineering and construction management.

Environmental and Right-of-Way Impacts

Moderate impacts to environmental wetland areas and right-of-way are anticipated for both SW Childs Road intersection alternatives (i.e., signal and roundabout). The costs associated with environmental impacts has been estimated separately as part of the entire corridor project and is not included in the individual intersection cost estimates. The cost of right-of-way was assumed to be 15$ per square foot, easements were assumed at $7.50 per square foot, and wetland area acquisition was assumed at $2.50 per square foot.

Considerations related to right-of-way impacts for each alternative are listed below.

SW Childs Road Alternative 1: Traffic Signal

The right-of-way needs associated with the traffic signal are driven by the need to realign SW Childs Road to create a 90-degree intersection with SW Stafford Road and to provide an appropriate tangent approaching the intersection. The primary impacts are anticipated to occur at the parcel in the southwest quadrant of the intersection where significant fill and retaining walls will be required to support the new intersection location. The property is currently vacant, and no functional loss is expected to occur; however, this design could impact future plans to owner has for the property.

Additional impacts associated with the widening of Stafford Road may occur at the parcel adjacent to the south side of the intersection. The design will require either cut slopes or a retaining wall that may encroach on the property. No functional loss of the property is anticipated.

SW Childs Road Alternative 2: Single-Lane Roundabout with Right-turns

The right-of-way needs associated with the roundabout are driven by the need to re-align SW Childs Road and SW Stafford Road to create appropriate entry geometry for the roundabout to manage entry speeds and accommodate design vehicles. There are two proposed locations, referred to as Alternative 2.1 and Alternative 2.2. Each has varying levels of right-of-way impacts which are discussed further below.

The first roundabout design option, Alternative 2.1, locates the roundabout adjacent to the existing intersection in the north quadrant. With this design, the primary right-of-way impacts occur at the north parcel. Additional, more minor impacts will also occur at the southwest parcel and at the south parcel. All of these impacts are due to the larger footprint of the roundabout and the need for significant fill in the canyon on the west side of SW Stafford Road. No functional loss is expected to occur at these properties; however, this design could impact future plans the owners have for their properties.

The second roundabout design option, Alternative 2.2, locates the roundabout adjacent to the existing intersection in the southwest quadrant. With this design, the primary right-of-way impacts occur at southwest parcel. Additional, more minor impacts will also occur at the north parcel and the south parcel. All of these impacts are due to the larger footprint of the roundabout and the need for significant fill in the canyon on the west side of SW Stafford Road. No functional loss is expected to occur at these properties; however, this design could impact future plans the owners have for their properties.

Table 16: Preliminary Construction Cost Estimates for Alternatives (2021 Costs)

Cost Breakdown	Alternative 1: Traffic Signal	Alternative 2.1: Single-Lane Roundabout	Alternative 2.2: Single-Lane Roundabout
Construction Cost	$4,307,692	$5,230,769	$4,538,461
30% Construction Contingency	$1,292,307	$1,569,230	$1,361,538
Right-of-Way Cost (Includes 10% Contingency)	$1,145,084	$1,326,801	$1,046,094
Project Cost (Including Contingencies)	**$6,745,084**	**$8,126,801**	**$6,946,094**

Life-Cycle Cost Analysis

A life-cycle cost analysis was conducted for the intersection of SW Stafford Road and SW Childs Road to compare costs over a 16-year design life (i.e., 2024 to 2040) for both alternatives. The life-cycle cost includes both "hard" costs incurred by the County (construction, right-of-way, operations, and maintenance) and "soft" costs incurred by society (value of users' time, fuel, crash costs). The cost estimates provided are 2021 values, and the net present value calculations are based on a base year of 2021. A discount rate of four percent (10) was applied to all future costs to calculate the net present value of the costs, with the generally assumed costs as summarized below.

Calculation of Hard Costs

Construction and right-of-way costs are one-time costs at the time of construction.

Assumed Post-Opening Costs for operations and maintenance are as follows:

- Traffic Signal:
    - Signal retiming - $5,000 every three years
    - Lighting - $1,000 annually
    - Signal Maintenance - $4,000 annually
- Single-Lane Roundabout
    - Lighting - $3,000 annually
    - Landscaping - $2,000 annually
- Minor-Road Stop (No Build)
    - No maintenance costs

Calculation of Soft Costs (Costs Realized as Benefits)

Delay costs were based on value of user time from the *2015 TTI Urban Mobility Report* (11). Crash cost estimates attempt to account for the economic costs (monetary impacts) of crashes including property damage, medical costs, crash response, lost wages, productivity loss, insurance administration, etc. Therefore, the cost for severe crashes is higher than that of property damage only crashes. The safety costs are identified in the ODOT Highway Safety Improvement Program Guide and are comprehensive economic values per crash type calculated by ODOT (12). See Appendix L for calculations of the fatal and injury crash cost.

Assumed value of time (delay costs):

- Person ($ per person hour): $17.67
- Trucks ($ per truck hour): $94.04

Analysis Findings

Table 17 summarizes the estimated life-cycle costs over a 16-year period. Appendix M provides the outputs for the life-cycle costs analysis.

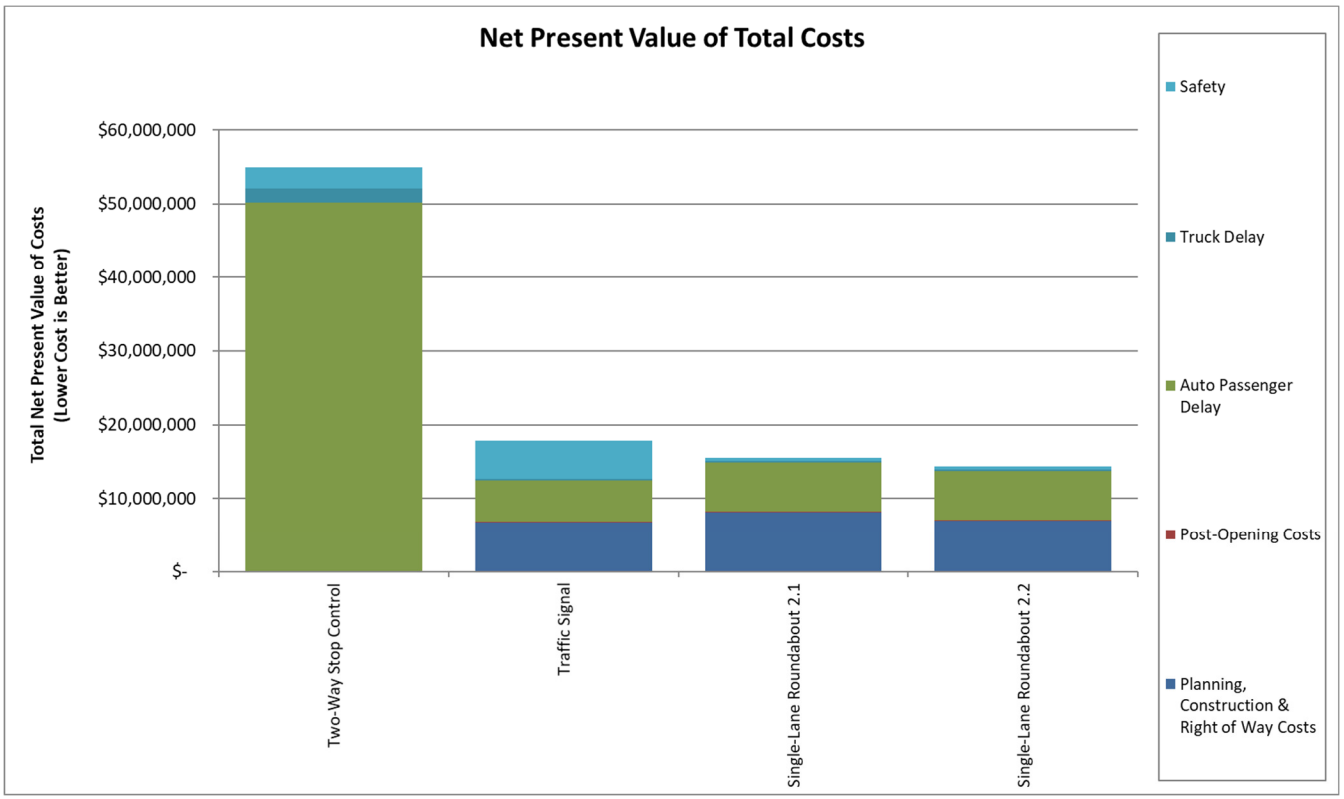
Table 17. Life Cycle Cost Analysis: Net Present Value of Costs (2021)

Cost Categories	Net Present Value of Costs (2021)			
	Two-Way Stop (No Build)	Alt 1: Traffic Signal	Alt 2.1: Roundabout	Alt 2.2: Roundabout
Planning, Construction & Right of Way Costs	$0	$6,745,084	$8,126,801	$6,946,094
Post-Opening Costs	$12,652	$86,070	$63,261	$63,261
Auto Passenger Delay	$50,228,660	$5,638,281	$6,683,459	$6,683,459
Truck Delay	$1,884,415	$211,530	$250,741	$250,741
Safety	$2,871,322	$5,187,448	$394,328	$394,328
Total cost	$54,997,049	$17,868,413	$15,518,592	$14,337,885

*Assumes partial property acquisitions, refer to page 30 for additional information.

Figure 17 shows the estimated net present value of total costs.

Figure 17: Net Present Value of Total Costs



CONCLUSION AND RECOMMENDATIONS

This evaluation of intersection control alternatives for each study intersection resulted in the following key conclusions:

SW STAFFORD RD AND SW CHILDS ROAD

- Analysis and design of Alternative 3 (multi-lane roundabout) was halted following the operations analysis because the additional construction cost and right-of-way acquisition needs for a larger multi-lane roundabout cannot be justified for a design that is not necessary from traffic operations and safety perspectives.
- Both Alternative 1 (traffic signal) and the Alternative 2 (single-lane roundabout) would provide adequate capacity and operational performance through the 2040 design year.
- Both the signal and the roundabout alternatives would provide consistent bicycle lanes on SW Stafford Rd with sidewalks and crosswalks to accommodate bicycle and pedestrian users at the intersection.
- Both the signal and roundabout alternatives can be designed to accommodate a fire truck and a WB-50 design vehicle on turning movements to and from SW Childs Road, and a WB-67 design vehicle on through movements along SW Stafford Road.
- The cost of construction and right-of-way for the traffic signal is expected $6.75 million while the single lane roundabout alt 2.1 is expected to be $8.13 million and alt 2.2 is expected to be $6.95 million.
- The single-lane roundabout is expected to provide a greater safety benefit and lower overall annual delay and operating cost. Therefore, the roundabout alternative has the lowest overall life-cycle cost through the 2040 design year.

SW STAFFORD RD AND JOHNSON ROAD

- Alternative 1 (Expanded Side-street Stop-control) does not provide adequate capacity and operational performance in the existing year 2021 or the future year 2040. Alternative 2 (RI/RO/LI) would provide adequate capacity and operational performance through the 2040 design year.
- Both alternatives will provide consistent bicycle lanes on SW Stafford Rd; however, there will be no sidewalk or crosswalks to accommodate bicycle and pedestrian users given the rural context of SW Stafford Road.
- Both alternatives can be designed to accommodate a fire truck and a WB-50 design vehicle on turning movements to and from Johnson Road, and a WB-67 design vehicle on through movements along SW Stafford Road.
- Both alternatives will have a similar footprint, with the only difference being that left turns will be restricted in Alternative 2 (RI/RO/LI). Therefore, construction and right-of-way costs are expected to be similar for both alternatives. The construction and right-of-way cost for SW Johnson Road has been included in the overall SW Stafford Road Corridor cost estimate which has been completed by others separate from this Intersection Control Evaluation.
- The crash prediction model for both alternatives shows a reduction in total crashes. Alternative 1 is expected to have a 44% reduction in crashes. Alternative 2 is predicted to have a greater than 44% reduction in total crashes due to added safety benefit of restricting westbound left turns.

RECOMMENDATIONS

The two study intersections are located approximately 1,500 feet from each other along SW Stafford Road and are therefore linked in the sense that one intersection treatment will affect the other. Considering

that, Alternative 2 at SW Johnson Road (RI/RO/LI) will not operate as effectively when paired with Alternative 1 at SW Childs Road (traffic signal) because drivers who cannot make a left turn at SW Johnson Road would instead need to make a U-turn at SW Childs Road. A U-turn movement at a single-lane traffic signal is difficult to accomplish for larger vehicles and introduces additional safety concerns.

In keeping with the findings of the life-cycle cost analysis, the preferred alternative at SW Stafford Road and SW Childs Road is the single-lane roundabout alt 2.2 with right-turn lanes. This alternative provides the highest safety benefit and the lowest life-cycle cost through the 2040 design year, and it is the cheaper of the two roundabout options that have been proposed. In addition, the roundabout is the best fit within the context of the rural Stafford Road corridor because there are already roundabouts installed at intersections to the north and south of the study area.

At SW Stafford Road and Johnson Road, the preferred alternative is the restricted right-in, right-out, left-in design. This is the only feasible alternative at SW Johnson Road that meets the County's capacity and operational standards. Additionally, this alternative fits well with the single-lane roundabout at SW Childs Rd which will easily accommodate U-turns for drivers originating from Johnson Road and hoping to travel southbound on SW Stafford Road. The left turn restriction is only necessary for traffic operations during peak hours, so the County may also consider a part time left-turn restriction that is only active during the busiest periods.

REFERENCES

1. ODOT. Analysis Procedures Manual Appendix 3E: Traffic Volume Development During Disruptive Events, 2020.
2. Transportation Research Board. *NCHRP Report 672 Roundabouts: An Informational Guide*. 2010.
3. Transportation Research Board. *Highway Capacity Manual, Sixth Edition.* 2016.
4. Transportation Research Board. *Highway Capacity Manual, 2000 Edition.* 2000.
5. Clackamas County Transportation System Plan. 2013.
6. FHWA. *Manual on Uniform Traffic Control Devices*. 2009.
7. ODOT. *Calibrating the Highway Safety Manual Prediction Methods for Oregon Highways, Final Report SPR 684*. 2012.
8. FHWA. *Capacity Analysis for Planning of Junctions Tool*. 2017.
9. ODOT. Developing Safety *Performance Measures for Roundabout Applications in the State of Oregon.* 2013.
10. NCHRP. *Web-Only Document 220: Estimating the Life-Cycle Cost of Intersection Designs*. 2017.
11. Texas A&M Transportation Institute. *2015 Urban Mobility Report.* 2015.
12. ODOT. Highway Safety Improvement Program (HISP) Guide. 2021

APPENDICES

A. 2020 Traffic Data
B. 2017 Historic Traffic Data
C. ODOT Crash Data – SW Childs Rd
D. ODOT Crash Data – Johnson Rd
E. Traffic Signal Truck Turning Figures
F. Roundabout Truck Turning Figures
G. Expanded Side-Street Truck Turning Figures
H. Existing and Future Traffic Operations Worksheets – SW Stafford Rd/SW Childs Rd
I. Signal Warrant Analysis – SW Stafford Rd/SW Childs Rd
J. Existing and Future Traffic Operations Worksheets – SW Stafford Rd/Johnson Rd
K. Conceptual Design Cost Estimates
L. Documentation of Cost per Crash Calculation
M. Life-Cycle Cost Analysis Output

APPENDIX A: 2020 Traffic Data

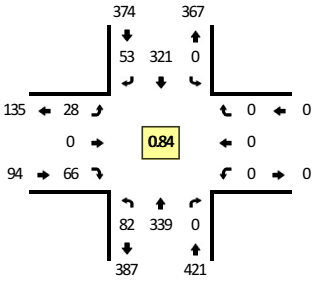
Type of peak hour being reported: Intersection Peak

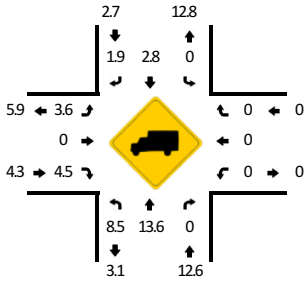
Method for determining peak hour: Total Entering Volume

LOCATION: SW Stafford Rd -- SW Childs Rd
CITY/STATE: Stafford, OR

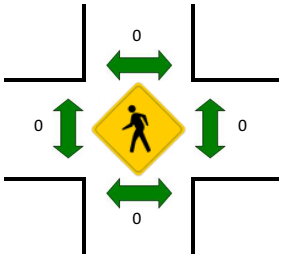
QC JOB #: 15336005
DATE: Thu, Dec 17 2020

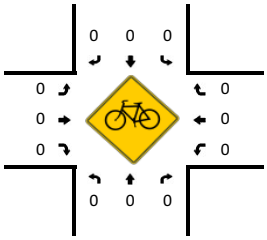
Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM

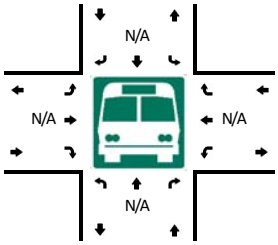


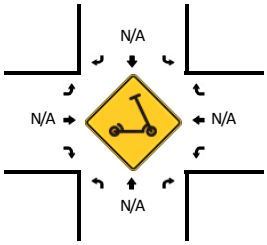


Quality Counts
DATA THAT DRIVES COMMUNITIES









5-Min Count Period Beginning At	SW Stafford Rd (Northbound)				SW Stafford Rd (Southbound)				SW Childs Rd (Eastbound)				SW Childs Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	13	0	0	0	14	3	0	0	0	4	0	0	0	0	0	37	
7:05 AM	2	13	0	0	0	19	2	0	0	0	3	0	0	0	0	0	39	
7:10 AM	5	18	0	0	0	29	2	0	2	0	2	0	0	0	0	0	58	
7:15 AM	5	20	0	0	0	19	6	0	0	0	7	0	0	0	0	0	57	
7:20 AM	2	23	0	0	0	17	6	0	0	0	7	0	0	0	0	0	55	
7:25 AM	3	23	0	0	0	23	1	0	1	0	7	0	0	0	0	0	58	
7:30 AM	3	21	0	0	0	31	6	0	0	0	3	0	0	0	0	0	64	
7:35 AM	5	24	0	0	0	27	6	0	3	0	3	0	0	0	0	0	68	
7:40 AM	13	33	0	0	0	27	10	0	2	0	6	0	0	0	0	0	91	
7:45 AM	6	29	0	0	0	27	10	0	3	0	7	0	0	0	0	0	82	
7:50 AM	9	22	0	0	0	29	5	0	2	0	9	0	0	0	0	0	76	
7:55 AM	7	21	0	0	0	28	3	0	2	0	1	0	0	0	0	0	62	747
8:00 AM	8	26	0	0	0	25	3	0	2	0	2	0	0	0	0	0	66	776
8:05 AM	8	29	0	0	0	19	3	0	1	0	6	0	0	0	0	0	66	803
8:10 AM	5	29	0	0	0	29	3	0	1	0	6	0	0	0	0	0	73	818
8:15 AM	7	25	0	0	0	22	2	0	8	0	5	0	0	0	0	0	69	830
8:20 AM	3	26	0	0	0	26	6	0	4	0	4	0	0	0	0	0	69	844
8:25 AM	5	24	0	0	0	26	1	0	0	0	3	0	0	0	0	0	59	845
8:30 AM	4	25	0	0	0	26	5	0	1	0	7	0	0	0	0	0	68	849
8:35 AM	6	24	0	0	0	28	10	0	0	0	2	0	0	0	0	0	70	851
8:40 AM	9	28	0	0	0	30	6	0	3	0	9	0	0	0	0	0	85	845
8:45 AM	3	43	0	0	0	32	6	0	4	0	6	0	0	0	0	0	94	857
8:50 AM	12	26	0	0	0	32	3	0	2	0	8	0	0	0	0	0	83	864
8:55 AM	12	34	0	0	0	26	5	0	2	0	8	0	0	0	0	0	87	889

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	108	412	0	0	0	360	56	0	32	0	88	0	0	0	0	0	1056
Heavy Trucks	12	52	0		0	12	0		0	0	12		0	0	0		88
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

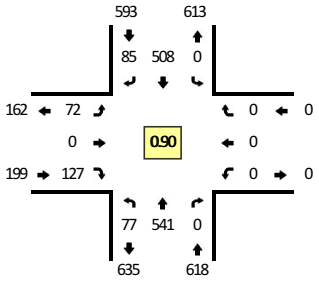
Type of peak hour being reported: Intersection Peak

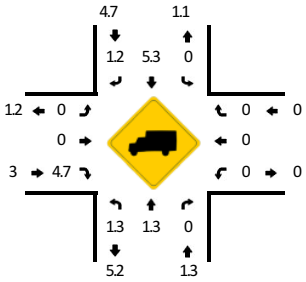
Method for determining peak hour: Total Entering Volume

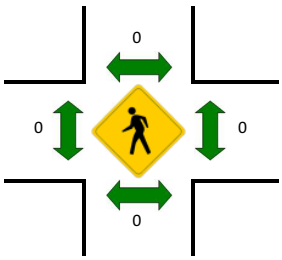
LOCATION: SW Stafford Rd -- SW Childs Rd
CITY/STATE: Stafford, OR

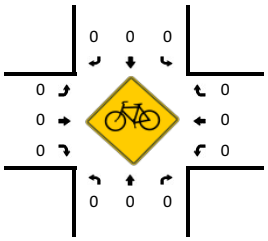
QC JOB #: 15336006
DATE: Thu, Dec 17 2020

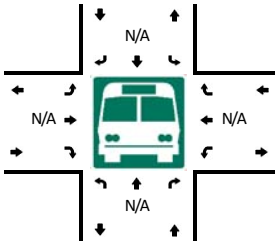
Peak-Hour: 4:05 PM -- 5:05 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

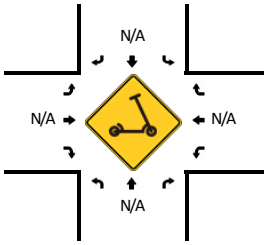












5-Min Count Period Beginning At	SW Stafford Rd (Northbound)				SW Stafford Rd (Southbound)				SW Childs Rd (Eastbound)				SW Childs Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	37	0	0	0	39	4	0	7	0	17	0	0	0	0	0	112	
4:05 PM	5	35	0	0	0	55	5	0	4	0	12	0	0	0	0	0	116	
4:10 PM	4	38	0	0	0	45	10	0	4	0	15	0	0	0	0	0	116	
4:15 PM	10	45	0	0	0	38	8	0	3	0	10	0	0	0	0	0	114	
4:20 PM	5	59	0	0	0	43	7	0	5	0	14	0	0	0	0	0	133	
4:25 PM	5	47	0	0	0	42	7	0	8	0	13	0	0	0	0	0	122	
4:30 PM	7	49	0	0	0	40	12	0	2	0	11	0	0	0	0	0	121	
4:35 PM	12	50	0	0	0	50	10	0	7	0	10	0	0	0	0	0	139	
4:40 PM	9	61	0	0	0	36	4	0	13	0	8	0	0	0	0	0	131	
4:45 PM	4	46	0	0	0	36	4	0	7	0	11	0	0	0	0	0	108	
4:50 PM	4	37	0	0	0	40	7	0	6	0	10	0	0	0	0	0	104	
4:55 PM	5	27	0	0	0	30	5	0	7	0	5	0	0	0	0	0	79	1395
5:00 PM	7	47	0	0	0	53	6	0	6	0	8	0	0	0	0	0	127	1410
5:05 PM	7	49	0	0	0	28	12	0	12	0	6	0	0	0	0	0	114	1408
5:10 PM	3	46	0	0	0	44	7	0	6	0	6	0	0	0	0	0	112	1404
5:15 PM	1	40	0	0	0	33	4	0	4	0	8	0	0	0	0	0	90	1380
5:20 PM	2	47	0	0	0	28	6	0	7	0	7	0	0	0	0	0	97	1344
5:25 PM	5	26	0	0	0	29	7	0	7	0	11	0	0	0	0	0	85	1307
5:30 PM	7	39	0	0	0	34	2	0	7	0	7	0	0	0	0	0	96	1282
5:35 PM	5	24	0	0	0	36	4	0	5	0	6	0	0	0	0	0	80	1223
5:40 PM	3	36	0	0	0	24	4	0	5	0	7	0	0	0	0	0	79	1171
5:45 PM	3	34	0	0	0	26	5	0	4	0	13	0	0	0	0	0	85	1148
5:50 PM	3	24	0	0	0	25	2	0	4	0	3	0	0	0	0	0	61	1105
5:55 PM	3	26	0	0	0	24	5	0	2	0	8	0	0	0	0	0	68	1094

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	112	640	0	0	0	504	104	0	88	0	116	0	0	0	0	0	1564
Heavy Trucks	0	16	0		0	28	4		0	0	4		0	0	0		52
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

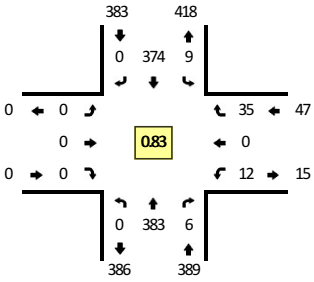
Type of peak hour being reported: Intersection Peak

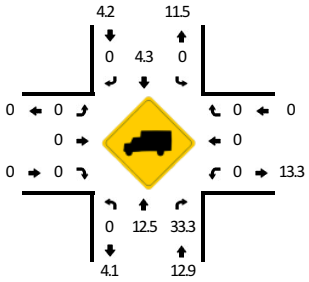
Method for determining peak hour: Total Entering Volume

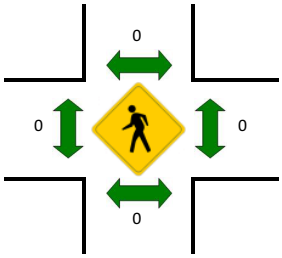
LOCATION: SW Stafford Rd -- SW Johnson Rd
CITY/STATE: Stafford, OR

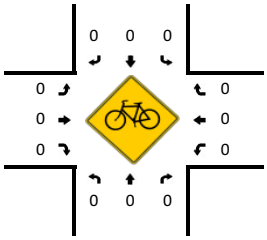
QC JOB #: 15336007
DATE: Thu, Dec 17 2020

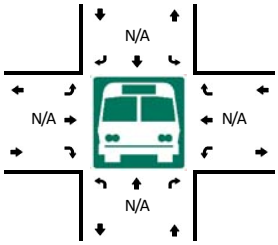
Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM

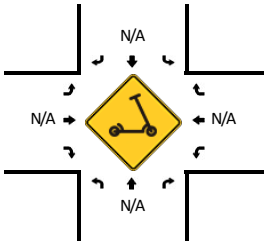












5-Min Count Period Beginning At	SW Stafford Rd (Northbound)				SW Stafford Rd (Southbound)				SW Johnson Rd (Eastbound)				SW Johnson Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	17	2	0	0	15	0	0	0	0	0	0	0	0	1	0	35	
7:05 AM	0	12	3	0	0	23	0	0	0	0	0	0	2	0	3	0	43	
7:10 AM	0	20	0	0	0	35	0	0	0	0	0	0	1	0	2	0	58	
7:15 AM	0	21	2	0	2	16	0	0	0	0	0	0	1	0	3	0	45	
7:20 AM	0	21	0	0	4	22	0	0	0	0	0	0	1	0	5	0	53	
7:25 AM	0	26	0	0	1	28	0	0	0	0	0	0	0	0	1	0	56	
7:30 AM	0	23	0	0	2	33	0	0	0	0	0	0	1	0	0	0	59	
7:35 AM	0	25	0	0	0	24	0	0	0	0	0	0	0	0	2	0	51	
7:40 AM	0	42	1	0	3	32	0	0	0	0	0	0	0	0	4	0	82	
7:45 AM	0	33	2	0	4	27	0	0	0	0	0	0	2	0	4	0	72	
7:50 AM	0	30	1	0	2	34	0	0	0	0	0	0	1	0	2	0	70	
7:55 AM	0	28	1	0	3	32	0	0	0	0	0	0	3	0	1	0	68	692
8:00 AM	0	31	1	0	0	24	0	0	0	0	0	0	0	0	1	0	57	714
8:05 AM	0	31	2	0	0	27	0	0	0	0	0	0	0	0	5	0	65	736
8:10 AM	0	31	0	0	3	25	0	0	0	0	0	0	3	0	2	0	64	742
8:15 AM	0	32	0	0	1	30	0	0	0	0	0	0	2	0	2	0	67	764
8:20 AM	0	26	0	0	0	30	0	0	0	0	0	0	3	0	3	0	62	773
8:25 AM	0	21	1	0	1	29	0	0	0	0	0	0	0	0	7	0	59	776
8:30 AM	0	27	0	0	0	30	0	0	0	0	0	0	2	0	1	0	60	777
8:35 AM	0	30	0	0	1	33	0	0	0	0	0	0	0	0	2	0	66	792
8:40 AM	0	30	1	0	0	35	0	0	0	0	0	0	1	0	4	0	71	781
8:45 AM	0	47	0	0	1	36	0	0	0	0	0	0	0	0	2	0	86	795
8:50 AM	0	35	0	0	2	36	0	0	0	0	0	0	0	0	2	0	75	800
8:55 AM	0	42	1	0	0	39	0	0	0	0	0	0	1	0	4	0	87	819

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	496	4	0	12	444	0	0	0	0	0	0	4	0	32	0	992
Heavy Trucks	0	64	4		0	24	0		0	0	0		0	0	0		92
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

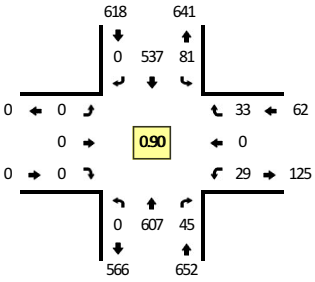
Report generated on 12/23/2020 5:14 PM

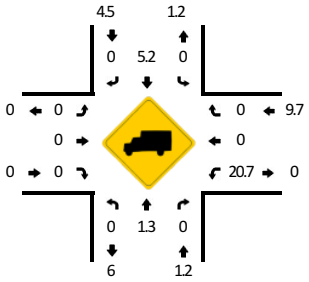
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

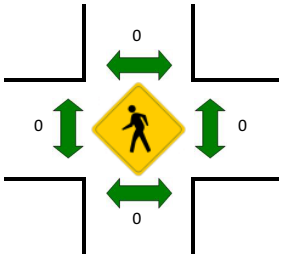
LOCATION: SW Stafford Rd -- SW Johnson Rd | **QC JOB #:** 15336008
CITY/STATE: Stafford, OR | **DATE:** Thu, Dec 17 2020

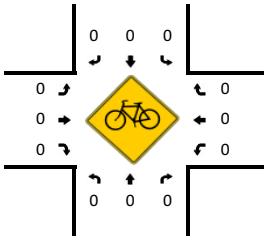
Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

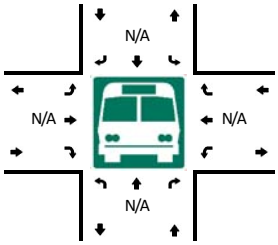


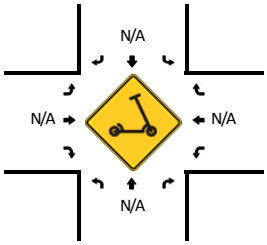


Quality Counts
DATA THAT DRIVES COMMUNITIES









5-Min Count Period Beginning At	SW Stafford Rd (Northbound)				SW Stafford Rd (Southbound)				SW Johnson Rd (Eastbound)				SW Johnson Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	46	3	0	3	52	0	0	0	0	0	0	3	0	4	0	111	
4:05 PM	0	31	3	0	6	51	0	0	0	0	0	0	5	0	3	0	99	
4:10 PM	0	45	6	0	6	63	0	0	0	0	0	0	1	0	2	0	123	
4:15 PM	0	51	1	0	6	43	0	0	0	0	0	0	2	0	4	0	107	
4:20 PM	0	56	4	0	4	48	0	0	0	0	0	0	0	0	2	0	114	
4:25 PM	0	59	3	0	7	51	0	0	0	0	0	0	4	0	1	0	125	
4:30 PM	0	49	4	0	6	46	0	0	0	0	0	0	3	0	1	0	109	
4:35 PM	0	64	5	0	6	51	0	0	0	0	0	0	3	0	7	0	136	
4:40 PM	0	66	4	0	6	44	0	1	0	0	0	0	2	0	3	0	126	
4:45 PM	0	49	5	0	8	37	0	0	0	0	0	0	4	0	2	0	105	
4:50 PM	0	39	7	0	10	39	0	0	0	0	0	0	3	0	0	0	98	
4:55 PM	0	31	0	0	7	30	0	0	0	0	0	0	3	0	1	0	72	1325
5:00 PM	0	53	4	0	7	46	0	0	0	0	0	0	2	0	2	0	114	1328
5:05 PM	0	45	2	0	7	39	0	0	0	0	0	0	2	0	8	0	103	1332
5:10 PM	0	52	5	0	11	32	0	0	0	0	0	0	2	0	0	0	102	1311
5:15 PM	0	39	3	0	14	32	0	0	0	0	0	0	1	0	1	0	90	1294
5:20 PM	0	47	5	0	5	31	0	0	0	0	0	0	1	0	4	0	93	1273
5:25 PM	0	29	5	0	4	36	0	0	0	0	0	0	1	0	2	0	77	1225
5:30 PM	0	41	2	0	6	39	0	0	0	0	0	0	1	0	3	0	92	1208
5:35 PM	0	28	1	0	6	27	0	0	0	0	0	0	0	0	3	0	65	1137
5:40 PM	0	40	4	0	2	32	0	0	0	0	0	0	1	0	1	0	80	1091
5:45 PM	0	35	3	0	7	35	0	0	0	0	0	0	2	0	1	0	83	1069
5:50 PM	0	27	2	0	3	28	0	0	0	0	0	0	3	0	2	0	65	1036
5:55 PM	0	21	1	0	4	25	0	0	0	0	0	0	2	0	3	0	56	1020

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	716	52	0	72	564	0	4	0	0	0	0	32	0	44	0	1484
Heavy Trucks	0	16	0		0	32	0		0	0	0		0	0	0		48
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

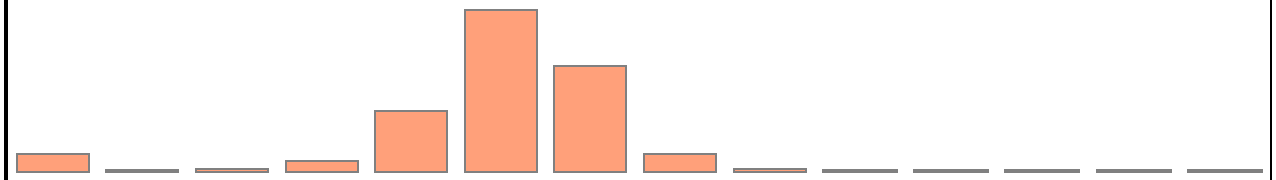
Comments:

Report generated on 12/23/2020 5:14 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 12 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	0	6	10	11	11	3	3	**2**	0	0	0	0	46	36-45	22
01:00 AM	0	0	1	0	1	3	4	5	1	0	0	0	0	0	15	41-50	9
02:00 AM	0	0	0	0	4	2	6	1	0	0	0	0	0	0	13	36-45	8
03:00 AM	0	0	**2**	0	0	3	3	2	1	0	0	0	0	0	11	36-45	6
04:00 AM	0	0	0	0	3	9	4	4	1	0	0	0	0	0	21	36-45	13
05:00 AM	1	0	0	1	5	11	18	5	1	0	0	0	0	0	42	36-45	29
06:00 AM	0	0	0	2	10	35	25	23	2	1	0	0	0	0	98	36-45	60
07:00 AM	8	0	0	7	41	79	67	15	3	0	0	0	0	0	220	36-45	146
08:00 AM	10	0	1	6	58	142	128	21	**5**	0	0	0	0	0	371	36-45	270
09:00 AM	19	0	1	14	76	230	199	22	4	0	0	0	0	0	565	36-45	429
10:00 AM	39	0	2	18	101	334	**243**	26	2	1	**1**	0	0	0	767	36-45	577
11:00 AM	**42**	0	1	**36**	**133**	**401**	232	**34**	4	0	0	0	0	0	**883**	36-45	633
12:00 PM	50	0	0	23	154	465	**295**	34	1	0	0	0	0	0	1022	36-45	760
01:00 PM	65	1	**15**	33	183	430	249	**50**	3	0	0	0	0	0	1029	36-45	679
02:00 PM	**81**	**7**	6	26	**187**	**482**	262	29	2	0	0	0	0	0	**1082**	36-45	744
03:00 PM	57	2	10	**51**	172	412	234	16	2	**1**	0	0	0	0	957	36-45	646
04:00 PM	50	0	1	20	154	396	197	26	2	1	0	0	0	0	847	36-45	593
05:00 PM	19	1	7	36	120	302	156	23	3	0	0	0	0	0	667	36-45	458
06:00 PM	8	0	1	7	69	197	176	19	3	1	0	0	0	0	481	36-45	373
07:00 PM	2	0	1	5	56	145	116	21	3	0	0	0	0	0	349	36-45	261
08:00 PM	5	0	0	7	48	112	89	22	2	1	0	0	0	**1**	287	36-45	201
09:00 PM	2	0	0	1	22	69	54	16	**4**	1	0	0	0	0	169	36-45	123
10:00 PM	1	0	1	2	14	51	44	9	2	0	0	0	0	0	124	36-45	95
11:00 PM	1	0	0	0	13	33	28	9	3	0	0	0	0	0	87	36-45	61
Day Total	460	11	50	301	1634	4354	2840	435	57	9	1	0	0	1	10153	36-45	7194
Percent	4.5%	0.1%	0.5%	3%	16.1%	42.9%	28%	4.3%	0.6%	0.1%	0%	0%	0%	0%			



AM Peak	11:00 AM	12:00 AM	3:00 AM	11:00 AM	11:00 AM	11:00 AM	10:00 AM	11:00 AM	8:00 AM	12:00 AM	10:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM		
Volume	42	0	2	36	133	401	243	34	5	2	1	0	0	0	883		
PM Peak	2:00 PM	2:00 PM	1:00 PM	3:00 PM	2:00 PM	2:00 PM	12:00 PM	1:00 PM	9:00 PM	3:00 PM	12:00 PM	12:00 PM	12:00 PM	8:00 PM	2:00 PM		
Volume	81	7	15	51	187	482	295	50	4	1	0	0	0	1	1082		

Comments:

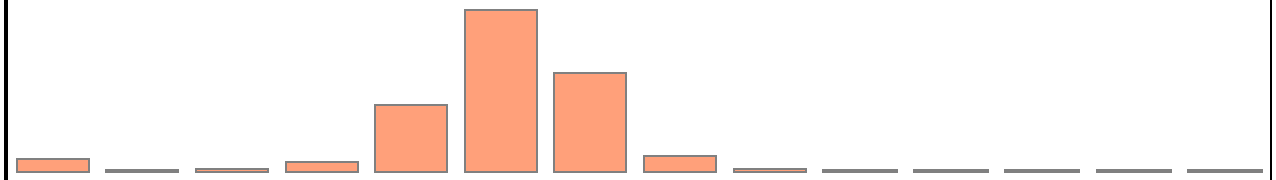
Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 13 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	1	0	8	14	9	3	0	0	0	0	0	0	35	36-45	23
01:00 AM	0	0	0	2	3	6	3	0	2	0	0	0	0	0	16	31-40	9
02:00 AM	0	0	0	0	4	2	2	1	0	0	0	0	0	0	9	31-40	6
03:00 AM	0	0	0	0	1	5	2	0	0	0	0	0	0	0	8	36-45	7
04:00 AM	0	0	0	2	3	11	2	0	0	0	0	0	0	0	18	31-40	14
05:00 AM	0	0	0	0	7	11	7	6	0	0	0	0	0	0	31	34-43	18
06:00 AM	0	0	1	2	19	23	12	3	1	0	0	0	0	0	61	31-40	42
07:00 AM	1	**1**	1	1	21	64	44	5	0	0	0	0	0	0	138	36-45	108
08:00 AM	2	0	0	4	27	101	97	25	**4**	0	0	0	0	0	260	36-45	198
09:00 AM	17	0	**3**	10	51	157	121	24	0	0	0	0	0	**1**	384	36-45	278
10:00 AM	17	0	3	9	80	264	179	21	3	**1**	0	0	0	0	577	36-45	443
11:00 AM	**32**	0	3	**21**	**133**	**281**	**214**	**35**	2	0	0	0	0	0	**721**	36-45	495
12:00 PM	32	**4**	4	24	**168**	325	213	25	**5**	0	0	0	0	0	800	36-45	538
01:00 PM	34	0	0	**30**	129	357	**226**	30	4	0	0	0	0	0	**810**	36-45	583
02:00 PM	26	1	4	13	147	**359**	206	**31**	0	0	0	0	0	0	787	36-45	565
03:00 PM	**36**	2	**8**	14	136	332	177	20	2	0	0	0	0	0	727	36-45	509
04:00 PM	34	0	0	4	119	320	152	20	1	**1**	0	0	0	0	651	36-45	472
05:00 PM	16	0	8	20	97	217	84	23	2	0	0	0	0	0	467	31-40	314
06:00 PM	7	0	1	11	90	167	97	16	0	0	0	0	0	0	389	36-45	264
07:00 PM	4	0	2	15	53	129	86	13	2	0	0	0	0	0	304	36-45	215
08:00 PM	0	0	0	4	38	80	58	15	0	1	0	0	0	0	196	36-45	138
09:00 PM	2	0	0	3	26	65	41	7	3	1	0	0	0	0	148	36-45	106
10:00 PM	0	0	0	4	14	31	27	6	3	1	0	0	0	0	86	36-45	58
11:00 PM	0	0	0	1	5	24	14	5	3	0	0	0	0	0	52	36-45	38
Day Total	260	8	39	194	1379	3345	2073	334	37	5	0	0	0	1	7675	36-45	5418
Percent	3.4%	0.1%	0.5%	2.5%	18%	43.6%	27%	4.4%	0.5%	0.1%	0%	0%	0%	0%			
AM Peak	11:00 AM	7:00 AM	9:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	11:00 AM	8:00 AM	10:00 AM	12:00 AM	12:00 AM	12:00 AM	9:00 AM	11:00 AM		
Volume	32	1	3	21	133	281	214	35	4	1	0	0	0	1	721		
PM Peak	3:00 PM	12:00 PM	3:00 PM	1:00 PM	12:00 PM	2:00 PM	1:00 PM	2:00 PM	12:00 PM	4:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	1:00 PM		
Volume	36	4	8	30	168	359	226	31	5	1	0	0	0	0	810		



Comments:

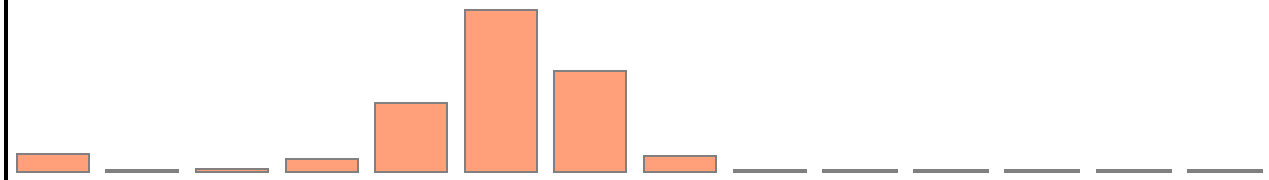
Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 14 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	0	2	0	8	5	2	1	0	0	0	0	0	18	36-45	13
01:00 AM	0	0	0	0	2	2	6	1	0	0	0	0	0	0	11	36-45	8
02:00 AM	0	0	0	0	6	7	4	1	1	0	0	0	0	0	19	31-40	13
03:00 AM	0	0	0	0	5	3	2	0	0	0	0	0	0	0	10	31-40	8
04:00 AM	0	0	1	2	7	11	7	5	0	0	0	0	0	0	33	34-43	18
05:00 AM	2	0	0	2	16	28	36	9	1	0	0	0	0	0	94	36-45	64
06:00 AM	1	0	0	4	44	125	84	**32**	**3**	0	0	0	0	0	293	36-45	209
07:00 AM	29	0	**22**	28	130	255	139	11	3	0	0	0	0	0	617	36-45	394
08:00 AM	37	0	7	**37**	**171**	325	152	23	2	0	**2**	**1**	0	**1**	758	31-40	496
09:00 AM	**47**	**1**	0	37	165	311	151	13	0	0	0	0	0	0	725	31-40	476
10:00 AM	39	1	5	9	126	335	195	28	1	**1**	0	0	0	0	740	36-45	530
11:00 AM	31	0	5	22	123	**350**	**231**	27	2	1	0	0	0	0	**792**	36-45	581
12:00 PM	38	2	3	21	141	346	233	38	2	1	0	0	0	0	825	36-45	579
01:00 PM	42	1	3	28	153	372	239	32	0	1	0	0	0	0	871	36-45	611
02:00 PM	**70**	6	9	27	143	375	**281**	**39**	2	0	0	0	0	0	952	36-45	656
03:00 PM	63	**14**	**14**	**41**	**213**	463	255	23	1	0	0	0	0	0	**1087**	36-45	718
04:00 PM	60	1	9	33	200	**494**	217	27	0	1	0	0	0	0	1042	36-45	711
05:00 PM	47	0	0	28	187	411	188	31	2	0	0	0	0	**1**	895	36-45	599
06:00 PM	6	0	0	14	92	215	194	29	2	0	0	0	0	0	552	36-45	409
07:00 PM	4	0	0	4	41	145	153	31	**5**	1	0	0	0	0	384	36-45	298
08:00 PM	4	0	0	3	33	87	73	20	1	1	0	0	0	0	222	36-45	160
09:00 PM	0	0	0	3	14	54	64	22	2	**3**	**1**	**1**	0	0	164	36-45	118
10:00 PM	0	1	0	2	7	24	29	7	4	1	1	1	**1**	0	78	36-45	53
11:00 PM	1	0	0	1	4	19	18	4	2	0	0	1	0	0	50	36-45	37
Day Total	521	27	78	348	2023	4765	2956	455	37	11	4	4	1	2	11232	36-45	7721
Percent	4.6%	0.2%	0.7%	3.1%	18%	42.4%	26.3%	4.1%	0.3%	0.1%	0%	0%	0%	0%			
AM Peak	9:00 AM	9:00 AM	7:00 AM	8:00 AM	8:00 AM	11:00 AM	11:00 AM	6:00 AM	6:00 AM	10:00 AM	8:00 AM	8:00 AM	12:00 AM	8:00 AM	11:00 AM		
Volume	47	1	22	37	171	350	231	32	3	1	2	1	0	1	792		
PM Peak	2:00 PM	3:00 PM	3:00 PM	3:00 PM	3:00 PM	4:00 PM	2:00 PM	2:00 PM	7:00 PM	9:00 PM	9:00 PM	9:00 PM	10:00 PM	5:00 PM	3:00 PM		
Volume	70	14	14	41	213	494	281	39	5	3	1	1	1	1	1087		



Comments:

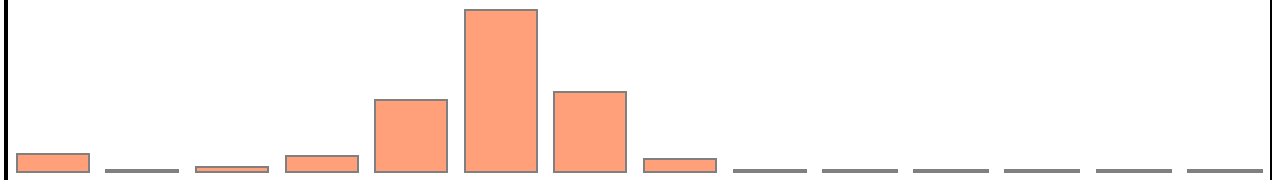
Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 15 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	0	2	0	7	12	2	**2**	**1**	0	0	0	0	26	36-45	19
01:00 AM	0	0	1	1	0	2	4	1	0	0	0	0	0	0	9	36-45	6
02:00 AM	0	0	1	0	0	1	2	1	2	0	0	0	0	0	7	41-50	3
03:00 AM	0	0	0	0	3	3	5	2	0	0	0	0	0	0	13	36-45	8
04:00 AM	0	0	0	1	6	10	5	6	1	1	0	0	0	0	30	31-40	16
05:00 AM	0	0	1	3	17	25	34	12	1	0	0	0	0	0	93	36-45	59
06:00 AM	6	0	0	3	30	135	117	16	2	0	0	0	0	0	309	36-45	252
07:00 AM	31	1	8	31	128	272	132	24	1	0	0	0	0	0	628	36-45	404
08:00 AM	**40**	1	8	**47**	**167**	342	163	17	0	0	0	0	0	**2**	787	31-40	509
09:00 AM	23	**5**	9	32	150	336	160	21	2	0	0	0	0	0	738	36-45	496
10:00 AM	33	0	**13**	17	139	361	154	19	1	1	0	0	0	0	738	36-45	515
11:00 AM	35	0	3	21	146	**411**	**189**	**25**	2	0	0	0	0	0	**832**	36-45	600
12:00 PM	40	3	8	37	147	386	**215**	19	1	0	0	0	0	**1**	857	36-45	601
01:00 PM	28	5	**14**	22	147	376	212	**27**	3	**1**	0	0	0	0	835	36-45	588
02:00 PM	49	3	13	28	190	433	193	23	2	0	0	0	0	0	934	36-45	626
03:00 PM	**79**	**8**	14	**77**	**280**	445	178	13	2	0	0	0	**1**	0	**1097**	31-40	725
04:00 PM	73	4	6	50	224	**507**	202	27	1	1	0	0	0	0	1095	31-40	731
05:00 PM	73	3	12	60	279	390	140	9	1	0	0	0	0	0	967	31-40	669
06:00 PM	19	2	8	28	120	278	135	13	**5**	0	0	0	0	0	608	36-45	413
07:00 PM	9	0	0	14	71	168	109	18	3	0	0	0	0	0	392	36-45	277
08:00 PM	6	0	0	3	24	108	92	22	1	1	0	0	0	0	257	36-45	200
09:00 PM	2	0	0	4	20	63	54	21	2	0	0	0	0	0	166	36-45	117
10:00 PM	0	0	0	1	6	45	13	15	1	0	0	0	0	0	81	36-45	58
11:00 PM	0	0	0	2	4	16	19	11	3	0	0	0	0	0	55	36-45	35
Day Total	546	35	119	484	2298	5120	2539	364	39	6	0	0	1	3	11554	36-45	7659
Percent	4.7%	0.3%	1%	4.2%	19.9%	44.3%	22%	3.2%	0.3%	0.1%	0%	0%	0%	0%			
AM Peak	8:00 AM	9:00 AM	10:00 AM	8:00 AM	8:00 AM	11:00 AM	11:00 AM	11:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	8:00 AM	11:00 AM		
Volume	40	5	13	47	167	411	189	25	2	1	0	0	0	2	832		
PM Peak	3:00 PM	3:00 PM	1:00 PM	3:00 PM	3:00 PM	4:00 PM	12:00 PM	1:00 PM	6:00 PM	1:00 PM	12:00 PM	12:00 PM	3:00 PM	12:00 PM	3:00 PM		
Volume	79	8	14	77	280	507	215	27	5	1	0	0	1	1	1097		



Comments:

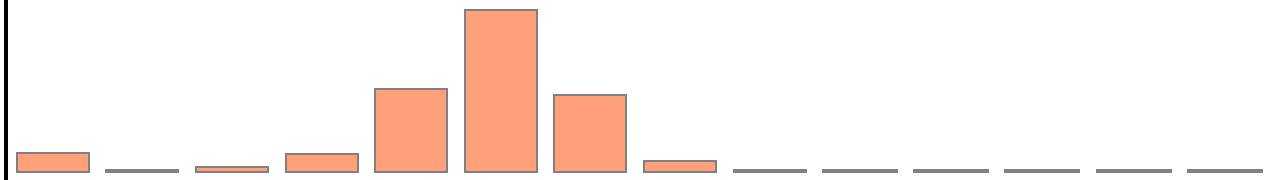
Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 16 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	0	0	6	6	9	1	1	**1**	0	0	0	0	24	36-45	15
01:00 AM	0	0	0	2	2	5	6	4	0	0	0	0	0	0	19	36-45	11
02:00 AM	0	0	0	0	3	8	3	1	0	0	0	0	0	0	15	31-40	11
03:00 AM	0	0	0	0	2	7	6	0	0	0	0	0	0	0	15	36-45	13
04:00 AM	0	0	0	1	1	9	13	6	0	0	0	0	0	0	30	36-45	22
05:00 AM	1	0	1	1	14	20	30	15	3	0	0	0	0	0	85	36-45	50
06:00 AM	4	0	1	7	39	104	105	26	3	1	0	0	0	0	290	36-45	209
07:00 AM	23	0	0	28	90	256	191	16	**4**	0	0	0	0	0	608	36-45	447
08:00 AM	39	1	4	**46**	127	344	191	**37**	2	0	0	0	0	0	791	36-45	535
09:00 AM	35	1	5	24	149	340	174	29	1	0	0	0	0	0	758	36-45	514
10:00 AM	37	0	3	32	144	**360**	183	18	1	0	0	0	0	0	778	36-45	543
11:00 AM	**75**	**10**	**12**	26	**189**	352	**193**	15	2	0	**1**	0	0	0	**875**	36-45	545
12:00 PM	**79**	6	8	43	257	434	147	9	0	0	0	0	0	0	983	31-40	691
01:00 PM	34	4	16	50	211	370	137	**20**	0	0	**1**	0	0	0	843	31-40	581
02:00 PM	58	0	2	34	232	429	166	14	1	0	0	0	0	0	936	31-40	661
03:00 PM	59	1	3	26	215	**505**	**167**	15	1	0	0	0	0	0	992	31-40	720
04:00 PM	61	2	16	80	**328**	459	152	13	1	**1**	0	0	0	0	**1113**	31-40	787
05:00 PM	61	**7**	**22**	**90**	313	363	128	13	0	0	0	0	0	0	997	31-40	676
06:00 PM	20	5	15	40	138	273	107	11	1	0	0	0	0	0	610	31-40	411
07:00 PM	4	0	0	9	54	206	94	20	0	0	0	0	0	0	387	36-45	300
08:00 PM	0	0	0	2	46	84	79	10	1	0	0	0	0	0	222	36-45	163
09:00 PM	0	0	0	4	22	70	74	14	**3**	0	0	0	0	0	187	36-45	144
10:00 PM	0	0	0	3	13	46	41	7	2	0	0	0	0	0	112	36-45	87
11:00 PM	0	0	0	1	13	22	7	3	2	0	0	0	0	0	48	31-40	35
Day Total	590	37	108	549	2608	5072	2403	317	29	3	2	0	0	0	11718	31-40	7680
Percent	5%	0.3%	0.9%	4.7%	22.3%	43.3%	20.5%	2.7%	0.2%	0%	0%	0%	0%	0%			
AM Peak	11:00 AM	11:00 AM	11:00 AM	8:00 AM	11:00 AM	10:00 AM	11:00 AM	8:00 AM	7:00 AM	12:00 AM	11:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM		
Volume	75	10	12	46	189	360	193	37	4	1	1	0	0	0	875		
PM Peak	12:00 PM	5:00 PM	5:00 PM	5:00 PM	4:00 PM	3:00 PM	3:00 PM	1:00 PM	9:00 PM	4:00 PM	1:00 PM	12:00 PM	12:00 PM	12:00 PM	4:00 PM		
Volume	79	7	22	90	328	505	167	20	3	1	1	0	0	0	1113		



Comments:

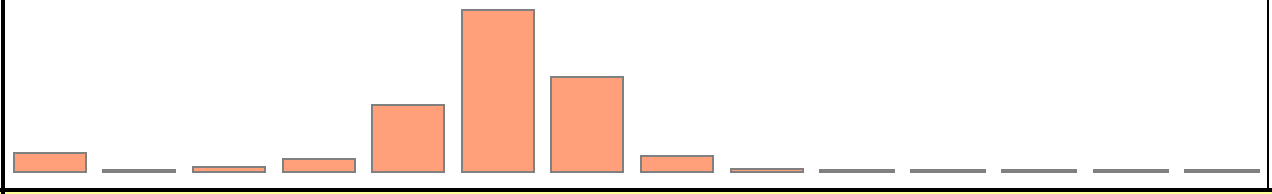
Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 17 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	0	2	2	11	8	2	0	**2**	0	0	0	0	27	36-45	19
01:00 AM	0	0	0	0	4	4	1	0	0	0	0	0	0	0	9	31-40	8
02:00 AM	0	0	0	0	0	4	3	2	0	0	0	0	0	0	9	36-45	7
03:00 AM	0	0	0	0	1	5	0	0	0	0	0	0	0	0	6	31-40	6
04:00 AM	3	0	1	1	0	9	10	6	1	0	0	0	0	0	31	36-45	19
05:00 AM	2	0	0	3	13	34	28	14	3	0	0	0	0	0	97	36-45	62
06:00 AM	6	0	0	3	43	112	106	24	**6**	2	0	0	0	0	302	36-45	218
07:00 AM	23	**3**	**15**	**35**	121	271	173	20	0	0	0	0	0	**1**	662	36-45	444
08:00 AM	35	0	4	32	**151**	348	179	22	2	0	0	0	0	0	773	36-45	527
09:00 AM	33	0	4	17	117	**370**	187	27	1	0	0	0	0	0	756	36-45	557
10:00 AM	23	0	11	10	127	287	**234**	**40**	2	0	0	0	0	0	734	36-45	521
11:00 AM	**45**	1	6	23	140	355	232	34	2	2	0	0	0	0	**840**	36-45	587
12:00 PM	51	3	**31**	19	158	387	**231**	26	5	0	0	0	0	0	911	36-45	618
01:00 PM	58	0	6	20	169	370	218	31	3	0	0	0	0	0	875	36-45	588
02:00 PM	55	6	8	35	218	449	207	30	3	0	0	0	0	0	1011	31-40	667
03:00 PM	64	4	10	44	225	**541**	213	26	4	0	0	0	0	**1**	1132	31-40	766
04:00 PM	**84**	**8**	17	**56**	**271**	526	185	22	3	1	0	0	0	0	**1173**	31-40	797
05:00 PM	61	1	7	33	151	412	225	21	4	0	0	0	0	0	915	36-45	637
06:00 PM	23	1	4	23	110	252	173	25	**7**	1	0	0	0	0	619	36-45	425
07:00 PM	2	0	0	4	46	152	155	29	3	0	0	0	0	0	391	36-45	307
08:00 PM	3	0	0	1	31	109	141	**32**	2	1	0	0	0	0	320	36-45	250
09:00 PM	0	0	0	1	18	71	61	20	5	1	0	0	0	0	177	36-45	132
10:00 PM	0	0	0	2	11	31	33	17	6	0	**1**	0	0	0	101	36-45	64
11:00 PM	0	0	0	0	13	17	16	9	2	**2**	0	0	0	0	59	36-45	33
Day Total	571	27	124	364	2140	5127	3019	479	64	12	1	0	0	2	11930	36-45	8146
Percent	4.8%	0.2%	1%	3.1%	17.9%	43%	25.3%	4%	0.5%	0.1%	0%	0%	0%	0%			
AM Peak	11:00 AM	7:00 AM	7:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	10:00 AM	6:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	7:00 AM	11:00 AM		
Volume	45	3	15	35	151	370	234	40	6	2	0	0	0	1	840		
PM Peak	4:00 PM	4:00 PM	12:00 PM	4:00 PM	4:00 PM	3:00 PM	12:00 PM	8:00 PM	6:00 PM	11:00 PM	10:00 PM	12:00 PM	12:00 PM	3:00 PM	4:00 PM		
Volume	84	8	31	56	271	541	231	32	7	2	1	0	0	1	1173		



Comments:

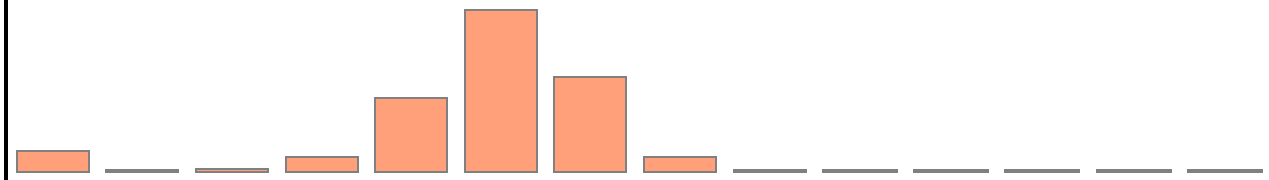
Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 18 2020

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	0	0	2	2	6	14	3	2	**1**	0	0	0	0	30	36-45	20
01:00 AM	0	0	0	0	0	6	6	4	0	0	**1**	0	0	0	17	36-45	12
02:00 AM	0	0	0	0	2	9	5	1	0	0	0	0	0	0	17	36-45	14
03:00 AM	0	0	0	1	1	5	3	1	0	0	0	0	0	0	11	36-45	8
04:00 AM	0	0	0	3	0	7	8	14	2	0	0	0	0	0	34	41-50	22
05:00 AM	3	0	0	4	17	15	30	16	3	0	0	0	0	0	88	41-50	46
06:00 AM	7	5	0	6	33	89	116	31	2	0	0	0	0	0	289	36-45	205
07:00 AM	16	1	0	15	103	241	180	27	**5**	0	0	0	0	0	588	36-45	421
08:00 AM	31	**13**	**12**	22	104	311	204	41	3	0	0	0	0	0	741	36-45	515
09:00 AM	29	2	10	18	130	301	**241**	22	0	0	0	0	0	0	753	36-45	542
10:00 AM	41	0	7	17	105	369	232	36	1	0	0	0	0	0	808	36-45	601
11:00 AM	**43**	0	5	**24**	**137**	**410**	238	**51**	2	0	0	0	0	0	**910**	36-45	648
12:00 PM	54	2	4	34	187	431	**291**	**34**	2	0	0	0	0	**1**	1040	36-45	722
01:00 PM	60	0	4	29	206	435	189	15	2	0	0	0	0	0	940	31-40	641
02:00 PM	76	7	**12**	45	209	449	234	28	1	0	**1**	0	0	1	1063	36-45	683
03:00 PM	**105**	3	11	51	223	**497**	236	32	3	**2**	0	0	0	0	**1163**	36-45	733
04:00 PM	74	**9**	11	**57**	**246**	494	206	21	1	1	0	0	0	1	1121	31-40	740
05:00 PM	46	1	1	35	214	389	194	16	0	0	0	0	0	0	896	31-40	603
06:00 PM	20	0	3	33	173	221	103	6	0	0	0	0	0	0	559	31-40	394
07:00 PM	6	1	1	15	94	160	80	16	1	0	0	0	0	0	374	31-40	254
08:00 PM	5	0	1	9	52	102	73	13	4	0	0	0	0	0	259	36-45	175
09:00 PM	4	0	1	7	39	78	63	7	3	1	0	0	0	0	203	36-45	141
10:00 PM	0	0	1	6	16	59	50	15	**6**	0	0	0	0	0	153	36-45	109
11:00 PM	1	0	0	6	16	35	14	6	1	0	0	0	0	0	79	31-40	51
Day Total	621	44	84	439	2309	5119	3010	456	44	5	2	0	0	3	12136	36-45	8129
Percent	5.1%	0.4%	0.7%	3.6%	19%	42.2%	24.8%	3.8%	0.4%	0%	0%	0%	0%	0%			



AM Peak	11:00 AM	8:00 AM	8:00 AM	11:00 AM	11:00 AM	11:00 AM	9:00 AM	11:00 AM	7:00 AM	12:00 AM	1:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM		
Volume	43	13	12	24	137	410	241	51	5	1	1	0	0	0	910		
PM Peak	3:00 PM	4:00 PM	2:00 PM	4:00 PM	4:00 PM	3:00 PM	12:00 PM	12:00 PM	10:00 PM	3:00 PM	2:00 PM	12:00 PM	12:00 PM	12:00 PM	3:00 PM		
Volume	105	9	12	57	246	497	291	34	6	2	1	0	0	1	1163		

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

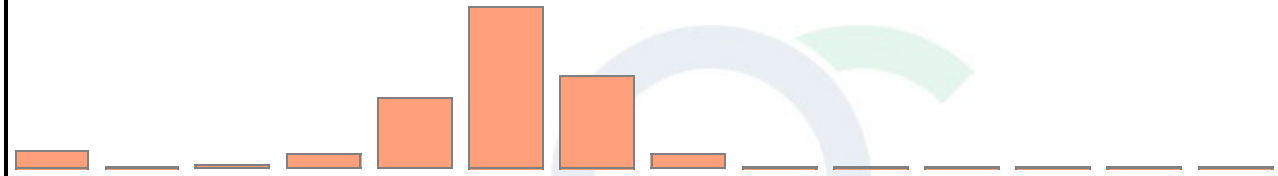
Type of report: Tube Count - Speed Data

SUMMARY - Tube Count - Speed Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 12 2020 - Dec 18 2020

Speed Range	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
Grand Total	3569	189	602	2679	14391	32902	18840	2840	307	51	10	4	2	12	76398	36-45	51742
Percent	4.7%	0.2%	0.8%	3.5%	18.8%	43.1%	24.7%	3.7%	0.4%	0.1%	0%	0%	0%	0%			
Cumulative Percent	4.7%	4.9%	5.7%	9.2%	28.1%	71.1%	95.8%	99.5%	99.9%	100%	100%	100%	100%	100%			

ADT
10914



85th Percentile: 42 MPH
Mean Speed(Average): 37 MPH
Median: 37 MPH
Mode: 38 MPH

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Quality Counts
DATA THAT DRIVES COMMUNITIES

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 12 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	41	5	0	0	0	0	0	0	0	0	0	0	0	46
01:00 AM	0	13	2	0	0	0	0	0	0	0	0	0	0	0	15
02:00 AM	0	10	2	0	0	0	0	1	0	0	0	0	0	0	13
03:00 AM	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
04:00 AM	0	14	5	0	1	0	0	1	0	0	0	0	0	0	21
05:00 AM	0	29	10	0	2	1	0	0	0	0	0	0	0	0	42
06:00 AM	1	70	19	0	8	0	0	0	0	0	0	0	0	0	98
07:00 AM	0	151	42	0	17	0	0	2	0	0	0	0	0	8	220
08:00 AM	0	236	84	2	28	**2**	0	**9**	0	0	0	0	0	10	371
09:00 AM	0	402	109	**3**	24	0	0	8	0	0	0	0	0	19	565
10:00 AM	3	581	109	0	34	1	0	2	0	0	0	0	0	37	767
11:00 AM	**4**	**655**	**140**	0	**38**	2	0	4	0	0	0	0	0	**40**	**883**
12:00 PM	4	727	**178**	1	**57**	**1**	0	**8**	0	0	0	0	0	46	1022
01:00 PM	6	763	162	1	31	1	**1**	7	0	0	0	0	0	57	1029
02:00 PM	**9**	**783**	172	**2**	35	0	0	3	0	0	0	0	0	**78**	**1082**
03:00 PM	9	709	141	2	37	0	0	2	0	0	0	0	0	57	957
04:00 PM	1	633	128	1	32	1	0	4	0	0	0	0	0	47	847
05:00 PM	1	516	102	0	27	0	0	3	0	0	0	0	0	18	667
06:00 PM	1	389	70	0	14	0	0	0	0	0	0	0	0	7	481
07:00 PM	0	292	46	0	9	0	0	0	0	0	0	0	0	2	349
08:00 PM	0	232	42	0	8	0	0	0	0	0	0	0	0	5	287
09:00 PM	0	137	23	0	7	0	0	0	0	0	0	0	0	2	169
10:00 PM	0	102	17	0	4	0	0	0	0	0	0	0	0	1	124
11:00 PM	0	70	15	0	1	0	0	0	0	0	0	0	0	1	87
Day Total	39	7564	1625	12	414	9	1	54	0	0	0	0	0	435	10153
Percent	0.4%	74.5%	16%	0.1%	4.1%	0.1%	0%	0.5%	0%	0%	0%	0%	0%	4.3%	
ADT 10153															
AM Peak	11:00 AM	11:00 AM	11:00 AM	9:00 AM	11:00 AM	8:00 AM	12:00 AM	8:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM	11:00 AM
Volume	4	655	140	3	38	2	0	9	0	0	0	0	0	40	883
PM Peak	2:00 PM	2:00 PM	12:00 PM	2:00 PM	12:00 PM	12:00 PM	1:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	2:00 PM	2:00 PM
Volume	9	783	178	2	57	1	1	8	0	0	0	0	0	78	1082

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 13 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	31	4	0	0	0	0	0	0	0	0	0	0	0	35
01:00 AM	0	15	1	0	0	0	0	0	0	0	0	0	0	0	16
02:00 AM	0	8	1	0	0	0	0	0	0	0	0	0	0	0	9
03:00 AM	0	7	1	0	0	0	0	0	0	0	0	0	0	0	8
04:00 AM	0	16	0	0	2	0	0	0	0	0	0	0	0	0	18
05:00 AM	0	29	2	0	0	0	0	0	0	0	0	0	0	0	31
06:00 AM	0	44	16	0	1	0	0	0	0	0	0	0	0	0	61
07:00 AM	0	111	19	0	7	0	0	0	0	0	0	0	0	1	138
08:00 AM	0	198	54	0	4	0	0	2	0	0	0	0	0	2	260
09:00 AM	0	289	61	0	16	0	0	1	0	0	0	0	0	17	384
10:00 AM	2	429	115	0	15	0	0	0	0	0	0	0	0	16	577
11:00 AM	0	560	97	0	28	0	0	4	0	0	0	0	0	32	721
12:00 PM	2	620	125	0	22	0	0	1	0	0	0	0	0	30	800
01:00 PM	1	617	129	0	28	0	0	1	0	0	0	0	0	34	810
02:00 PM	0	624	105	0	30	0	0	2	0	0	0	0	0	26	787
03:00 PM	0	556	109	0	24	1	0	5	0	0	0	0	0	32	727
04:00 PM	0	481	111	0	21	1	0	3	0	0	0	0	0	34	651
05:00 PM	0	363	68	0	20	0	0	0	0	0	0	0	0	16	467
06:00 PM	1	302	65	1	11	0	0	2	0	0	0	0	0	7	389
07:00 PM	0	248	42	0	10	0	0	0	0	0	0	0	0	4	304
08:00 PM	0	154	30	0	12	0	0	0	0	0	0	0	0	0	196
09:00 PM	0	122	20	0	4	0	0	0	0	0	0	0	0	2	148
10:00 PM	0	76	8	0	2	0	0	0	0	0	0	0	0	0	86
11:00 PM	0	45	7	0	0	0	0	0	0	0	0	0	0	0	52
Day Total	6	5945	1190	1	257	2	0	21	0	0	0	0	0	253	7675
Percent	0.1%	77.5%	15.5%	0%	3.3%	0%	0%	0.3%	0%	0%	0%	0%	0%	3.3%	
ADT 7675															
AM Peak	10:00 AM	11:00 AM	10:00 AM	12:00 AM	11:00 AM	12:00 AM	12:00 AM	11:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM	11:00 AM
Volume	2	560	115	0	28	0	0	4	0	0	0	0	0	32	721
PM Peak	12:00 PM	2:00 PM	1:00 PM	6:00 PM	2:00 PM	3:00 PM	12:00 PM	3:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	1:00 PM	1:00 PM
Volume	2	624	129	1	30	1	0	5	0	0	0	0	0	34	810

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 14 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	16	2	0	0	0	0	0	0	0	0	0	0	0	18
01:00 AM	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
02:00 AM	0	16	3	0	0	0	0	0	0	0	0	0	0	0	19
03:00 AM	0	6	3	0	1	0	0	0	0	0	0	0	0	0	10
04:00 AM	0	28	5	0	0	0	0	0	0	0	0	0	0	0	33
05:00 AM	1	73	10	0	5	2	0	1	0	0	0	0	0	2	94
06:00 AM	0	204	59	0	25	2	0	1	**1**	0	0	0	0	1	293
07:00 AM	1	398	119	2	52	6	1	5	0	**3**	0	0	**1**	29	617
08:00 AM	1	465	**164**	3	**70**	2	2	**14**	1	1	0	0	0	35	758
09:00 AM	**2**	468	122	**5**	61	5	2	14	0	3	0	0	0	**43**	725
10:00 AM	2	468	149	2	65	3	2	13	0	1	0	0	1	34	740
11:00 AM	0	**546**	135	5	56	**7**	**4**	7	0	0	0	0	0	32	**792**
12:00 PM	2	549	175	**5**	47	1	1	7	0	**1**	0	0	0	37	825
01:00 PM	2	598	153	4	60	**4**	**4**	4	0	0	0	0	0	42	871
02:00 PM	**6**	624	170	0	**68**	3	0	**14**	0	0	0	0	0	**67**	952
03:00 PM	5	**759**	**184**	4	68	3	2	4	0	0	0	0	0	58	**1087**
04:00 PM	4	743	173	2	52	2	2	7	0	0	0	0	0	57	1042
05:00 PM	3	672	129	1	39	0	0	4	0	0	0	0	0	47	895
06:00 PM	0	446	78	1	21	0	0	0	0	0	0	0	0	6	552
07:00 PM	0	326	38	1	14	0	0	1	0	0	0	0	0	4	384
08:00 PM	0	175	34	0	9	0	0	0	0	0	0	0	0	4	222
09:00 PM	0	127	31	0	6	0	0	0	0	0	0	0	0	0	164
10:00 PM	0	69	7	0	2	0	0	0	0	0	0	0	0	0	78
11:00 PM	0	43	4	0	2	0	0	0	0	0	0	0	0	1	50
Day Total	29	7828	1949	35	723	40	20	96	2	9	0	0	2	499	11232
Percent	0.3%	69.7%	17.4%	0.3%	6.4%	0.4%	0.2%	0.9%	0%	0.1%	0%	0%	0%	4.4%	
ADT 11232															
AM Peak	9:00 AM	11:00 AM	8:00 AM	9:00 AM	8:00 AM	11:00 AM	11:00 AM	8:00 AM	6:00 AM	7:00 AM	12:00 AM	12:00 AM	7:00 AM	9:00 AM	11:00 AM
Volume	2	546	164	5	70	7	4	14	1	3	0	0	1	43	792
PM Peak	2:00 PM	3:00 PM	3:00 PM	12:00 PM	2:00 PM	1:00 PM	1:00 PM	2:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	2:00 PM	3:00 PM
Volume	6	759	184	5	68	4	4	14	0	1	0	0	0	67	1087

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 15 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	19	6	0	1	0	0	0	0	0	0	0	0	0	26
01:00 AM	0	7	2	0	0	0	0	0	0	0	0	0	0	0	9
02:00 AM	0	5	2	0	0	0	0	0	0	0	0	0	0	0	7
03:00 AM	0	9	2	0	1	0	0	1	0	0	0	0	0	0	13
04:00 AM	0	23	7	0	0	0	0	0	0	0	0	0	0	0	30
05:00 AM	0	76	12	0	5	0	0	0	0	0	0	0	0	0	93
06:00 AM	0	215	59	1	25	1	1	1	0	0	0	0	0	6	309
07:00 AM	**3**	394	111	6	69	4	1	11	**1**	0	0	0	0	28	628
08:00 AM	0	476	**169**	**9**	70	5	**5**	**13**	0	0	0	0	0	**40**	787
09:00 AM	1	468	155	4	71	5	4	8	0	0	0	0	0	22	738
10:00 AM	0	483	140	2	61	**7**	2	10	0	0	0	0	0	33	738
11:00 AM	2	**561**	145	3	**74**	4	0	10	0	0	0	0	0	33	**832**
12:00 PM	1	571	161	3	64	**5**	0	12	0	0	0	0	0	40	857
01:00 PM	0	558	160	**6**	66	2	**2**	**14**	0	0	0	0	0	27	835
02:00 PM	1	617	193	1	59	5	0	13	0	0	0	0	0	45	934
03:00 PM	**3**	716	212	4	**71**	3	2	9	0	0	0	0	0	**77**	**1097**
04:00 PM	1	**746**	**216**	3	48	1	1	8	0	0	0	0	0	71	1095
05:00 PM	3	691	152	0	44	1	0	3	0	0	0	0	0	73	967
06:00 PM	1	486	72	0	31	0	0	0	0	0	0	0	0	18	608
07:00 PM	1	316	45	2	18	0	0	2	0	0	0	0	0	8	392
08:00 PM	0	208	37	1	5	0	0	0	0	0	0	0	0	6	257
09:00 PM	0	139	19	0	6	0	0	0	0	0	0	0	0	2	166
10:00 PM	0	72	7	0	2	0	0	0	0	0	0	0	0	0	81
11:00 PM	0	49	6	0	0	0	0	0	0	0	0	0	0	0	55
Day Total	17	7905	2090	45	791	43	18	115	1	0	0	0	0	529	11554
Percent	0.1%	68.4%	18.1%	0.4%	6.8%	0.4%	0.2%	1%	0%	0%	0%	0%	0%	4.6%	
ADT 11554															
AM Peak	7:00 AM	11:00 AM	8:00 AM	8:00 AM	11:00 AM	10:00 AM	8:00 AM	8:00 AM	7:00 AM	12:00 AM	12:00 AM	12:00 AM	12:00 AM	8:00 AM	11:00 AM
Volume	3	561	169	9	74	7	5	13	1	0	0	0	0	40	832
PM Peak	3:00 PM	4:00 PM	4:00 PM	1:00 PM	3:00 PM	12:00 PM	1:00 PM	1:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	3:00 PM	3:00 PM
Volume	3	746	216	6	71	5	2	14	0	0	0	0	0	77	1097

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 16 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	24	0	0	0	0	0	0	0	0	0	0	0	0	24
01:00 AM	0	17	2	0	0	0	0	0	0	0	0	0	0	0	19
02:00 AM	0	10	3	0	1	0	0	1	0	0	0	0	0	0	15
03:00 AM	0	11	2	0	2	0	0	0	0	0	0	0	0	0	15
04:00 AM	0	25	4	0	1	0	0	0	0	0	0	0	0	0	30
05:00 AM	0	70	10	0	4	0	0	0	0	0	0	0	0	1	85
06:00 AM	1	202	60	0	19	1	0	2	**1**	0	0	0	0	4	290
07:00 AM	2	405	121	1	47	0	1	9	0	0	0	0	0	22	608
08:00 AM	0	488	**174**	6	65	6	1	11	0	**1**	0	0	0	39	791
09:00 AM	1	489	139	**9**	**70**	4	0	11	0	0	0	0	0	35	758
10:00 AM	3	516	141	5	53	7	**2**	**14**	0	0	0	0	0	37	778
11:00 AM	**4**	**568**	153	7	60	**9**	0	12	1	1	0	0	0	**60**	**875**
12:00 PM	2	620	**202**	**4**	**61**	**5**	1	**13**	0	0	0	0	0	**75**	983
01:00 PM	1	590	153	4	51	4	**2**	6	0	0	0	0	0	32	843
02:00 PM	0	669	151	0	47	3	2	6	0	0	0	0	0	58	936
03:00 PM	0	700	164	3	61	0	0	5	0	0	0	0	0	59	992
04:00 PM	1	**798**	192	0	54	0	0	7	0	0	0	0	0	61	**1113**
05:00 PM	**4**	723	175	1	51	1	0	0	0	0	0	0	0	42	997
06:00 PM	3	468	88	0	33	0	0	0	0	0	0	0	0	18	610
07:00 PM	0	292	58	1	31	0	0	1	0	0	0	0	0	4	387
08:00 PM	0	177	37	0	8	0	0	0	0	0	0	0	0	0	222
09:00 PM	0	159	22	0	6	0	0	0	0	0	0	0	0	0	187
10:00 PM	0	96	12	0	4	0	0	0	0	0	0	0	0	0	112
11:00 PM	0	41	6	0	1	0	0	0	0	0	0	0	0	0	48
Day Total	22	8158	2069	41	730	40	9	98	2	2	0	0	0	547	11718
Percent	0.2%	69.6%	17.7%	0.3%	6.2%	0.3%	0.1%	0.8%	0%	0%	0%	0%	0%	4.7%	
ADT 11718															
AM Peak	11:00 AM	11:00 AM	8:00 AM	9:00 AM	9:00 AM	11:00 AM	10:00 AM	10:00 AM	6:00 AM	8:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM	11:00 AM
Volume	4	568	174	9	70	9	2	14	1	1	0	0	0	60	875
PM Peak	5:00 PM	4:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	1:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	4:00 PM
Volume	4	798	202	4	61	5	2	13	0	0	0	0	0	75	1113

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 17 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	24	3	0	0	0	0	0	0	0	0	0	0	0	27
01:00 AM	0	7	2	0	0	0	0	0	0	0	0	0	0	0	9
02:00 AM	0	5	4	0	0	0	0	0	0	0	0	0	0	0	9
03:00 AM	0	5	0	0	1	0	0	0	0	0	0	0	0	0	6
04:00 AM	0	19	6	0	3	0	0	0	0	0	0	0	0	3	31
05:00 AM	0	71	10	0	11	3	0	0	0	0	0	0	0	2	97
06:00 AM	1	212	57	0	19	5	0	2	0	0	0	0	0	6	302
07:00 AM	0	426	124	**7**	74	3	0	5	0	0	0	0	0	23	662
08:00 AM	1	507	**155**	4	52	7	0	**12**	0	0	0	0	0	35	773
09:00 AM	**2**	481	142	4	**77**	**8**	0	10	0	0	0	0	0	32	756
10:00 AM	0	489	147	1	56	8	**1**	9	0	0	0	0	0	23	734
11:00 AM	0	**568**	155	2	53	8	1	8	0	**1**	0	0	0	**44**	**840**
12:00 PM	3	600	156	**9**	74	**7**	1	**14**	0	0	0	0	0	47	911
01:00 PM	1	596	135	6	70	3	1	6	0	0	0	0	0	57	875
02:00 PM	2	687	170	5	**78**	3	**2**	9	0	0	0	0	0	55	1011
03:00 PM	1	759	**221**	2	72	5	0	8	0	0	0	0	0	64	1132
04:00 PM	**6**	**799**	214	1	67	1	0	6	0	0	0	0	0	**79**	**1173**
05:00 PM	2	672	138	0	38	0	0	6	0	0	0	0	0	59	915
06:00 PM	0	487	84	0	22	0	0	3	0	0	0	0	0	23	619
07:00 PM	0	305	65	1	17	0	0	1	0	0	0	0	0	2	391
08:00 PM	0	253	58	1	5	0	0	0	0	0	0	0	0	3	320
09:00 PM	0	143	25	0	9	0	0	0	0	0	0	0	0	0	177
10:00 PM	0	87	13	0	1	0	0	0	0	0	0	0	0	0	101
11:00 PM	0	52	6	0	1	0	0	0	0	0	0	0	0	0	59
Day Total	19	8254	2090	43	800	61	6	99	0	1	0	0	0	557	11930
Percent	0.2%	69.2%	17.5%	0.4%	6.7%	0.5%	0.1%	0.8%	0%	0%	0%	0%	0%	4.7%	
ADT 11930															
AM Peak	9:00 AM	11:00 AM	8:00 AM	7:00 AM	9:00 AM	9:00 AM	10:00 AM	8:00 AM	12:00 AM	11:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM	11:00 AM
Volume	2	568	155	7	77	8	1	12	0	1	0	0	0	44	840
PM Peak	4:00 PM	4:00 PM	3:00 PM	12:00 PM	2:00 PM	12:00 PM	2:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	4:00 PM	4:00 PM
Volume	6	799	221	9	78	7	2	14	0	0	0	0	0	79	1173

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 18 2020

Start Time	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
12:00 AM	0	25	5	0	0	0	0	0	0	0	0	0	0	0	30
01:00 AM	0	16	1	0	0	0	0	0	0	0	0	0	0	0	17
02:00 AM	0	12	5	0	0	0	0	0	0	0	0	0	0	0	17
03:00 AM	0	10	0	0	1	0	0	0	0	0	0	0	0	0	11
04:00 AM	0	27	7	0	0	0	0	0	0	0	0	0	0	0	34
05:00 AM	0	67	7	0	8	3	0	0	0	0	0	0	0	3	88
06:00 AM	0	195	64	1	20	2	0	0	0	0	0	0	0	7	289
07:00 AM	**1**	385	126	1	46	7	1	6	0	0	0	0	0	15	588
08:00 AM	1	469	161	4	50	**13**	2	15	0	0	0	0	0	26	741
09:00 AM	0	489	154	**5**	52	10	1	13	0	0	0	0	0	29	753
10:00 AM	1	501	**187**	4	44	9	**3**	**17**	0	**1**	0	0	0	41	808
11:00 AM	1	**603**	178	5	**61**	10	0	8	0	1	0	0	0	**43**	**910**
12:00 PM	**6**	706	192	**8**	57	4	**2**	11	0	0	0	0	0	54	1040
01:00 PM	5	614	182	6	54	**5**	1	**14**	0	0	0	0	0	59	940
02:00 PM	3	715	189	4	**62**	4	0	14	0	0	0	0	0	72	1063
03:00 PM	5	776	**221**	5	45	2	0	9	0	0	0	0	0	**100**	**1163**
04:00 PM	1	**784**	200	2	55	2	1	6	0	0	0	0	0	70	1121
05:00 PM	0	662	154	2	28	0	0	4	0	0	0	0	0	46	896
06:00 PM	2	443	71	0	20	0	0	3	0	0	0	0	0	20	559
07:00 PM	0	309	43	1	14	0	0	1	0	0	0	0	0	6	374
08:00 PM	0	211	31	1	11	0	0	0	0	0	0	0	0	5	259
09:00 PM	0	155	36	0	8	0	0	0	0	0	0	0	0	4	203
10:00 PM	0	137	14	0	2	0	0	0	0	0	0	0	0	0	153
11:00 PM	0	68	8	0	2	0	0	0	0	0	0	0	0	1	79
Day Total	26	8379	2236	49	640	71	11	121	0	2	0	0	0	601	12136
Percent	0.2%	69%	18.4%	0.4%	5.3%	0.6%	0.1%	1%	0%	0%	0%	0%	0%	5%	
ADT 12136															
AM Peak	7:00 AM	11:00 AM	10:00 AM	9:00 AM	11:00 AM	8:00 AM	10:00 AM	10:00 AM	12:00 AM	10:00 AM	12:00 AM	12:00 AM	12:00 AM	11:00 AM	11:00 AM
Volume	1	603	187	5	61	13	3	17	0	1	0	0	0	43	910
PM Peak	12:00 PM	4:00 PM	3:00 PM	12:00 PM	2:00 PM	1:00 PM	12:00 PM	1:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	12:00 PM	3:00 PM	3:00 PM
Volume	6	784	221	8	62	5	2	14	0	0	0	0	0	100	1163

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Vehicle Classification Data

SUMMARY - Tube Count - Vehicle Classification Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
SPECIFIC LOCATION:
CITY/STATE: Stafford, OR

QC JOB #: 15336009
DIRECTION: NB, SB
DATE: Dec 12 2020

	Motorcycles	Cars & Trailer	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axle Double	5 Axle Double	>6 Axle Double	<6 Axle Multi	6 Axle Multi	>6 Axle Multi	Not Classified	Total
Grand Total	158	54033	13249	226	4355	266	65	604	5	14	0	0	2	3421	76398
Percent	0.2%	70.7%	17.3%	0.3%	5.7%	0.3%	0.1%	0.8%	0%	0%	0%	0%	0%	4.5%	
ADT 10914															

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Quality Counts
DATA THAT DRIVES COMMUNITIES

Type of report: Tube Count - Volume Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd | **QC JOB #:** 15336009

SPECIFIC LOCATION: | **DIRECTION:** NB, SB

CITY/STATE: Stafford, OR | **DATE:** Dec 12 2020 - Dec 18 2020

Start Time	Mon	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat 12 Dec 20	Sun 13 Dec 20	Average Week Hourly Traffic	Average Week Profile
12:00 AM							46	35	41	
01:00 AM							15	16	16	
02:00 AM							13	9	11	
03:00 AM							11	8	10	
04:00 AM							21	18	20	
05:00 AM							42	31	37	
06:00 AM							98	61	80	
07:00 AM							220	138	179	
08:00 AM							371	260	316	
09:00 AM							565	384	475	
10:00 AM							767	577	672	
11:00 AM							**883**	**721**	802	
12:00 PM							1022	800	911	
01:00 PM							1029	**810**	920	
02:00 PM							**1082**	787	935	
03:00 PM							957	727	842	
04:00 PM							847	651	749	
05:00 PM							667	467	567	
06:00 PM							481	389	435	
07:00 PM							349	304	327	
08:00 PM							287	196	242	
09:00 PM							169	148	159	
10:00 PM							124	86	105	
11:00 PM							87	52	70	
Day Total							10153	7675	8921	
% Weekday Average										
% Week Average						0%	113.8%	86%		
AM Peak Volume							11:00 AM 883	11:00 AM 721	11:00 AM 802	
PM Peak Volume							2:00 PM 1082	1:00 PM 810	2:00 PM 935	

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Type of report: Tube Count - Volume Data

LOCATION: SW Stafford Rd btwn Childs & Johnson Rd
QC JOB #: 15336009
SPECIFIC LOCATION:
DIRECTION: NB, SB
CITY/STATE: Stafford, OR
DATE: Dec 12 2020 - Dec 18 2020

Start Time	Mon 14 Dec 20	Tue 15 Dec 20	Wed 16 Dec 20	Thu 17 Dec 20	Fri 18 Dec 20	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	18	26	24	27	30	25			25	
01:00 AM	11	9	19	9	17	13			13	
02:00 AM	19	7	15	9	17	13			13	
03:00 AM	10	13	15	6	11	11			11	
04:00 AM	33	30	30	31	34	32			32	
05:00 AM	94	93	85	97	88	91			91	
06:00 AM	293	309	290	302	289	297			297	
07:00 AM	617	628	608	662	588	621			621	
08:00 AM	758	787	791	773	741	770			770	
09:00 AM	725	738	758	756	753	746			746	
10:00 AM	740	738	778	734	808	760			760	
11:00 AM	**792**	**832**	**875**	**840**	**910**	**850**			**850**	
12:00 PM	825	857	983	911	1040	923			923	
01:00 PM	871	835	843	875	940	873			873	
02:00 PM	952	934	936	1011	1063	979			979	
03:00 PM	**1087**	**1097**	992	1132	**1163**	1094			1094	
04:00 PM	1042	1095	**1113**	**1173**	1121	**1109**			**1109**	
05:00 PM	895	967	997	915	896	934			934	
06:00 PM	552	608	610	619	559	590			590	
07:00 PM	384	392	387	391	374	386			386	
08:00 PM	222	257	222	320	259	256			256	
09:00 PM	164	166	187	177	203	179			179	
10:00 PM	78	81	112	101	153	105			105	
11:00 PM	50	55	48	59	79	58			58	
Day Total	11232	11554	11718	11930	12136	11715			11715	
% Weekday Average	95.9%	98.6%	100%	101.8%	103.6%					
% Week Average	95.9%	98.6%	100%	101.8%	103.6%	100%				
AM Peak Volume	11:00 AM 792	11:00 AM 832	11:00 AM 875	11:00 AM 840	11:00 AM 910	11:00 AM 850			11:00 AM 850	
PM Peak Volume	3:00 PM 1087	3:00 PM 1097	4:00 PM 1113	4:00 PM 1173	3:00 PM 1163	4:00 PM 1109			4:00 PM 1109	

Comments:

Report generated on 12/23/2020 5:14 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Quality Counts DATA THAT DRIVES COMMUNITIES

APPENDIX B: 2017 Historic Traffic Data

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Childs Road
Site Code:
Start Date: 04/13/2017

Turning Movement Data

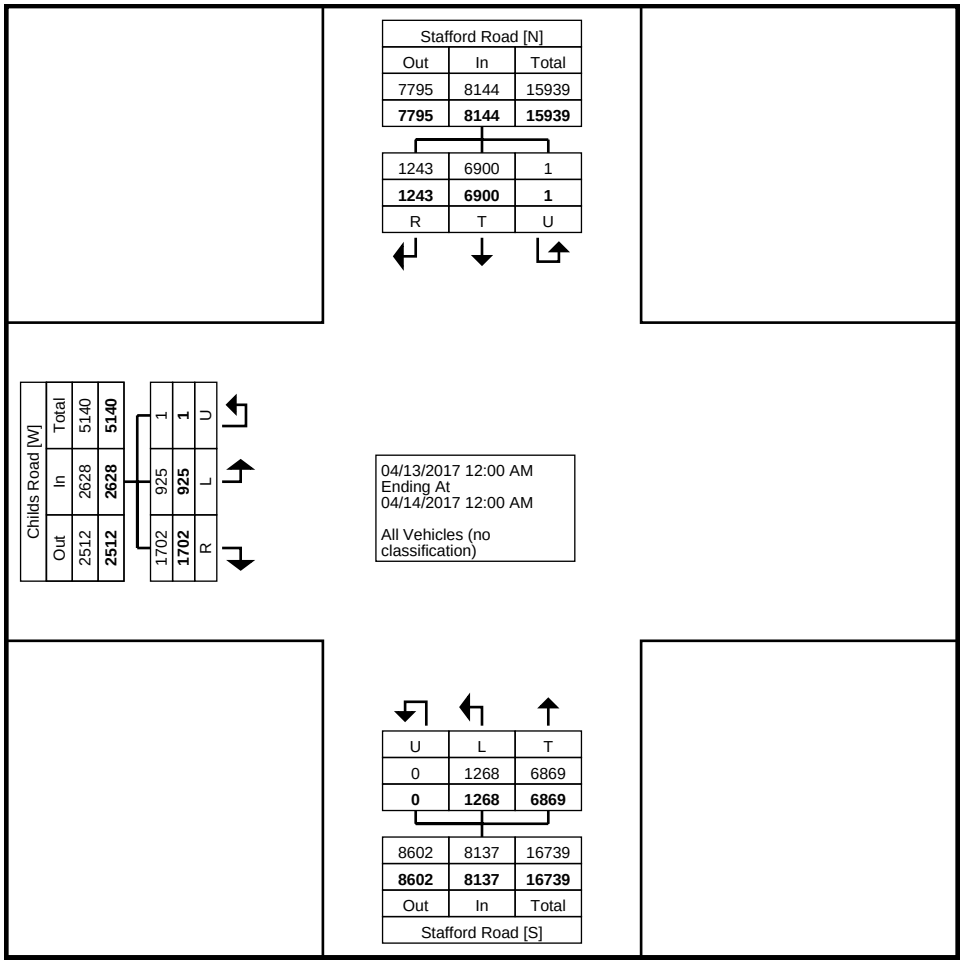
Start Time	Stafford Road Southbound				Stafford Road Northbound				Childs Road Eastbound				Int. Total
	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	
12:00 AM	0	3	0	3	4	1	0	5	2	0	0	2	10
12:15 AM	0	4	0	4	5	0	0	5	0	0	0	0	9
12:30 AM	0	2	0	2	5	0	0	5	0	0	0	0	7
12:45 AM	0	2	0	2	3	0	0	3	0	0	0	0	5
Hourly Total	0	11	0	11	17	1	0	18	2	0	0	2	31
1:00 AM	0	0	0	0	3	0	0	3	0	0	0	0	3
1:15 AM	0	0	0	0	1	0	0	1	0	0	0	0	1
1:30 AM	0	1	0	1	2	0	0	2	0	0	0	0	3
1:45 AM	0	2	0	2	2	0	0	2	0	0	0	0	4
Hourly Total	0	3	0	3	8	0	0	8	0	0	0	0	11
2:00 AM	0	1	0	1	1	0	0	1	0	0	0	0	2
2:15 AM	0	1	0	1	2	0	0	2	0	0	0	0	3
2:30 AM	0	1	0	1	2	0	0	2	0	0	0	0	3
2:45 AM	0	1	0	1	2	0	0	2	1	0	0	1	4
Hourly Total	0	4	0	4	7	0	0	7	1	0	0	1	12
3:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
3:15 AM	1	1	0	2	0	1	0	1	0	0	0	0	3
3:30 AM	0	1	0	1	0	0	0	0	2	0	0	2	3
3:45 AM	0	1	0	1	2	0	0	2	0	2	0	2	5
Hourly Total	1	4	0	5	2	1	0	3	2	2	0	4	12
4:00 AM	1	0	0	1	6	1	0	7	1	0	0	1	9
4:15 AM	2	9	0	11	0	1	0	1	0	0	0	0	12
4:30 AM	1	7	0	8	4	0	0	4	4	2	0	6	18
4:45 AM	2	4	0	6	4	0	0	4	1	1	0	2	12
Hourly Total	6	20	0	26	14	2	0	16	6	3	0	9	51
5:00 AM	4	10	0	14	4	1	0	5	2	0	0	2	21
5:15 AM	5	22	0	27	13	3	0	16	1	6	0	7	50
5:30 AM	10	33	0	43	15	3	0	18	3	6	0	9	70
5:45 AM	5	17	0	22	26	2	0	28	2	2	0	4	54
Hourly Total	24	82	0	106	58	9	0	67	8	14	0	22	195
6:00 AM	9	31	0	40	32	6	0	38	6	2	0	8	86
6:15 AM	11	43	0	54	47	19	0	66	4	5	0	9	129
6:30 AM	26	70	0	96	61	24	0	85	7	5	0	12	193
6:45 AM	20	80	0	100	85	27	0	112	11	7	0	18	230
Hourly Total	66	224	0	290	225	76	0	301	28	19	0	47	638
7:00 AM	36	84	0	120	120	34	0	154	14	11	0	25	299
7:15 AM	50	127	0	177	129	33	0	162	21	20	0	41	380
7:30 AM	60	164	0	224	151	48	0	199	21	4	0	25	448

7:45 AM	54	152	0	206	173	49	0	222	15	14	0	29	457
Hourly Total	200	527	0	727	573	164	0	737	71	49	0	120	1584
8:00 AM	45	122	0	167	132	40	0	172	32	7	0	39	378
8:15 AM	41	113	0	154	130	37	0	167	14	11	0	25	346
8:30 AM	41	128	0	169	126	27	0	153	23	13	0	36	358
8:45 AM	30	141	0	171	135	22	0	157	18	17	0	35	363
Hourly Total	157	504	0	661	523	126	0	649	87	48	0	135	1445
9:00 AM	34	133	0	167	132	24	0	156	18	18	1	37	360
9:15 AM	37	139	0	176	98	26	0	124	20	18	0	38	338
9:30 AM	22	111	0	133	94	17	0	111	12	9	0	21	265
9:45 AM	18	90	0	108	81	21	0	102	20	5	0	25	235
Hourly Total	111	473	0	584	405	88	0	493	70	50	1	121	1198
10:00 AM	14	103	0	117	84	15	0	99	12	17	0	29	245
10:15 AM	22	94	0	116	70	19	0	89	19	5	0	24	229
10:30 AM	11	106	0	117	85	24	0	109	13	12	0	25	251
10:45 AM	19	90	0	109	80	18	0	98	12	13	0	25	232
Hourly Total	66	393	0	459	319	76	0	395	56	47	0	103	957
11:00 AM	15	74	0	89	68	24	0	92	11	12	0	23	204
11:15 AM	19	82	0	101	83	11	0	94	20	11	0	31	226
11:30 AM	13	98	0	111	89	12	0	101	19	11	0	30	242
11:45 AM	23	92	0	115	110	19	0	129	19	20	0	39	283
Hourly Total	70	346	0	416	350	66	0	416	69	54	0	123	955
12:00 PM	17	116	0	133	97	21	0	118	22	10	0	32	283
12:15 PM	15	84	0	99	90	15	0	105	14	15	0	29	233
12:30 PM	9	83	0	92	82	13	0	95	23	17	0	40	227
12:45 PM	16	96	0	112	106	11	0	117	14	19	0	33	262
Hourly Total	57	379	0	436	375	60	0	435	73	61	0	134	1005
1:00 PM	11	78	1	90	103	13	0	116	23	8	0	31	237
1:15 PM	17	92	0	109	82	12	0	94	17	15	0	32	235
1:30 PM	19	107	0	126	112	17	0	129	21	22	0	43	298
1:45 PM	19	85	0	104	103	12	0	115	27	20	0	47	266
Hourly Total	66	362	1	429	400	54	0	454	88	65	0	153	1036
2:00 PM	15	102	0	117	108	13	0	121	32	15	0	47	285
2:15 PM	32	123	0	155	133	26	0	159	22	14	0	36	350
2:30 PM	22	117	0	139	128	26	0	154	23	24	0	47	340
2:45 PM	15	139	0	154	146	19	0	165	35	26	0	61	380
Hourly Total	84	481	0	565	515	84	0	599	112	79	0	191	1355
3:00 PM	16	145	0	161	116	16	0	132	43	18	0	61	354
3:15 PM	21	148	0	169	163	23	0	186	64	18	0	82	437
3:30 PM	18	159	0	177	149	21	0	170	61	17	0	78	425
3:45 PM	21	165	0	186	167	28	0	195	60	19	0	79	460
Hourly Total	76	617	0	693	595	88	0	683	228	72	0	300	1676
4:00 PM	20	164	0	184	153	21	0	174	54	25	0	79	437
4:15 PM	14	184	0	198	167	21	0	188	54	20	0	74	460
4:30 PM	14	138	0	152	173	18	0	191	79	18	0	97	440
4:45 PM	19	172	0	191	147	15	0	162	66	24	0	90	443
Hourly Total	67	658	0	725	640	75	0	715	253	87	0	340	1780
5:00 PM	18	175	0	193	156	32	0	188	75	17	0	92	473
5:15 PM	11	205	0	216	131	16	0	147	53	19	0	72	435
5:30 PM	16	164	0	180	116	18	0	134	83	27	0	110	424
5:45 PM	9	170	0	179	126	17	0	143	64	21	0	85	407
Hourly Total	54	714	0	768	529	83	0	612	275	84	0	359	1739

6:00 PM	18	166	0	184	146	25	0	171	57	13	0	70	425
6:15 PM	15	132	0	147	135	27	0	162	53	18	0	71	380
6:30 PM	10	110	0	120	100	14	0	114	35	19	0	54	288
6:45 PM	11	95	0	106	97	13	0	110	18	12	0	30	246
Hourly Total	54	503	0	557	478	79	0	557	163	62	0	225	1339
7:00 PM	7	84	0	91	92	20	0	112	19	16	0	35	238
7:15 PM	17	61	0	78	87	9	0	96	11	16	0	27	201
7:30 PM	7	56	0	63	102	18	0	120	7	10	0	17	200
7:45 PM	5	52	0	57	63	10	0	73	6	13	0	19	149
Hourly Total	36	253	0	289	344	57	0	401	43	55	0	98	788
8:00 PM	8	49	0	57	63	11	0	74	10	10	0	20	151
8:15 PM	2	47	0	49	57	5	0	62	10	8	0	18	129
8:30 PM	4	33	0	37	57	9	0	66	4	1	0	5	108
8:45 PM	3	36	0	39	56	11	0	67	9	7	0	16	122
Hourly Total	17	165	0	182	233	36	0	269	33	26	0	59	510
9:00 PM	12	28	0	40	47	9	0	56	12	10	0	22	118
9:15 PM	1	38	0	39	55	4	0	59	6	4	0	10	108
9:30 PM	3	23	0	26	31	3	0	34	1	4	0	5	65
9:45 PM	4	19	0	23	30	7	0	37	1	4	0	5	65
Hourly Total	20	108	0	128	163	23	0	186	20	22	0	42	356
10:00 PM	5	15	0	20	20	4	0	24	4	5	0	9	53
10:15 PM	1	15	0	16	15	3	0	18	4	2	0	6	40
10:30 PM	3	14	0	17	14	3	0	17	0	2	0	2	36
10:45 PM	1	6	0	7	17	1	0	18	1	8	0	9	34
Hourly Total	10	50	0	60	66	11	0	77	9	17	0	26	163
11:00 PM	1	8	0	9	9	2	0	11	3	4	0	7	27
11:15 PM	0	6	0	6	6	4	0	10	1	1	0	2	18
11:30 PM	0	3	0	3	9	1	0	10	1	4	0	5	18
11:45 PM	0	2	0	2	6	2	0	8	0	0	0	0	10
Hourly Total	1	19	0	20	30	9	0	39	5	9	0	14	73
Grand Total	1243	6900	1	8144	6869	1268	0	8137	1702	925	1	2628	18909
Approach %	15.3	84.7	0.0	-	84.4	15.6	0.0	-	64.8	35.2	0.0	-	-
Total %	6.6	36.5	0.0	43.1	36.3	6.7	0.0	43.0	9.0	4.9	0.0	13.9	-
All Vehicles (no classification)	1243	6900	1	8144	6869	1268	0	8137	1702	925	1	2628	18909
% All Vehicles (no classification)	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Childs Road
Site Code:
Start Date: 04/13/2017



Turning Movement Data Plot

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

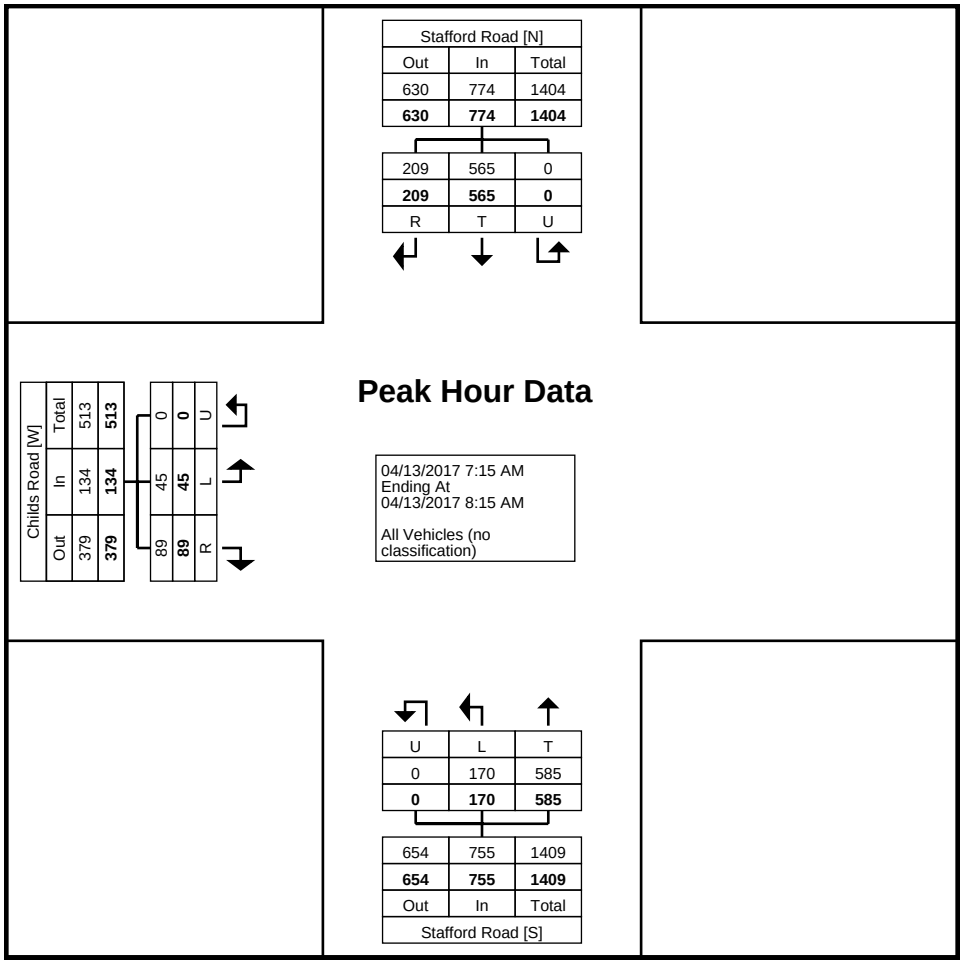
Count Name: Stafford Road @ Childs Road
Site Code:
Start Date: 04/13/2017

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Stafford Road Southbound				Stafford Road Northbound				Childs Road Eastbound				
	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
7:15 AM	50	127	0	177	129	33	0	162	21	20	0	41	380
7:30 AM	60	164	0	224	151	48	0	199	21	4	0	25	448
7:45 AM	54	152	0	206	173	49	0	222	15	14	0	29	457
8:00 AM	45	122	0	167	132	40	0	172	32	7	0	39	378
Total	209	565	0	774	585	170	0	755	89	45	0	134	1663
Approach %	27.0	73.0	0.0	-	77.5	22.5	0.0	-	66.4	33.6	0.0	-	-
Total %	12.6	34.0	0.0	46.5	35.2	10.2	0.0	45.4	5.4	2.7	0.0	8.1	-
PHF	0.871	0.861	0.000	0.864	0.845	0.867	0.000	0.850	0.695	0.563	0.000	0.817	0.910
All Vehicles (no classification)	209	565	0	774	585	170	0	755	89	45	0	134	1663
% All Vehicles (no classification)	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Childs Road
Site Code:
Start Date: 04/13/2017



Turning Movement Peak Hour Data Plot (7:15 AM)

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

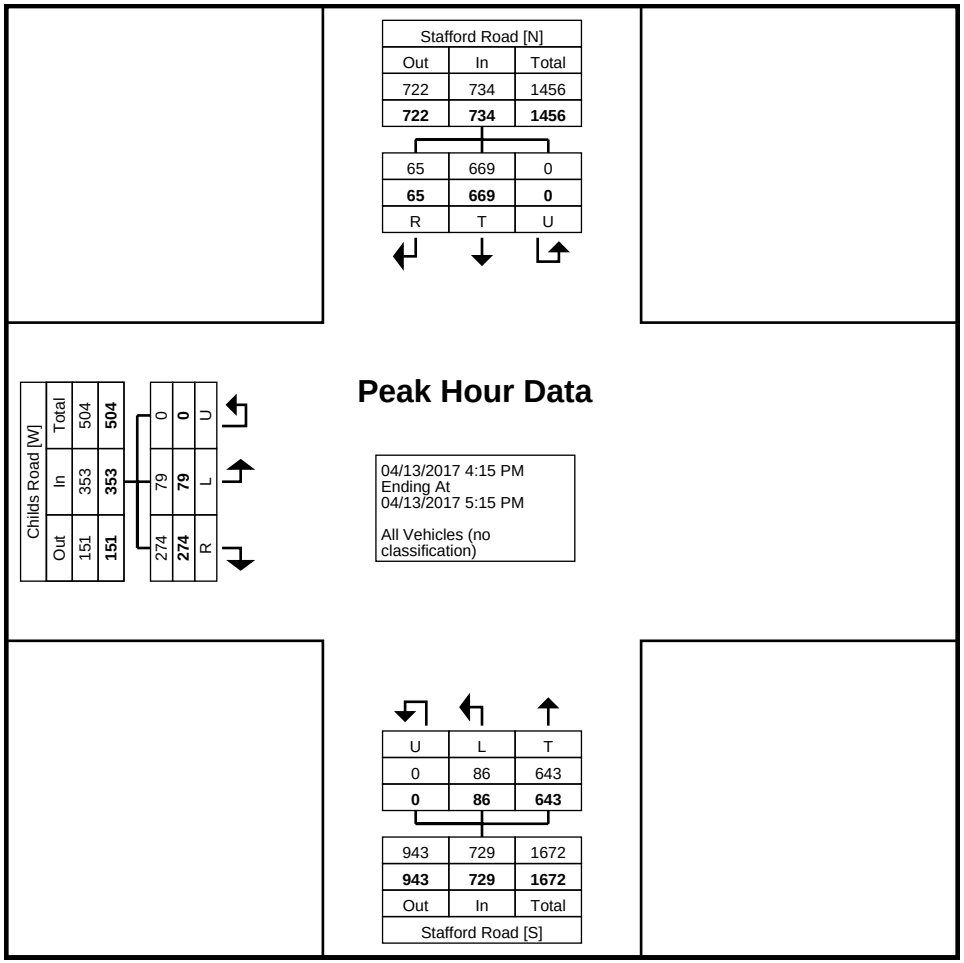
Count Name: Stafford Road @ Childs Road
Site Code:
Start Date: 04/13/2017

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Stafford Road Southbound				Stafford Road Northbound				Childs Road Eastbound				
	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Int. Total
4:15 PM	14	184	0	198	167	21	0	188	54	20	0	74	460
4:30 PM	14	138	0	152	173	18	0	191	79	18	0	97	440
4:45 PM	19	172	0	191	147	15	0	162	66	24	0	90	443
5:00 PM	18	175	0	193	156	32	0	188	75	17	0	92	473
Total	65	669	0	734	643	86	0	729	274	79	0	353	1816
Approach %	8.9	91.1	0.0	-	88.2	11.8	0.0	-	77.6	22.4	0.0	-	-
Total %	3.6	36.8	0.0	40.4	35.4	4.7	0.0	40.1	15.1	4.4	0.0	19.4	-
PHF	0.855	0.909	0.000	0.927	0.929	0.672	0.000	0.954	0.867	0.823	0.000	0.910	0.960
All Vehicles (no classification)	65	669	0	734	643	86	0	729	274	79	0	353	1816
% All Vehicles (no classification)	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Childs Road
Site Code:
Start Date: 04/13/2017



Turning Movement Peak Hour Data Plot (4:15 PM)

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Johnson Road
Site Code:
Start Date: 04/13/2017

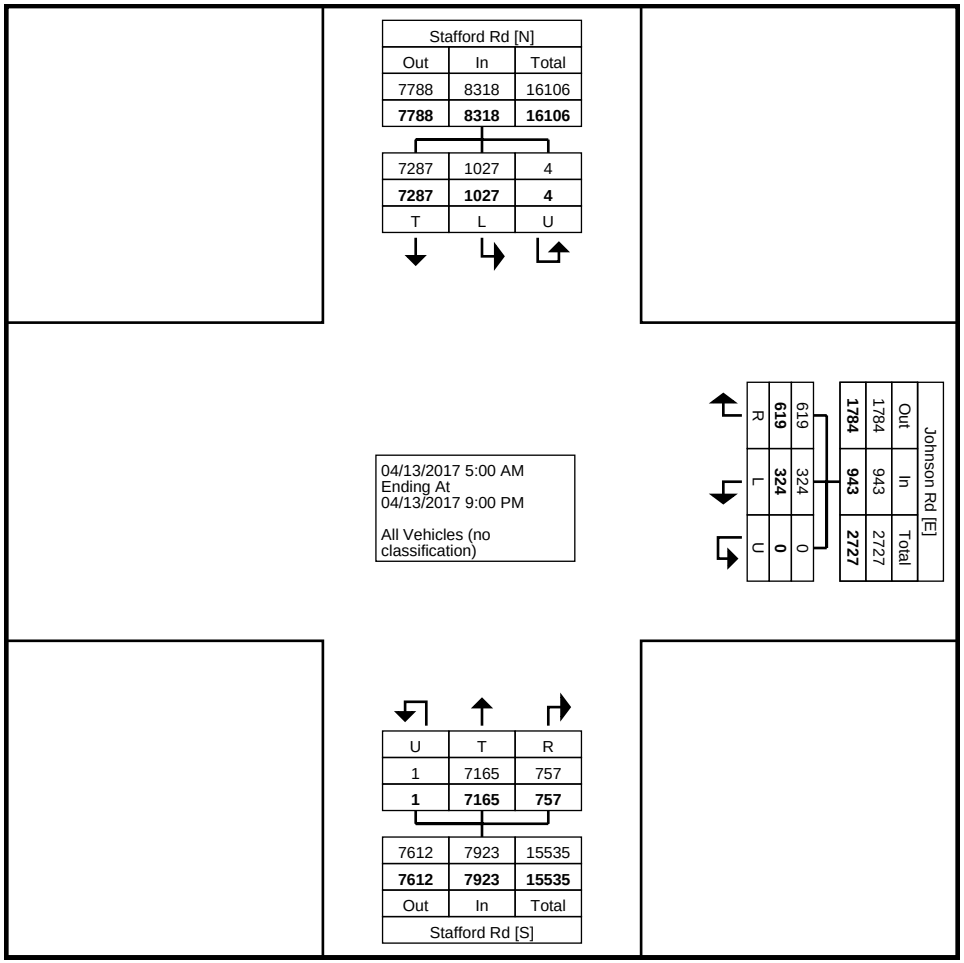
Turning Movement Data

Start Time	Stafford Rd Southbound				Johnson Rd Westbound				Stafford Rd Northbound				Int. Total
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	
5:00 AM	12	0	0	12	3	5	0	8	0	3	0	3	23
5:15 AM	23	0	0	23	4	1	0	5	0	12	0	12	40
5:30 AM	36	0	0	36	1	4	0	5	0	16	0	16	57
5:45 AM	19	0	0	19	3	3	0	6	0	24	0	24	49
Hourly Total	90	0	0	90	11	13	0	24	0	55	0	55	169
6:00 AM	35	2	0	37	11	3	0	14	0	34	0	34	85
6:15 AM	42	1	0	43	12	3	0	15	1	54	0	55	113
6:30 AM	79	1	0	80	15	4	0	19	2	66	0	68	167
6:45 AM	88	1	0	89	17	7	0	24	3	94	0	97	210
Hourly Total	244	5	0	249	55	17	0	72	6	248	0	254	575
7:00 AM	96	5	0	101	29	5	0	34	4	128	0	132	267
7:15 AM	139	8	0	147	23	7	0	30	2	144	0	146	323
7:30 AM	175	6	0	181	24	9	0	33	4	183	0	187	401
7:45 AM	159	9	0	168	35	15	0	50	5	184	0	189	407
Hourly Total	569	28	0	597	111	36	0	147	15	639	0	654	1398
8:00 AM	148	6	0	154	29	4	0	33	3	144	0	147	334
8:15 AM	124	2	0	126	24	6	0	30	2	142	0	144	300
8:30 AM	144	8	0	152	20	9	0	29	4	134	0	138	319
8:45 AM	149	5	0	154	14	9	0	23	5	138	0	143	320
Hourly Total	565	21	0	586	87	28	0	115	14	558	0	572	1273
9:00 AM	147	4	0	151	11	6	0	17	13	147	0	160	328
9:15 AM	145	16	0	161	18	7	0	25	3	104	0	107	293
9:30 AM	117	6	0	123	10	5	0	15	4	101	0	105	243
9:45 AM	104	7	0	111	10	3	0	13	4	95	0	99	223
Hourly Total	513	33	0	546	49	21	0	70	24	447	0	471	1087
10:00 AM	110	4	0	114	5	1	0	6	5	88	0	93	213
10:15 AM	112	3	0	115	4	3	0	7	4	91	0	95	217
10:30 AM	110	4	0	114	8	7	0	15	5	97	0	102	231
10:45 AM	98	5	0	103	7	7	0	14	4	89	0	93	210
Hourly Total	430	16	0	446	24	18	0	42	18	365	0	383	871
11:00 AM	78	5	1	84	8	8	0	16	1	81	0	82	182
11:15 AM	95	5	0	100	5	4	0	9	10	89	0	99	208
11:30 AM	108	7	0	115	8	2	0	10	8	93	0	101	226
11:45 AM	105	7	0	112	9	5	0	14	2	124	0	126	252
Hourly Total	386	24	1	411	30	19	0	49	21	387	0	408	868
12:00 PM	124	8	1	133	8	8	0	16	2	106	0	108	257
12:15 PM	93	8	0	101	5	7	0	12	3	100	1	104	217
12:30 PM	98	9	1	108	8	7	0	15	4	89	0	93	216

12:45 PM	97	9	0	106	6	6	0	12	11	107	0	118	236
Hourly Total	412	34	2	448	27	28	0	55	20	402	1	423	926
1:00 PM	92	14	0	106	8	3	0	11	7	110	0	117	234
1:15 PM	99	10	0	109	4	3	0	7	2	93	0	95	211
1:30 PM	116	8	0	124	5	4	0	9	5	121	0	126	259
1:45 PM	100	13	0	113	9	6	0	15	13	107	0	120	248
Hourly Total	407	45	0	452	26	16	0	42	27	431	0	458	952
2:00 PM	130	8	0	138	4	8	0	12	5	116	0	121	271
2:15 PM	139	12	0	151	4	8	0	12	10	152	0	162	325
2:30 PM	127	14	0	141	7	3	0	10	5	153	0	158	309
2:45 PM	156	18	0	174	9	6	0	15	9	150	0	159	348
Hourly Total	552	52	0	604	24	25	0	49	29	571	0	600	1253
3:00 PM	155	23	0	178	3	4	0	7	14	126	0	140	325
3:15 PM	167	39	0	206	5	5	0	10	16	188	0	204	420
3:30 PM	175	27	0	202	11	8	0	19	47	159	0	206	427
3:45 PM	179	49	0	228	10	4	0	14	43	185	0	228	470
Hourly Total	676	138	0	814	29	21	0	50	120	658	0	778	1642
4:00 PM	166	43	1	210	14	3	0	17	37	171	0	208	435
4:15 PM	192	50	0	242	7	3	0	10	38	170	0	208	460
4:30 PM	143	51	0	194	16	7	0	23	39	203	0	242	459
4:45 PM	195	58	0	253	10	3	0	13	55	159	0	214	480
Hourly Total	696	202	1	899	47	16	0	63	169	703	0	872	1834
5:00 PM	173	74	0	247	10	5	0	15	57	165	0	222	484
5:15 PM	224	51	0	275	9	5	0	14	40	145	0	185	474
5:30 PM	179	68	0	247	12	5	0	17	36	123	0	159	423
5:45 PM	187	53	0	240	8	5	0	13	37	132	0	169	422
Hourly Total	763	246	0	1009	39	20	0	59	170	565	0	735	1803
6:00 PM	167	57	0	224	20	7	0	27	37	145	0	182	433
6:15 PM	145	40	0	185	1	6	0	7	15	138	0	153	345
6:30 PM	131	19	0	150	9	7	0	16	12	101	0	113	279
6:45 PM	96	16	0	112	5	3	0	8	8	109	0	117	237
Hourly Total	539	132	0	671	35	23	0	58	72	493	0	565	1294
7:00 PM	94	11	0	105	8	8	0	16	6	104	0	110	231
7:15 PM	65	7	0	72	4	6	0	10	9	94	0	103	185
7:30 PM	56	6	0	62	2	3	0	5	6	116	0	122	189
7:45 PM	54	6	0	60	1	1	0	2	10	70	0	80	142
Hourly Total	269	30	0	299	15	18	0	33	31	384	0	415	747
8:00 PM	53	6	0	59	6	2	0	8	9	69	0	78	145
8:15 PM	51	4	0	55	1	0	0	1	6	63	0	69	125
8:30 PM	34	6	0	40	1	2	0	3	3	64	0	67	110
8:45 PM	38	5	0	43	2	1	0	3	3	63	0	66	112
Hourly Total	176	21	0	197	10	5	0	15	21	259	0	280	492
Grand Total	7287	1027	4	8318	619	324	0	943	757	7165	1	7923	17184
Approach %	87.6	12.3	0.0	-	65.6	34.4	0.0	-	9.6	90.4	0.0	-	-
Total %	42.4	6.0	0.0	48.4	3.6	1.9	0.0	5.5	4.4	41.7	0.0	46.1	-
All Vehicles (no classification)	7287	1027	4	8318	619	324	0	943	757	7165	1	7923	17184
% All Vehicles (no classification)	100.0	100.0	100.0	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Johnson Road
Site Code:
Start Date: 04/13/2017



Turning Movement Data Plot

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

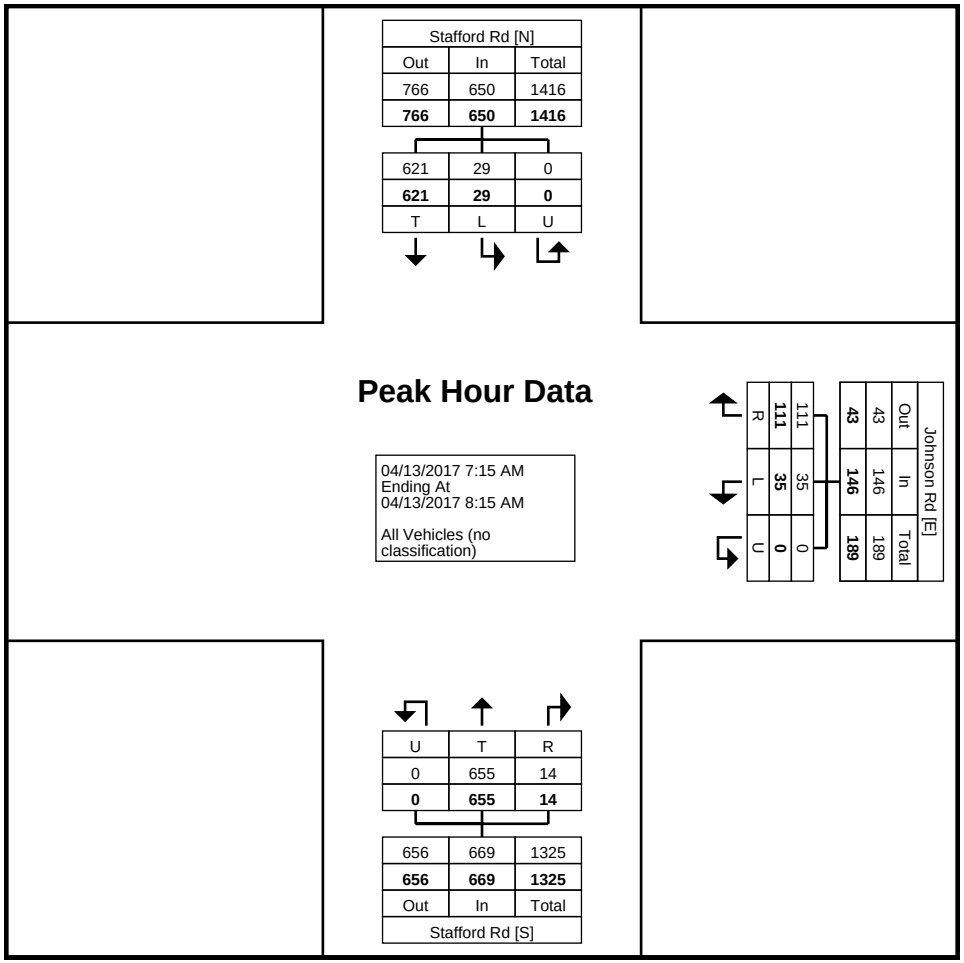
Count Name: Stafford Road @ Johnson Road
Site Code:
Start Date: 04/13/2017

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Stafford Rd Southbound				Johnson Rd Westbound				Stafford Rd Northbound				
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
7:15 AM	139	8	0	147	23	7	0	30	2	144	0	146	323
7:30 AM	175	6	0	181	24	9	0	33	4	183	0	187	401
7:45 AM	159	9	0	168	35	15	0	50	5	184	0	189	407
8:00 AM	148	6	0	154	29	4	0	33	3	144	0	147	334
Total	621	29	0	650	111	35	0	146	14	655	0	669	1465
Approach %	95.5	4.5	0.0	-	76.0	24.0	0.0	-	2.1	97.9	0.0	-	-
Total %	42.4	2.0	0.0	44.4	7.6	2.4	0.0	10.0	1.0	44.7	0.0	45.7	-
PHF	0.887	0.806	0.000	0.898	0.793	0.583	0.000	0.730	0.700	0.890	0.000	0.885	0.900
All Vehicles (no classification)	621	29	0	650	111	35	0	146	14	655	0	669	1465
% All Vehicles (no classification)	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Johnson Road
Site Code:
Start Date: 04/13/2017



Turning Movement Peak Hour Data Plot (7:15 AM)

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

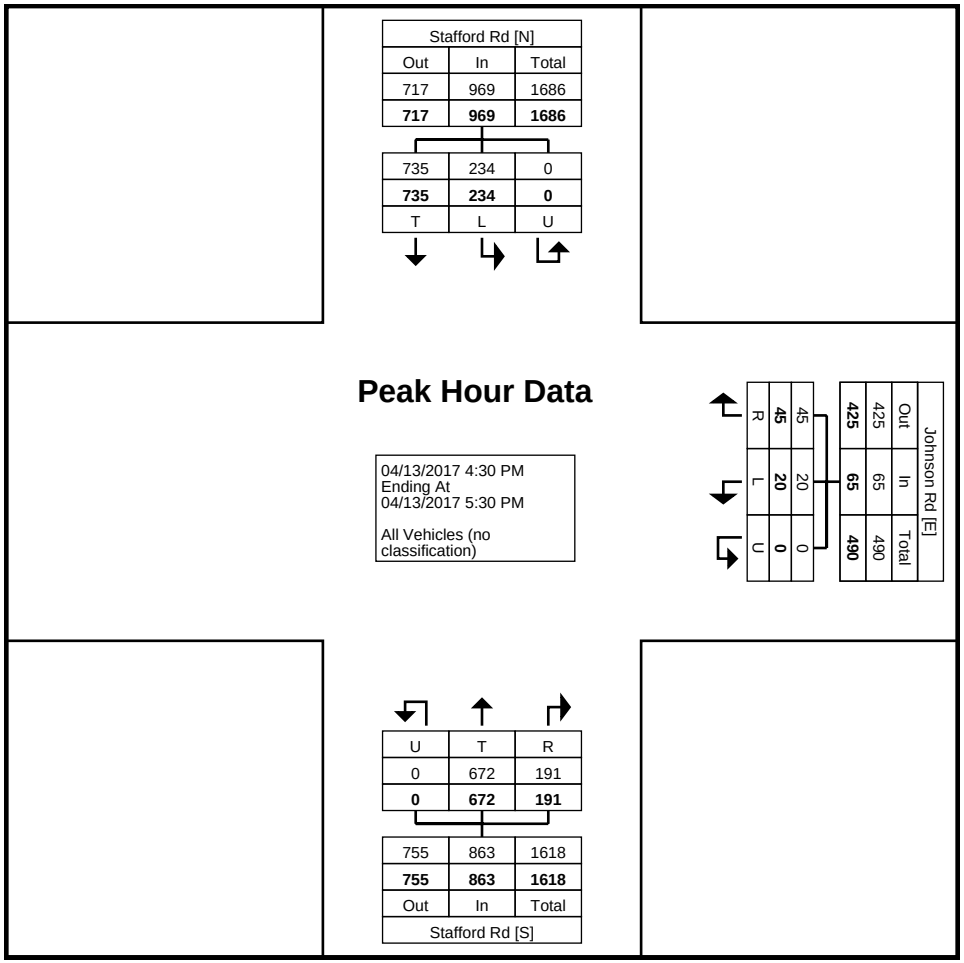
Count Name: Stafford Road @ Johnson Road
Site Code:
Start Date: 04/13/2017

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Stafford Rd Southbound				Johnson Rd Westbound				Stafford Rd Northbound				
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
4:30 PM	143	51	0	194	16	7	0	23	39	203	0	242	459
4:45 PM	195	58	0	253	10	3	0	13	55	159	0	214	480
5:00 PM	173	74	0	247	10	5	0	15	57	165	0	222	484
5:15 PM	224	51	0	275	9	5	0	14	40	145	0	185	474
Total	735	234	0	969	45	20	0	65	191	672	0	863	1897
Approach %	75.9	24.1	0.0	-	69.2	30.8	0.0	-	22.1	77.9	0.0	-	-
Total %	38.7	12.3	0.0	51.1	2.4	1.1	0.0	3.4	10.1	35.4	0.0	45.5	-
PHF	0.820	0.791	0.000	0.881	0.703	0.714	0.000	0.707	0.838	0.828	0.000	0.892	0.980
All Vehicles (no classification)	735	234	0	969	45	20	0	65	191	672	0	863	1897
% All Vehicles (no classification)	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0	100.0	-	100.0	100.0

Clackamas County
150 Beavercreek Rd
150
Oregon City, Oregon, United States 97045
5037424704 MMcDowell@co.clackamas.or.us

Count Name: Stafford Road @ Johnson Road
Site Code:
Start Date: 04/13/2017



Turning Movement Peak Hour Data Plot (4:30 PM)

QUALITY COUNTS REPORT

Type: Volume Data
Location: #52 Stafford Rd 120' S of Roundabout
Specific Lo: #52 Stafford Rd 120' S of Roundabout
City/State: Lake Oswe OR
QCJobNo: 14277251
Date:
Direction: NB
Comments:

Start Time	Mon	Tue	Wed	Thu	Fri	Average W	Sat	Sun	Average Week Hourly Traffic
		18-Apr-17	19-Apr-17						
12:00 AM		2	5			4			4
12:15 AM		5	9			7			7
12:30 AM		1	5			3			3
12:45 AM		3	3			3			3
1:00 AM		3	3			3			3
1:15 AM		5	1			3			3
1:30 AM		3	2			3			3
1:45 AM		1	3			2			2
2:00 AM		1	1			1			1
2:15 AM		2	1			2			2
2:30 AM		2	1			2			2
2:45 AM		1	1			1			1
3:00 AM		2	1			2			2
3:15 AM		1	1			1			1
3:30 AM		2	2			2			2
3:45 AM		3	4			4			4
4:00 AM		1	4			3			3
4:15 AM		2	2			2			2
4:30 AM		2	4			3			3
4:45 AM		2	1			2			2
5:00 AM		8	7			8			8
5:15 AM		9	8			9			9
5:30 AM		13	12			13			13
5:45 AM		35	26			31			31
6:00 AM		37	29			33			33
6:15 AM		39	45			42			42
6:30 AM		66	53			60			60
6:45 AM		93	87			90			90
7:00 AM		109	118			114			114
7:15 AM		124	121			123			123
7:30 AM		131	132			132			132
7:45 AM		146	150			148			148
8:00 AM		125	145			135			135
8:15 AM		113	115			114			114
8:30 AM		113	127			120			120
8:45 AM		133	124			129			129
9:00 AM		140	148			144			144
9:15 AM		126	97			112			112
9:30 AM		77	97			87			87
9:45 AM		77	105			91			91
10:00 AM		79	69			74			74
10:15 AM		77	88			83			83
10:30 AM		75	73			74			74
10:45 AM		95	81			88			88
11:00 AM		109	98			104			104

11:15 AM	127	109	118	118
11:30 AM	83	82	83	83
11:45 AM	112	128	120	120
12:00 PM	84	101	93	93
12:15 PM	97	93	95	95
12:30 PM	109	86	98	98
12:45 PM	103	98	101	101
1:00 PM	90	79	85	85
1:15 PM	93	117	105	105
1:30 PM	78	85	82	82
1:45 PM	107	102	105	105
2:00 PM	102	90	96	96
2:15 PM	135	113	124	124
2:30 PM	124	138	131	131
2:45 PM	130	150	140	140
3:00 PM	126	134	130	130
3:15 PM	176	143	160	160
3:30 PM	148	127	138	138
3:45 PM	145	132	139	139
4:00 PM	139	120	130	130
4:15 PM	128	108	118	118
4:30 PM	42	36	39	39
4:45 PM	59	50	55	55
5:00 PM	90	68	79	79
5:15 PM	55	36	46	46
5:30 PM	50	42	46	46
5:45 PM	112	65	89	89
6:00 PM	126	81	104	104
6:15 PM	144	113	129	129
6:30 PM	136	173	155	155
6:45 PM	104	146	125	125
7:00 PM	107	119	113	113
7:15 PM	106	92	99	99
7:30 PM	82	107	95	95
7:45 PM	97	91	94	94
8:00 PM	63	53	58	58
8:15 PM	59	60	60	60
8:30 PM	59	42	51	51
8:45 PM	63	48	56	56
9:00 PM	38	49	44	44
9:15 PM	43	52	48	48
9:30 PM	30	42	36	36
9:45 PM	32	31	32	32
10:00 PM	17	21	19	19
10:15 PM	18	21	20	20
10:30 PM	18	16	17	17
10:45 PM	9	14	12	12
11:00 PM	6	10	8	8
11:15 PM	9	10	10	10
11:30 PM	9	2	6	6
11:45 PM	3	6	5	5
Day Total	6415	6240	6352	6352
ADT	6415	6240	6352	6352
%Weekday Average	101.00%	98.20%		
%Week Average	101.00%	98.20%	100.00%	
AM Peak	7:45 AM	7:45 AM	7:45 AM	7:45 AM
15-min Vol	146	150	148	148
PM Peak	3:15 PM	6:30 PM	3:15 PM	3:15 PM
15-min Vol	176	173	160	160

QUALITY COUNTS REPORT

Type: Volume Data
Location: #52 Stafford Rd 120' S of Roundabout
Specific Lo: #52 Stafford Rd 120' S of Roundabout
City/State: Lake Oswe OR
QCJobNo: 14277251
Date:
Direction: SB
Comments:

Start Time	Mon	Tue	Wed	Thu	Fri	Average W	Sat	Sun	Average Week Hourly Traffic
		18-Apr-17	19-Apr-17						
12:00 AM		1	1			1			1
12:15 AM		4	2			3			3
12:30 AM		1	7			4			4
12:45 AM		3	4			4			4
1:00 AM		4	1			3			3
1:15 AM		1	3			2			2
1:30 AM		2	2			2			2
1:45 AM		0	3			2			2
2:00 AM		1	0			1			1
2:15 AM		0	0			0			0
2:30 AM		1	2			2			2
2:45 AM		1	3			2			2
3:00 AM		0	1			1			1
3:15 AM		5	2			4			4
3:30 AM		2	1			2			2
3:45 AM		4	2			3			3
4:00 AM		3	2			3			3
4:15 AM		4	5			5			5
4:30 AM		6	4			5			5
4:45 AM		4	7			6			6
5:00 AM		13	15			14			14
5:15 AM		20	17			19			19
5:30 AM		34	25			30			30
5:45 AM		25	26			26			26
6:00 AM		50	36			43			43
6:15 AM		46	41			44			44
6:30 AM		78	78			78			78
6:45 AM		116	112			114			114
7:00 AM		115	100			108			108
7:15 AM		176	181			179			179
7:30 AM		214	183			199			199
7:45 AM		181	184			183			183
8:00 AM		163	162			163			163
8:15 AM		148	145			147			147
8:30 AM		145	154			150			150
8:45 AM		176	152			164			164
9:00 AM		133	127			130			130
9:15 AM		161	159			160			160
9:30 AM		111	128			120			120
9:45 AM		114	116			115			115
10:00 AM		96	80			88			88
10:15 AM		86	89			88			88
10:30 AM		103	114			109			109
10:45 AM		93	66			80			80
11:00 AM		101	81			91			91

11:15 AM	86	105	96	96
11:30 AM	116	100	108	108
11:45 AM	105	108	107	107
12:00 PM	102	97	100	100
12:15 PM	92	111	102	102
12:30 PM	99	112	106	106
12:45 PM	118	117	118	118
1:00 PM	118	90	104	104
1:15 PM	79	97	88	88
1:30 PM	97	101	99	99
1:45 PM	94	97	96	96
2:00 PM	117	91	104	104
2:15 PM	120	126	123	123
2:30 PM	98	101	100	100
2:45 PM	145	147	146	146
3:00 PM	147	162	155	155
3:15 PM	150	129	140	140
3:30 PM	190	190	190	190
3:45 PM	181	203	192	192
4:00 PM	182	198	190	190
4:15 PM	163	189	176	176
4:30 PM	159	171	165	165
4:45 PM	147	182	165	165
5:00 PM	154	130	142	142
5:15 PM	138	160	149	149
5:30 PM	165	181	173	173
5:45 PM	114	144	129	129
6:00 PM	106	122	114	114
6:15 PM	128	103	116	116
6:30 PM	90	85	88	88
6:45 PM	89	100	95	95
7:00 PM	101	98	100	100
7:15 PM	89	75	82	82
7:30 PM	58	62	60	60
7:45 PM	59	47	53	53
8:00 PM	52	70	61	61
8:15 PM	58	42	50	50
8:30 PM	49	33	41	41
8:45 PM	43	48	46	46
9:00 PM	46	35	41	41
9:15 PM	27	38	33	33
9:30 PM	24	42	33	33
9:45 PM	21	32	27	27
10:00 PM	20	24	22	22
10:15 PM	8	20	14	14
10:30 PM	12	6	9	9
10:45 PM	12	11	12	12
11:00 PM	8	6	7	7
11:15 PM	7	7	7	7
11:30 PM	5	2	4	4
11:45 PM	3	5	4	4
Day Total	7336	7375	7379	7379
ADT	7336	7375	7379	7379
%Weekday Average	99.40%	99.90%		
%Week Average	99.40%	99.90%	100.00%	
AM Peak	7:30 AM	7:45 AM	7:30 AM	7:30 AM
15-min Vol	214	184	199	199
PM Peak	3:30 PM	3:45 PM	3:45 PM	3:45 PM
15-min Vol	190	203	192	192

APPENDIX C: ODOT Crash Data – SW Childs Rd

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at Stafford Rd & Childs Rd
January 1, 2014 through December 31, 2018

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2018														
TURNING MOVEMENTS	0	1	1	2	0	1	0	2	0	2	0	2	0	0
2018 TOTAL	0	1	1	2	0	1	0	2	0	2	0	2	0	0
YEAR: 2017														
REAR-END	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2017 TOTAL	0	1	0	1	0	2	0	1	0	1	0	1	0	0
YEAR: 2016														
REAR-END	0	1	1	2	0	1	0	1	1	1	1	2	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2016 TOTAL	0	1	2	3	0	1	0	2	1	2	1	3	0	0
YEAR: 2015														
REAR-END	0	1	0	1	0	2	0	0	1	0	1	1	0	0
TURNING MOVEMENTS	0	3	2	5	0	5	0	5	0	4	1	5	0	0
2015 TOTAL	0	4	2	6	0	7	0	5	1	4	2	6	0	0
YEAR: 2014														
TURNING MOVEMENTS	0	3	0	3	0	3	0	3	0	3	0	3	0	0
2014 TOTAL	0	3	0	3	0	3	0	3	0	3	0	3	0	0
FINAL TOTAL	0	10	5	15	0	14	0	13	2	12	3	15	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Childs Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG / MJ	SCHL	SWORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
04975	N	N	N			10/26/2016	0.00	SW CHILDS RD	INTER	3-LEG	N	N	RAIN	S-1STOP	01	NONE 9	STRGHT											29
NONE			N			Wed 5P			NW		STOP SIGN	N	WET	REAR		N/A	NW SE									000		00
No	*45 23 18.44*					*-122 41 33.31*			06	0		N	DUSK	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
															02	NONE 9	STOP											
																N/A	NW SE									011		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
03550	N	N	N	N	N	8/31/2015	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
NONE			N			Mon 5P			UN		STOP SIGN	N	DRY	TURN		PRVTE	NE SW									000		00
No	*45 23 18.44*					*-122 41 33.31*			01	1		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	51	M	OR-Y OR<25		000	000		00
															02	NONE 0	TURN-R											
																PRVTE	NW SW									015		00
																PSNGR CAR		01	DRVR	NONE	21	M	OR-Y OR<25		028	000		02
04839	N	N	N	N	N	11/17/2015	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	RAIN	S-1STOP	01	NONE 0	STRGHT										093,013,079	27,29
COUNTY			N			Tue 7P			SW		UNKNOWN	N	WET	REAR		PRVTE	SW NE									000		00
No	*45 23 18.44*					*-122 41 33.31*			06	1		N	DARK	INJ		PSNGR CAR		01	DRVR	NONE	25	F	OR-Y OR<25		016,026	038	093	27,29
															02	NONE 0	STOP											
																PRVTE	SW NE									012	013	00
																PSNGR CAR		01	DRVR	INJB	48	F	OR-Y OR<25		000	000		00
															03	NONE 0	STRGHT											
																PRVTE	NE SW									022	013,079	00
																PSNGR CAR		01	DRVR	INJB	44	F	OR-Y OR<25		000	000		00
															04	NONE 0	STOP											
																PRVTE	NW SE									022		00
																PSNGR CAR		01	DRVR	NONE	23	F	OR-Y OR<25		000	000		00
02052	N	N	N			5/7/2016	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										115	27,29
NO RPT			N			Sat 11A			SW		UNKNOWN	N	DRY	REAR		PRVTE	SW NE									000		00
No	*45 23 18.44*					*-122 41 33.31*			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	27	F	OR-Y OR<25		016,026	038	115	27,29
															02	NONE 0	STOP											
																PRVTE	SW NE									011		00
																PSNGR CAR		01	DRVR	INJC	42	M	OR-Y OR<25		000	000		00

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Childs Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG / MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
03624	N	N	N			9/2/2017	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											29
NO RPT			N			Sat 2P			SW		UNKNOWN	N	DRY	REAR		PRVTE	SW NE										000		00
No						*45 23 18.44 -122 41 33.31*			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	70	U	OR-Y		026	000		29
																								OR<25				
															02	NONE 0	STOP											
																PRVTE	SW NE									012		00
																PSNGR CAR		01	DRVR	INJC	26	F	OR-Y		000	000		00
																							OR<25					
																		02	PSNG	INJC	28	M			000	000		00
01024	N	N	N			3/13/2014	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-R											02
NO RPT			N			Thu 11A			CN		STOP SIGN	N	DRY	TURN		UNKN	NW SW									015		00
No						*45 23 18.56 -122 41 33.15*			01	1		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	00	U	UNK		028	000		02
																							UNK					
															02	NONE 0	STRGHT											
																PRVTE	NE SW									000		00
																PSNGR CAR		01	DRVR	INJB	45	M	OR-Y		000	000		00
																							OR<25					
03497	N	N	N			8/28/2015	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-R											02
NONE			N			Fri 3P			CN		STOP SIGN	N	DRY	TURN		PRVTE	NW SW									015		00
No						*45 23 18.44 -122 41 33.31*			01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	34	M	OTH-Y		028	000		02
																							N-RES					
															02	NONE 0	STRGHT											
																PRVTE	NE SW									000		00
																PSNGR CAR		01	DRVR	NONE	29	M	OR-Y		000	000		00
																							OR>25					
03049	N	N	N			7/7/2016	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 9	STRGHT											02
NONE			N			Thu 7P			CN		STOP SIGN	N	DRY	TURN		N/A	NE SW									000		00
No						*45 23 18.44 -122 41 33.31*			01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																							UNK					
															02	NONE 9	TURN-L											
																N/A	NW NE									015		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																							UNK					
01077	N	N	N			3/13/2014	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 0	STRGHT											02
NONE			N			Thu 11A			CN		UNKNOWN	N	DRY	TURN		UNKN	NE SW									000		00
No						*45 23 18.56 -122 41 33.15*			02	1		N	DAY	INJ		UNKNOWN		01	DRVR	NONE	00	U	UNK		000	000		00
																							UNK					

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Childs Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG / MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
															02	NONE 0 PRVTE	TURN-L SW NW									000		00
																PSNGR CAR		01	DRVR	INJC	62	M	OR-Y OR<25		028,004	000		02
04083	N	N	N			10/4/2015	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 0	STRGHT											02,08
COUNTY			N			Sun 1P			CN		STOP SIGN	N	DRY	TURN		PRVTE	NE SW									000		00
No	*45*	*23*	*18.44*	*-122*	*41*	*33.31*			02	1		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	32	M	OTH-Y N-RES		000	000		00
																		02	PSNG	INJB	29	F			000	000		00
															02	NONE 0 PRVTE	TURN-L SW NW									000		00
																PSNGR CAR		01	DRVR	INJB	52	M	OR-Y OR<25		028,004	000		02,08
01738	N	N	N			5/22/2018	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 9	STRGHT											02
NO RPT			N			Tue 9A			CN		STOP SIGN	N	DRY	TURN		N/A	NE SW									000		00
No	*45*	*23*	*18.44*	*-122*	*41*	*33.31*			02	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
															02	NONE 9 N/A	TURN-L NW NE									015		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
03925	N	N	N			10/5/2014	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L											02
NONE			N			Sun 10A			CN		STOP SIGN	N	DRY	TURN		PRVTE	NW NE									015		00
No	*45*	*23*	*18.56*	*-122*	*41*	*33.15*			03	1		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	37	F	OR-Y OR<25		028	000		02
															02	NONE 0 PRVTE	TURN-L SW NW									000		00
																PSNGR CAR		01	DRVR	INJC	56	M	OR-Y OR<25		000	000		00
04468	N	N	N			10/29/2015	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L											02
NO RPT			N			Thu 9A			CN		STOP SIGN	N	DRY	TURN		UNKN	NW NE									015		00
No	*45*	*23*	*18.44*	*-122*	*41*	*33.31*			03	1		N	DAY	INJ		UNKNOWN		01	DRVR	NONE	00	U	UNK UNK		028	000		02
															02	NONE 0 PRVTE	TURN-L SW NW									000		00
																PSNGR CAR		01	DRVR	INJC	48	M	OR-Y OR<25		000	000		00

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Childs Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG/MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
04234	N	N	N			11/19/2018	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L											02
NO RPT			N			Mon 1P			CN		STOP SIGN	N	DRY	TURN		PRVTE	NW NE										015		00
No						*45 23 18.43 -122 41 33.28*			03	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	21	F	OR-Y OR<25		028	000		02
															02	NONE 0	TURN-L											
																PRVTE	SW NW									000		00
																PSNGR CAR		01	DRVR	INJB	18	F	OR-Y OR<25		000	000		00
02879	N	Y	N	N	N	7/17/2015	5.97	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-R											08,33
COUNTY			N			Fri 11P			CN		STOP SIGN	N	DRY	TURN		PRVTE	NW SW									000		00
No						*45 23 18.44 -122 41 33.31*			04	1		N	DARK	PDO		PSNGR CAR		01	DRVR	NONE	48	M	OR-Y OR<25		001,051	000		08,33
															02	NONE 0	STRGHT											
																PRVTE	SW NE									000		00
																PSNGR CAR		01	DRVR	NONE	16	F	OR-Y OR<25		000	000		00

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
000	NONE	NO ACTION OR NON-WARRANTED
001	SKIDDED	SKIDDED
002	ON/OFF V	GETTING ON OR OFF STOPPED OR PARKED VEHICLE
003	LOAD OVR	OVERHANGING LOAD STRUCK ANOTHER VEHICLE, ETC.
006	SLOW DN	SLOWED DOWN
007	AVOIDING	AVOIDING MANEUVER
008	PAR PARK	PARALLEL PARKING
009	ANG PARK	ANGLE PARKING
010	INTERFERE	PASSENGER INTERFERING WITH DRIVER
011	STOPPED	STOPPED IN TRAFFIC NOT WAITING TO MAKE A LEFT TURN
012	STP/L TRN	STOPPED BECAUSE OF LEFT TURN SIGNAL OR WAITING, ETC.
013	STP TURN	STOPPED WHILE EXECUTING A TURN
014	EMR V PKD	EMERGENCY VEHICLE LEGALLY PARKED IN THE ROADWAY
015	GO A/STOP	PROCEED AFTER STOPPING FOR A STOP SIGN/FLASHING RED.
016	TRN A/RED	TURNED ON RED AFTER STOPPING
017	LOSTCTRL	LOST CONTROL OF VEHICLE
018	EXIT DWY	ENTERING STREET OR HIGHWAY FROM ALLEY OR DRIVEWAY
019	ENTR DWY	ENTERING ALLEY OR DRIVEWAY FROM STREET OR HIGHWAY
020	STR ENTR	BEFORE ENTERING ROADWAY, STRUCK PEDESTRIAN, ETC. ON SIDEWALK OR SHOULDER
021	NO DRVR	CAR RAN AWAY - NO DRIVER
022	PREV COL	STRUCK, OR WAS STRUCK BY, VEHICLE OR PEDESTRIAN IN PRIOR COLLISION BEFORE ACC. STABILIZED
023	STALLED	VEHICLE STALLED OR DISABLED
024	DRVR DEAD	DEAD BY UNASSOCIATED CAUSE
025	FATIGUE	FATIGUED, SLEEPY, ASLEEP
026	SUN	DRIVER BLINDED BY SUN
027	HDLGHTS	DRIVER BLINDED BY HEADLIGHTS
028	ILLNESS	PHYSICALLY ILL
029	THRU MED	VEHICLE CROSSED, PLUNGED OVER, OR THROUGH MEDIAN BARRIER
030	PURSUIT	PURSUING OR ATTEMPTING TO STOP A VEHICLE
031	PASSING	PASSING SITUATION
032	PRKOFFRD	VEHICLE PARKED BEYOND CURB OR SHOULDER
033	CROS MED	VEHICLE CROSSED EARTH OR GRASS MEDIAN
034	X N/SGNL	CROSSING AT INTERSECTION - NO TRAFFIC SIGNAL PRESENT
035	X W/ SGNL	CROSSING AT INTERSECTION - TRAFFIC SIGNAL PRESENT
036	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
037	BTWN INT	CROSSING BETWEEN INTERSECTIONS
038	DISTRACT	DRIVER'S ATTENTION DISTRACTED
039	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
040	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
041	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
042	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
043	PLAYINRD	PLAYING IN STREET OR ROAD
044	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
045	WORK ON	WORKING IN ROADWAY OR ALONG SHOULDER
046	W/ TRAFIC	NON-MOTORIST WALKING, RUNNING, RIDING, ETC. WITH TRAFFIC
047	A/ TRAFIC	NON-MOTORIST WALKING, RUNNING, RIDING, ETC. FACING TRAFFIC
050	LAY ON RD	STANDING OR LYING IN ROADWAY
051	ENT OFFRD	ENTERING / STARTING IN TRAFFIC LANE FROM OFF ROAD
052	MERGING	MERGING

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
055	SPRAY	BLINDED BY WATER SPRAY
088	OTHER	OTHER ACTION
099	UNK	UNKNOWN ACTION

CAUSE CODE TRANSLATION LIST

CAUSE CODE	SHORT DESCRIPTION	LONG DESCRIPTION
00	NO CODE	NO CAUSE ASSOCIATED AT THIS LEVEL
01	TOO-FAST	TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED
02	NO-YIELD	DID NOT YIELD RIGHT-OF-WAY
03	PAS-STOP	PASSED STOP SIGN OR RED FLASHER
04	DIS SIG	DISREGARDED TRAFFIC SIGNAL
05	LEFT-CTR	DROVE LEFT OF CENTER ON TWO-WAY ROAD; STRADDLING
06	IMP-OVER	IMPROPER OVERTAKING
07	TOO-CLOS	FOLLOWED TOO CLOSELY
08	IMP-TURN	MADE IMPROPER TURN
09	DRINKING	ALCOHOL OR DRUG INVOLVED
10	OTHR-IMP	OTHER IMPROPER DRIVING
11	MECH-DEF	MECHANICAL DEFECT
12	OTHER	OTHER (NOT IMPROPER DRIVING)
13	IMP LN C	IMPROPER CHANGE OF TRAFFIC LANES
14	DIS TCD	DISREGARDED OTHER TRAFFIC CONTROL DEVICE
15	WRNG WAY	WRONG WAY ON ONE-WAY ROAD; WRONG SIDE DIVIDED RO
16	FATIGUE	DRIVER DROWSY/FATIGUED/SLEEPY
17	ILLNESS	PHYSICAL ILLNESS
18	IN RDWY	NON-MOTORIST ILLEGALLY IN ROADWAY
19	NT VISBL	NON-MOTORIST NOT VISIBLE; NON-REFLECTIVE CLOTHIN
20	IMP PKNG	VEHICLE IMPROPERLY PARKED
21	DEF STER	DEFECTIVE STEERING MECHANISM
22	DEF BRKE	INADEQUATE OR NO BRAKES
24	LOADSHFT	VEHICLE LOST LOAD OR LOAD SHIFTED
25	TIREFAIL	TIRE FAILURE
26	PHANTOM	PHANTOM / NON-CONTACT VEHICLE
27	INATTENT	INATTENTION
28	NM INATT	NON-MOTORIST INATTENTION
29	F AVOID	FAILED TO AVOID VEHICLE AHEAD
30	SPEED	DRIVING IN EXCESS OF POSTED SPEED
31	RACING	SPEED RACING (PER PAR)
32	CARELESS	CARELESS DRIVING (PER PAR)
33	RECKLESS	RECKLESS DRIVING (PER PAR)
34	AGGRESV	AGGRESSIVE DRIVING (PER PAR)
35	RD RAGE	ROAD RAGE (PER PAR)
40	VIEW OBS	VIEW OBSCURED
50	USED MDN	IMPROPER USE OF MEDIAN OR SHOULDER
51	FAIL LN	FAILED TO MAINTAIN LANE
52	OFF RD	RAN OFF ROAD

COLLISION TYPE CODE TRANSLATION LIST

COLL CODE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OTH	MISCELLANEOUS
-	BACK	BACKING
0	PED	PEDESTRIAN
1	ANGL	ANGLE
2	HEAD	HEAD-ON
3	REAR	REAR-END
4	SS-M	SIDESWIPE - MEETING
5	SS-O	SIDESWIPE - OVERTAKING
6	TURN	TURNING MOVEMENT
7	PARK	PARKING MANEUVER
8	NCOL	NON-COLLISION
9	FIX	FIXED OBJECT OR OTHER OBJECT

CRASH TYPE CODE TRANSLATION LIST

CRASH TYPE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OVERTURN	OVERTURNED
0	NON-COLL	OTHER NON-COLLISION
1	OTH RDWY	MOTOR VEHICLE ON OTHER ROADWAY
2	PRKD MV	PARKED MOTOR VEHICLE
3	PED	PEDESTRIAN
4	TRAIN	RAILWAY TRAIN
6	BIKE	PEDALCYCLIST
7	ANIMAL	ANIMAL
8	FIX OBJ	FIXED OBJECT
9	OTH OBJ	OTHER OBJECT
A	ANGL-STP	ENTERING AT ANGLE - ONE VEHICLE STOPPED
B	ANGL-OTH	ENTERING AT ANGLE - ALL OTHERS
C	S-STRGHT	FROM SAME DIRECTION - BOTH GOING STRAIGHT
D	S-1TURN	FROM SAME DIRECTION - ONE TURN, ONE STRAIGHT
E	S-1STOP	FROM SAME DIRECTION - ONE STOPPED
F	S-OTHER	FROM SAME DIRECTION-ALL OTHERS, INCLUDING PARKING
G	O-STRGHT	FROM OPPOSITE DIRECTION - BOTH GOING STRAIGHT
H	O-1 L-TURN	FROM OPPOSITE DIRECTION-ONE LEFT TURN,ONE STRAIGHT
I	O-1STOP	FROM OPPOSITE DIRECTION - ONE STOPPED
J	O-OTHER	FROM OPPOSITE DIRECTION-ALL OTHERS INCL. PARKING

DRIVER LICENSE CODE TRANSLATION LIST

LIC CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NOT LICENSED (HAD NEVER BEEN LICENSED)
1	OR-Y	VALID OREGON LICENSE
2	OTH-Y	VALID LICENSE, OTHER STATE OR COUNTRY
3	SUSP	SUSPENDED/REVOKED
4	EXP	EXPIRED
8	N-VAL	OTHER NON-VALID LICENSE
9	UNK	UNKNOWN IF DRIVER WAS LICENSED AT TIME OF CRASH

DRIVER RESIDENCE CODE TRANSLATION LIST

RES CODE	SHORT DESC	LONG DESCRIPTION
1	OR<25	OREGON RESIDENT WITHIN 25 MILE OF HOME
2	OR>25	OREGON RESIDENT 25 OR MORE MILES FROM HOME
3	OR-?	OREGON RESIDENT - UNKNOWN DISTANCE FROM HOME
4	N-RES	NON-RESIDENT
9	UNK	UNKNOWN IF OREGON RESIDENT

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
000	NONE	NO ERROR
001	WIDE TRN	WIDE TURN
002	CUT CORN	CUT CORNER ON TURN
003	FAIL TRN	FAILED TO OBEY MANDATORY TRAFFIC TURN SIGNAL, SIGN OR LANE MARKINGS
004	L IN TRF	LEFT TURN IN FRONT OF ONCOMING TRAFFIC
005	L PROHIB	LEFT TURN WHERE PROHIBITED
006	FRM WRNG	TURNED FROM WRONG LANE
007	TO WRONG	TURNED INTO WRONG LANE
008	ILLEG U	U-TURNED ILLEGALLY
009	IMP STOP	IMPROPERLY STOPPED IN TRAFFIC LANE
010	IMP SIG	IMPROPER SIGNAL OR FAILURE TO SIGNAL
011	IMP BACK	BACKING IMPROPERLY (NOT PARKING)
012	IMP PARK	IMPROPERLY PARKED
013	UNPARK	IMPROPER START LEAVING PARKED POSITION
014	IMP STRT	IMPROPER START FROM STOPPED POSITION
015	IMP LGHT	IMPROPER OR NO LIGHTS (VEHICLE IN TRAFFIC)
016	INATTENT	INATTENTION (FAILURE TO DIM LIGHTS PRIOR TO 4/1/97)
017	UNSF VEH	DRIVING UNSAFE VEHICLE (NO OTHER ERROR APPARENT)
018	OTH PARK	ENTERING/EXITING PARKED POSITION W/ INSUFFICIENT CLEARANCE; OTHER IMPROPER PARKING MANEUVER
019	DIS DRIV	DISREGARDED OTHER DRIVER'S SIGNAL
020	DIS SGNL	DISREGARDED TRAFFIC SIGNAL
021	RAN STOP	DISREGARDED STOP SIGN OR FLASHING RED
022	DIS SIGN	DISREGARDED WARNING SIGN, FLARES OR FLASHING AMBER
023	DIS OFCR	DISREGARDED POLICE OFFICER OR FLAGMAN
024	DIS EMER	DISREGARDED SIREN OR WARNING OF EMERGENCY VEHICLE
025	DIS RR	DISREGARDED RR SIGNAL, RR SIGN, OR RR FLAGMAN
026	REAR-END	FAILED TO AVOID STOPPED OR PARKED VEHICLE AHEAD OTHER THAN SCHOOL BUS
027	BIKE ROW	DID NOT HAVE RIGHT-OF-WAY OVER PEDALCYCLIST
028	NO ROW	DID NOT HAVE RIGHT-OF-WAY
029	PED ROW	FAILED TO YIELD RIGHT-OF-WAY TO PEDESTRIAN
030	PAS CURV	PASSING ON A CURVE
031	PAS WRNG	PASSING ON THE WRONG SIDE
032	PAS TANG	PASSING ON STRAIGHT ROAD UNDER UNSAFE CONDITIONS
033	PAS X-WK	PASSED VEHICLE STOPPED AT CROSSWALK FOR PEDESTRIAN
034	PAS INTR	PASSING AT INTERSECTION
035	PAS HILL	PASSING ON CREST OF HILL
036	N/PAS ZN	PASSING IN "NO PASSING" ZONE
037	PAS TRAF	PASSING IN FRONT OF ONCOMING TRAFFIC
038	CUT-IN	CUTTING IN (TWO LANES - TWO WAY ONLY)
039	WRNGSIDE	DRIVING ON WRONG SIDE OF THE ROAD (2-WAY UNDIVIDED ROADWAYS)

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
040	THRU MED	DRIVING THROUGH SAFETY ZONE OR OVER ISLAND
041	F/ST BUS	FAILED TO STOP FOR SCHOOL BUS
042	F/SLO MV	FAILED TO DECREASE SPEED FOR SLOWER MOVING VEHICLE
043	TOO CLOSE	FOLLOWING TOO CLOSELY (MUST BE ON OFFICER'S REPORT)
044	STRDL LN	STRADDLING OR DRIVING ON WRONG LANES
045	IMP CHG	IMPROPER CHANGE OF TRAFFIC LANES
046	WRNG WAY	WRONG WAY ON ONE-WAY ROADWAY; WRONG SIDE DIVIDED ROAD
047	BASCRULE	DRIVING TOO FAST FOR CONDITIONS (NOT EXCEEDING POSTED SPEED)
048	OPN DOOR	OPENED DOOR INTO ADJACENT TRAFFIC LANE
049	IMPEDING	IMPEDING TRAFFIC
050	SPEED	DRIVING IN EXCESS OF POSTED SPEED
051	RECKLESS	RECKLESS DRIVING (PER PAR)
052	CARELESS	CARELESS DRIVING (PER PAR)
053	RACING	SPEED RACING (PER PAR)
054	X N/SGNL	CROSSING AT INTERSECTION, NO TRAFFIC SIGNAL PRESENT
055	X W/SGNL	CROSSING AT INTERSECTION, TRAFFIC SIGNAL PRESENT
056	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
057	BTWN INT	CROSSING BETWEEN INTERSECTIONS
059	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
060	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
061	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
062	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
063	PLAYINRD	PLAYING IN STREET OR ROAD
064	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
065	WORK IN RD	WORKING IN ROADWAY OR ALONG SHOULDER
070	LAY ON RD	STANDING OR LYING IN ROADWAY
071	NM IMP USE	IMPROPER USE OF TRAFFIC LANE BY NON-MOTORIST
073	ELUDING	ELUDING / ATTEMPT TO ELUDE
079	F NEG CURV	FAILED TO NEGOTIATE A CURVE
080	FAIL LN	FAILED TO MAINTAIN LANE
081	OFF RD	RAN OFF ROAD
082	NO CLEAR	DRIVER MISJUDGED CLEARANCE
083	OVRSTEER	OVER-CORRECTING
084	NOT USED	CODE NOT IN USE
085	OVRLOAD	OVERLOADING OR IMPROPER LOADING OF VEHICLE WITH CARGO OR PASSENGERS
097	UNA DIS TC	UNABLE TO DETERMINE WHICH DRIVER DISREGARDED TRAFFIC CONTROL DEVICE

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
001	FEL/JUMP	OCCUPANT FELL, JUMPED OR WAS EJECTED FROM MOVING VEHICLE
002	INTERFER	PASSENGER INTERFERED WITH DRIVER
003	BUG INTF	ANIMAL OR INSECT IN VEHICLE INTERFERED WITH DRIVER
004	INDRCT PED	PEDESTRIAN INDIRECTLY INVOLVED (NOT STRUCK)
005	SUB-PED	"SUB-PED": PEDESTRIAN INJURED SUBSEQUENT TO COLLISION, ETC.
006	INDRCT BIK	PEDALCYCLIST INDIRECTLY INVOLVED (NOT STRUCK)
007	HITCHIKR	HITCHHIKER (SOLICITING A RIDE)
008	PSNGR TOW	PASSENGER OR NON-MOTORIST BEING TOWED OR PUSHED ON CONVEYANCE
009	ON/OFF V	GETTING ON/OFF STOPPED/PARKED VEHICLE (OCCUPANTS ONLY; MUST HAVE PHYSICAL CONTACT W/ VEHIC
010	SUB OTRN	OVERTURNED AFTER FIRST HARMFUL EVENT
011	MV PUSHD	VEHICLE BEING PUSHED
012	MV TOWED	VEHICLE TOWED OR HAD BEEN TOWING ANOTHER VEHICLE
013	FORCED	VEHICLE FORCED BY IMPACT INTO ANOTHER VEHICLE, PEDALCYCLIST OR PEDESTRIAN
014	SET MOTN	VEHICLE SET IN MOTION BY NON-DRIVER (CHILD RELEASED BRAKES, ETC.)
015	RR ROW	AT OR ON RAILROAD RIGHT-OF-WAY (NOT LIGHT RAIL)
016	LT RL ROW	AT OR ON LIGHT-RAIL RIGHT-OF-WAY
017	RR HIT V	TRAIN STRUCK VEHICLE
018	V HIT RR	VEHICLE STRUCK TRAIN
019	HIT RR CAR	VEHICLE STRUCK RAILROAD CAR ON ROADWAY
020	JACKNIFE	JACKKNIFE; TRAILER OR TOWED VEHICLE STRUCK TOWING VEHICLE
021	TRL OTRN	TRAILER OR TOWED VEHICLE OVERTURNED
022	CN BROKE	TRAILER CONNECTION BROKE
023	DETACH TRL	DETACHED TRAILING OBJECT STRUCK OTHER VEHICLE, NON-MOTORIST, OR OBJECT
024	V DOOR OPN	VEHICLE DOOR OPENED INTO ADJACENT TRAFFIC LANE
025	WHEELOFF	WHEEL CAME OFF
026	HOOD UP	HOOD FLEW UP
028	LOAD SHIFT	LOST LOAD, LOAD MOVED OR SHIFTED
029	TIREFAIL	TIRE FAILURE
030	PET	PET: CAT, DOG AND SIMILAR
031	LVSTOCK	STOCK: COW, CALF, BULL, STEER, SHEEP, ETC.
032	HORSE	HORSE, MULE, OR DONKEY
033	HRSE&RID	HORSE AND RIDER
034	GAME	WILD ANIMAL, GAME (INCLUDES BIRDS; NOT DEER OR ELK)
035	DEER ELK	DEER OR ELK, WAPITI
036	ANML VEH	ANIMAL-DRAWN VEHICLE
037	CULVERT	CULVERT, OPEN LOW OR HIGH MANHOLE
038	ATENUATN	IMPACT ATTENUATOR
039	PK METER	PARKING METER
040	CURB	CURB (ALSO NARROW SIDEWALKS ON BRIDGES)
041	JIGGLE	JIGGLE BAR OR TRAFFIC SNAKE FOR CHANNELIZATION
042	GDRL END	LEADING EDGE OF GUARDRAIL
043	GARDRAIL	GUARD RAIL (NOT METAL MEDIAN BARRIER)
044	BARRIER	MEDIAN BARRIER (RAISED OR METAL)
045	WALL	RETAINING WALL OR TUNNEL WALL
046	BR RAIL	BRIDGE RAILING OR PARAPET (ON BRIDGE OR APPROACH)
047	BR ABUTMNT	BRIDGE ABUTMENT (INCLUDED "APPROACH END" THRU 2013)
048	BR COLMN	BRIDGE PILLAR OR COLUMN
049	BR GIRDR	BRIDGE GIRDER (HORIZONTAL BRIDGE STRUCTURE OVERHEAD)
050	ISLAND	TRAFFIC RAISED ISLAND
051	GORE	GORE
052	POLE UNK	POLE - TYPE UNKNOWN
053	POLE UTL	POLE - POWER OR TELEPHONE
054	ST LIGHT	POLE - STREET LIGHT ONLY
055	TRF SGNL	POLE - TRAFFIC SIGNAL AND PED SIGNAL ONLY
056	SGN BRDG	POLE - SIGN BRIDGE
057	STOPSIGN	STOP OR YIELD SIGN

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
058	OTH SIGN	OTHER SIGN, INCLUDING STREET SIGNS
059	HYDRANT	HYDRANT
060	MARKER	DELINEATOR OR MARKER (REFLECTOR POSTS)
061	MAILBOX	MAILBOX
062	TREE	TREE, STUMP OR SHRUBS
063	VEG OHED	TREE BRANCH OR OTHER VEGETATION OVERHEAD, ETC.
064	WIRE/CBL	WIRE OR CABLE ACROSS OR OVER THE ROAD
065	TEMP SGN	TEMPORARY SIGN OR BARRICADE IN ROAD, ETC.
066	PERM SGN	PERMANENT SIGN OR BARRICADE IN/OFF ROAD
067	SLIDE	SLIDES, FALLEN OR FALLING ROCKS
068	FRGN OBJ	FOREIGN OBSTRUCTION/DEBRIS IN ROAD (NOT GRAVEL)
069	EQP WORK	EQUIPMENT WORKING IN/OFF ROAD
070	OTH EQP	OTHER EQUIPMENT IN OR OFF ROAD (INCLUDES PARKED TRAILER, BOAT)
071	MAIN EQP	WRECKER, STREET SWEEPER, SNOW PLOW OR SANDING EQUIPMENT
072	OTHER WALL	ROCK, BRICK OR OTHER SOLID WALL
073	IRRGL PVMT	OTHER BUMP (NOT SPEED BUMP), POTHOLE OR PAVEMENT IRREGULARITY (PER PAR)
074	OVERHD OBJ	OTHER OVERHEAD OBJECT (HIGHWAY SIGN, SIGNAL HEAD, ETC.); NOT BRIDGE
075	CAVE IN	BRIDGE OR ROAD CAVE IN
076	HI WATER	HIGH WATER
077	SNO BANK	SNOW BANK
078	LO-HI EDGE	LOW OR HIGH SHOULDER AT PAVEMENT EDGE
079	DITCH	CUT SLOPE OR DITCH EMBANKMENT
080	OBJ FRM MV	STRUCK BY ROCK OR OTHER OBJECT SET IN MOTION BY OTHER VEHICLE (INCL. LOST LOADS)
081	FLY-OBJ	STRUCK BY ROCK OR OTHER MOVING OR FLYING OBJECT (NOT SET IN MOTION BY VEHICLE)
082	VEH HID	VEHICLE OBSCURED VIEW
083	VEG HID	VEGETATION OBSCURED VIEW
084	BLDG HID	VIEW OBSCURED BY FENCE, SIGN, PHONE BOOTH, ETC.
085	WIND GUST	WIND GUST
086	IMMERSED	VEHICLE IMMERSED IN BODY OF WATER
087	FIRE/EXP	FIRE OR EXPLOSION
088	FENC/BLD	FENCE OR BUILDING, ETC.
089	OTHR CRASH	CRASH RELATED TO ANOTHER SEPARATE CRASH
090	TO 1 SIDE	TWO-WAY TRAFFIC ON DIVIDED ROADWAY ALL ROUTED TO ONE SIDE
091	BUILDING	BUILDING OR OTHER STRUCTURE
092	PHANTOM	OTHER (PHANTOM) NON-CONTACT VEHICLE
093	CELL PHONE	CELL PHONE (ON PAR OR DRIVER IN USE)
094	VIOL GDL	TEENAGE DRIVER IN VIOLATION OF GRADUATED LICENSE PGM
095	GUY WIRE	GUY WIRE
096	BERM	BERM (EARTHEN OR GRAVEL MOUND)
097	GRAVEL	GRAVEL IN ROADWAY
098	ABR EDGE	ABRUPT EDGE
099	CELL WTNSD	CELL PHONE USE WITNESSED BY OTHER PARTICIPANT
100	UNK FIXD	FIXED OBJECT, UNKNOWN TYPE.
101	OTHER OBJ	NON-FIXED OBJECT, OTHER OR UNKNOWN TYPE
102	TEXTING	TEXTING
103	WZ WORKER	WORK ZONE WORKER
104	ON VEHICLE	PASSENGER RIDING ON VEHICLE EXTERIOR
105	PEDAL PSGR	PASSENGER RIDING ON PEDALCYCLE
106	MAN WHLCHR	PEDESTRIAN IN NON-MOTORIZED WHEELCHAIR
107	MTR WHLCHR	PEDESTRIAN IN MOTORIZED WHEELCHAIR
108	OFFICER	LAW ENFORCEMENT / POLICE OFFICER
109	SUB-BIKE	"SUB-BIKE": PEDALCYCLIST INJURED SUBSEQUENT TO COLLISION, ETC.
110	N-MTR	NON-MOTORIST STRUCK VEHICLE
111	S CAR VS V	STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM) STRUCK VEHICLE
112	V VS S CAR	VEHICLE STRUCK STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM)
113	S CAR ROW	AT OR ON STREET CAR OR TROLLEY RIGHT-OF-WAY

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
114	RR EQUIP	VEHICLE STRUCK RAILROAD EQUIPMENT (NOT TRAIN) ON TRACKS
115	DSTRCT GPS	DISTRACTED BY NAVIGATION SYSTEM OR GPS DEVICE
116	DSTRCT OTH	DISTRACTED BY OTHER ELECTRONIC DEVICE
117	RR GATE	RAIL CROSSING DROP-ARM GATE
118	EXPNSN JNT	EXPANSION JOINT
119	JERSEY BAR	JERSEY BARRIER
120	WIRE BAR	WIRE OR CABLE MEDIAN BARRIER
121	FENCE	FENCE
123	OBJ IN VEH	LOOSE OBJECT IN VEHICLE STRUCK OCCUPANT
124	SLIPPERY	SLIDING OR SWERVING DUE TO WET, ICY, SLIPPERY OR LOOSE SURFACE (NOT GRAVEL)
125	SHLDR	SHOULDER GAVE WAY
126	BOULDER	ROCK(S), BOULDER (NOT GRAVEL; NOT ROCK SLIDE)
127	LAND SLIDE	ROCK SLIDE OR LAND SLIDE
128	CURVE INV	CURVE PRESENT AT CRASH LOCATION
129	HILL INV	VERTICAL GRADE / HILL PRESENT AT CRASH LOCATION
130	CURVE HID	VIEW OBSCURED BY CURVE
131	HILL HID	VIEW OBSCURED BY VERTICAL GRADE / HILL
132	WINDOW HID	VIEW OBSCURED BY VEHICLE WINDOW CONDITIONS
133	SPRAY HID	VIEW OBSCURED BY WATER SPRAY
134	TORRENTIAL	TORRENTIAL RAIN (EXCEPTIONALLY HEAVY RAIN)
135	RAIL OCC	INJURED OCCUPANT OF RAILWAY TRAIN, LIGHT RAIL, STREET CAR OR CABLE CAR

FUNCTIONAL CLASSIFICATION TRANSLATION LIST

FUNC CLASS	DESCRIPTION
01	RURAL PRINCIPAL ARTERIAL - INTERSTATE
02	RURAL PRINCIPAL ARTERIAL - OTHER
06	RURAL MINOR ARTERIAL
07	RURAL MAJOR COLLECTOR
08	RURAL MINOR COLLECTOR
09	RURAL LOCAL
11	URBAN PRINCIPAL ARTERIAL - INTERSTATE
12	URBAN PRINCIPAL ARTERIAL - OTHER FREEWAYS AND EXP
14	URBAN PRINCIPAL ARTERIAL - OTHER
16	URBAN MINOR ARTERIAL
17	URBAN MAJOR COLLECTOR
18	URBAN MINOR COLLECTOR
19	URBAN LOCAL
78	UNKNOWN RURAL SYSTEM
79	UNKNOWN RURAL NON-SYSTEM
98	UNKNOWN URBAN SYSTEM
99	UNKNOWN URBAN NON-SYSTEM

HIGHWAY COMPONENT TRANSLATION LIST

CODE	DESCRIPTION
0	MAINLINE STATE HIGHWAY
1	COUPLET
3	FRONTAGE ROAD
6	CONNECTION
8	HIGHWAY - OTHER

INJURY SEVERITY CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
1	KILL	FATAL INJURY (K)
2	INJA	SUSPECTED SERIOUS INJURY (A)
3	INJB	SUSPECTED MINOR INJURY (B)
4	INJC	POSSIBLE INJURY (C)
5	PRI	DIED PRIOR TO CRASH
7	NO<5	NO INJURY - 0 TO 4 YEARS OF AGE
9	NONE	NO APPARENT INJURY (O)

LIGHT CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	DAY	DAYLIGHT
2	DLIT	DARKNESS - WITH STREET LIGHTS
3	DARK	DARKNESS - NO STREET LIGHTS
4	DAWN	DAWN (TWILIGHT)
5	DUSK	DUSK (TWILIGHT)

MEDIAN TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NO MEDIAN
1	RSDMD	SOLID MEDIAN BARRIER
2	DIVMD	EARTH, GRASS OR PAVED MEDIAN

MILEAGE TYPE CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
0	REGULAR MILEAGE
T	TEMPORARY
Y	SPUR
Z	OVERLAPPING

MOVEMENT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	STRGHT	STRAIGHT AHEAD
2	TURN-R	TURNING RIGHT
3	TURN-L	TURNING LEFT
4	U-TURN	MAKING A U-TURN
5	BACK	BACKING
6	STOP	STOPPED IN TRAFFIC
7	PRKD-P	PARKED - PROPERLY
8	PRKD-I	PARKED - IMPROPERLY
9	PARKNG	PARKING MANEUVER

NON-MOTORIST LOCATION CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
00	AT INTERSECTION - NOT IN ROADWAY
01	AT INTERSECTION - INSIDE CROSSWALK
02	AT INTERSECTION - IN ROADWAY, OUTSIDE CROSSWALK
03	AT INTERSECTION - IN ROADWAY, XWALK AVAIL UNKNWN
04	NOT AT INTERSECTION - IN ROADWAY
05	NOT AT INTERSECTION - ON SHOULDER
06	NOT AT INTERSECTION - ON MEDIAN
07	NOT AT INTERSECTION - WITHIN TRAFFIC RIGHT-OF-WAY
08	NOT AT INTERSECTION - IN BIKE PATH OR PARKING LANE
09	NOT-AT INTERSECTION - ON SIDEWALK
10	OUTSIDE TRAFFICWAY BOUNDARIES
13	AT INTERSECTION - IN BIKE LANE
14	NOT AT INTERSECTION - IN BIKE LANE
15	NOT AT INTERSECTION - INSIDE MID-BLOCK CROSSWALK
16	NOT AT INTERSECTION - IN PARKING LANE
18	OTHER, NOT IN ROADWAY
99	UNKNOWN LOCATION

ROAD CHARACTER CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	INTER	INTERSECTION
2	ALLEY	DRIVEWAY OR ALLEY
3	STRGHT	STRAIGHT ROADWAY
4	TRANS	TRANSITION
5	CURVE	CURVE (HORIZONTAL CURVE)
6	OPENAC	OPEN ACCESS OR TURNOUT
7	GRADE	GRADE (VERTICAL CURVE)
8	BRIDGE	BRIDGE STRUCTURE
9	TUNNEL	TUNNEL

PARTICIPANT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	OCC	UNKNOWN OCCUPANT TYPE
1	DRVR	DRIVER
2	PSNG	PASSENGER
3	PED	PEDESTRIAN
4	CONV	PEDESTRIAN USING A PEDESTRIAN CONVEYA
5	PTOW	PEDESTRIAN TOWING OR TRAILERING AN OB
6	BIKE	PEDALCYCLIST
7	BTOW	PEDALCYCLIST TOWING OR TRAILERING AN
8	PRKD	OCCUPANT OF A PARKED MOTOR VEHICLE
9	OTHR	OTHER TYPE OF NON-MOTORIST

TRAFFIC CONTROL DEVICE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
000	NONE	NO CONTROL
001	TRF SIGNAL	TRAFFIC SIGNALS
002	FLASHBCN-R	FLASHING BEACON - RED (STOP)
003	FLASHBCN-A	FLASHING BEACON - AMBER (SLOW)
004	STOP SIGN	STOP SIGN
005	SLOW SIGN	SLOW SIGN
006	REG-SIGN	REGULATORY SIGN
007	YIELD	YIELD SIGN
008	WARNING	WARNING SIGN
009	CURVE	CURVE SIGN
010	SCHL X-ING	SCHOOL CROSSING SIGN OR SPECIAL SIGNAL
011	OFCR/FLAG	POLICE OFFICER, FLAGMAN - SCHOOL PATROL
012	BRDG-GATE	BRIDGE GATE - BARRIER
013	TEMP-BARR	TEMPORARY BARRIER
014	NO-PASS-ZN	NO PASSING ZONE
015	ONE-WAY	ONE-WAY STREET
016	CHANNEL	CHANNELIZATION
017	MEDIAN BAR	MEDIAN BARRIER
018	PILOT CAR	PILOT CAR
019	SP PED SIG	SPECIAL PEDESTRIAN SIGNAL
020	X-BUCK	CROSSBUCK
021	THR-GN-SIG	THROUGH GREEN ARROW OR SIGNAL
022	L-GRN-SIG	LEFT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
023	R-GRN-SIG	RIGHT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
024	WIGWAG	WIGWAG OR FLASHING LIGHTS W/O DROP-ARM GATE
025	X-BUCK WRN	CROSSBUCK AND ADVANCE WARNING
026	WW W/ GATE	FLASHING LIGHTS WITH DROP-ARM GATES
027	OVRHD SGNL	SUPPLEMENTAL OVERHEAD SIGNAL (RR XING ONLY)
028	SP RR STOP	SPECIAL RR STOP SIGN
029	ILUM GRD X	ILLUMINATED GRADE CROSSING
037	RAMP METER	METERED RAMPS
038	RUMBLE STR	RUMBLE STRIP
090	L-TURN REF	LEFT TURN REFUGE (WHEN REFUGE IS INVOLVED)
091	R-TURN ALL	RIGHT TURN AT ALL TIMES SIGN, ETC.
092	EMR SGN/FL	EMERGENCY SIGNS OR FLARES
093	ACCEL LANE	ACCELERATION OR DECELERATION LANES
094	R-TURN PRO	RIGHT TURN PROHIBITED ON RED AFTER STOPPING
095	BUS STPSGN	BUS STOP SIGN AND RED LIGHTS
099	UNKNOWN	UNKNOWN OR NOT DEFINITE

VEHICLE TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
00	PDO	NOT COLLECTED FOR PDO CRASHES
01	PSNGR CAR	PASSENGER CAR, PICKUP, LIGHT DELIVERY, ETC.
02	BOBTAIL	TRUCK TRACTOR WITH NO TRAILERS (BOBTAIL)
03	FARM TRCTR	FARM TRACTOR OR SELF-PROPELLED FARM EQUIPMENT
04	SEMI TOW	TRUCK TRACTOR WITH TRAILER/MOBILE HOME IN TOW
05	TRUCK	TRUCK WITH NON-DETACHABLE BED, PANEL, ETC.
06	MOPED	MOPED, MINIBIKE, SEATED MOTOR SCOOTER, MOTOR BIKE
07	SCHL BUS	SCHOOL BUS (INCLUDES VAN)
08	OTH BUS	OTHER BUS
09	MTRCYCLE	MOTORCYCLE, DIRT BIKE
10	OTHER	OTHER: FORKLIFT, BACKHOE, ETC.
11	MOTRHOME	MOTORHOME
12	TROLLEY	MOTORIZED STREET CAR/TROLLEY (NO RAILS/WIRES)
13	ATV	ATV
14	MTRSCTR	MOTORIZED SCOOTER (STANDING)
15	SNOWMOBILE	SNOWMOBILE
99	UNKNOWN	UNKNOWN VEHICLE TYPE

WEATHER CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	CLR	CLEAR
2	CLD	CLOUDY
3	RAIN	RAIN
4	SLT	SLEET
5	FOG	FOG
6	SNOW	SNOW
7	DUST	DUST
8	SMOK	SMOKE
9	ASH	ASH

APPENDIX D: ODOT Crash Data – Johnson Rd

OREGON DEPARTMENT OF TRANSPORTATION - POLICY, DATA AND ANALYSIS DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at Stafford Rd & Johnson Rd
January 1, 2014 through December 31, 2018

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2018														
REAR-END	0	5	1	6	0	5	0	5	1	4	2	6	0	0
TURNING MOVEMENTS	0	1	2	3	0	2	0	3	0	3	0	3	0	0
2018 TOTAL	0	6	3	9	0	7	0	8	1	7	2	9	0	0
YEAR: 2017														
REAR-END	0	0	1	1	0	0	0	0	1	1	0	1	0	0
TURNING MOVEMENTS	0	2	0	2	0	2	0	2	0	2	0	2	0	0
2017 TOTAL	0	2	1	3	0	2	0	2	1	3	0	3	0	0
YEAR: 2016														
REAR-END	0	2	1	3	0	2	0	2	1	2	1	3	0	0
TURNING MOVEMENTS	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2016 TOTAL	0	3	1	4	0	4	0	3	1	3	1	4	0	0
YEAR: 2015														
BACKING	0	0	1	1	0	0	0	1	0	0	1	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2015 TOTAL	0	0	2	2	0	0	0	2	0	1	1	2	0	0
YEAR: 2014														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	1	0	1	0	1	0	0	1	1	0	1	0	0
2014 TOTAL	0	1	1	2	0	1	0	1	1	2	0	2	0	0
FINAL TOTAL	0	12	8	20	0	14	0	16	4	16	4	20	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Johnson Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG/MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00065	N	N	N			1/6/2015	0.00	SW JOHNSON RD	INTER	3-LEG	N	N	CLR	O-1STOP	01	NONE 0	BACK											10
NONE			N			Tue 7A			E		STOP SIGN	N	DRY	BACK		UNKN	W E										000		00
No	*45 23*		*6.31*	*-122*	*41*	*41.99*			06	0		N	DAWN	PDO		UNKNOWN		01	DRVR	NONE	00	M	UNK UNK		011	000		10
															02	NONE 0	STOP											
																PRVTE	E W									011		00
																PSNGR CAR		01	DRVR	NONE	37	M	OR-Y OR<25		000	000		00
00924	N	N	N			3/15/2018	0.00	SW JOHNSON RD	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											29
NONE			N			Thu 8A			SE		STOP SIGN	N	DRY	REAR		PRVTE	SE NW									000		00
No	*45 23*		*6.31*	*-122*	*41*	*41.99*			06	0		N	DAWN	INJ		PSNGR CAR		01	DRVR	NONE	26	M	OR-Y OR<25		026	000		29
															02	NONE 0	STOP											
																PRVTE	SE NW									011		00
																PSNGR CAR		01	DRVR	INJC	67	M	OR-Y OR<25		000	000		00
02009	N	N	N	N	N	6/11/2018	0.00	SW JOHNSON RD	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											27,29
COUNTY			N			Mon 8A			SE		STOP SIGN	N	DRY	REAR		PRVTE	SE NW									000		00
No	*45 23*		*6.31*	*-122*	*41*	*41.99*			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	53	M	OR-Y OR<25		026	000		27,29
															02	NONE 0	STOP											
																PRVTE	SE NW									011		00
																PSNGR CAR		01	DRVR	INJC	33	F	OR-Y OR<25		000	000		00
04707	N	N	N	N	N	10/12/2016	0.00	SW JOHNSON RD	INTER	3-LEG	N	N	CLD	O-1 L-TURN	01	NONE 0	STRGHT											02,08
COUNTY			N			Wed 4P			CN		STOP SIGN	N	DRY	TURN		PRVTE	S N									000		00
No	*45 23*		*6.31*	*-122*	*41*	*41.99*			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	63	F	OR-Y OR<25		000	000		00
															02	NONE 0	TURN-L											
																PRVTE	N E									000		00
																PSNGR CAR		01	DRVR	INJC	23	F	OR-Y OR<25		028,004	000		02,08
03938	N	N	N			10/29/2018	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	RAIN	S-1STOP	01	NONE 0	STRGHT											29
NO RPT			N			Mon 5P			UN		STOP SIGN	N	WET	REAR		PRVTE	N S									000		00
No	*45 23*		*6.31*	*-122*	*41*	*41.99*			06	0		N	DUSK	INJ		PSNGR CAR		01	DRVR	NONE	59	M	OR-Y OR<25		026	000		29
															02	NONE 0	STOP											
																PRVTE	N S									012		00
																PSNGR CAR		01	DRVR	INJC	60	F	OR-Y OR<25		000	000		00

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Johnson Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG/MJ	SCHL	SWORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
00387	N	N	N	N	N	1/30/2014	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLD	S-1STOP	01	NONE 0	STRGHT											29,32
COUNTY			N			Thu 4P			N		UNKNOWN	N	DRY	REAR		PRVTE	N S									000		00
No	*45*	*23*				*6.31 -122 41 41.99*			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	55	M	OR-Y OR<25		026,052	000		29,32
															02	NONE 0	STOP											
																PRVTE	N S									012		00
																PSNGR CAR		01	DRVR	NONE	38	F	SUSP OR<25		000	000		00
02583	N	N	N			6/8/2016	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											29
NONE			N			Wed 12P			N		STOP SIGN	N	DRY	REAR		PRVTE	N S									000		00
No	*45*	*23*				*6.31 -122 41 41.99*			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	71	M	OR-Y OR<25		026	000		29
															02	NONE 0	STOP											
																PRVTE	N S									012		00
																PSNGR CAR		01	DRVR	NONE	22	M	OR-Y OR<25		000	000		00
																		02	PSNG	INJB	23	M			000	000		00
06206	N	N	N			10/14/2016	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	S-1STOP	01	NONE 0	STRGHT											29
NO RPT			N			Fri 11A			N		STOP SIGN	N	DRY	REAR		PRVTE	N S									000		00
No	*45*	*23*				*6.31 -122 41 41.99*			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	38	M	OR-Y OR<25		026	000		29
															02	NONE 0	STOP											
																PRVTE	N S									012		00
																PSNGR CAR		01	DRVR	INJC	60	M	OR-Y OR<25		000	000		00
04961	N	N	N			10/26/2016	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	RAIN	S-1STOP	01	NONE 9	STRGHT											29
NONE			N			Wed 5P			N		STOP SIGN	N	WET	REAR		N/A	N S									000		00
No	*45*	*23*				*6.31 -122 41 41.99*			06	0		N	DUSK	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
															02	NONE 9	STOP											
																N/A	N S									012		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
04615	N	N	N			11/3/2017	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	RAIN	S-1STOP	01	NONE 9	STRGHT											29
NONE			N			Fri 3P			N		STOP SIGN	N	WET	REAR		N/A	N S									000		00
No	*45*	*23*				*6.31 -122 41 41.99*			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Johnson Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG / MJ	SCHL	SWORK	DATE / DAY/TIME / LAT/LONG	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS / FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
															02	NONE 9 N/A	STOP N S									012		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
02516	N	N	N			7/19/2018 Thu 4P	5.68	SW STAFFORD RD- 30013	INTER N	3-LEG 0	N STOP SIGN	N N	CLR DRY	S-1STOP REAR	01	NONE 0 PRVTE	STRGHT N S												29
NONE			N																							000		00
No	45	23	6.31 -122 41 41.99						06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	33	F	OR-Y OR<25		026	038		29
															02	NONE 0 PRVTE	STOP N S									012		00
																PSNGR CAR		01	DRVR	INJC	36	M	OR-Y OR<25		000	000		00
04359	N	N	N			11/6/2018 Tue 3P	5.68	SW STAFFORD RD- 30013	INTER N	3-LEG 0	N STOP SIGN	N N	CLR DRY	S-1STOP REAR	01	NONE 9 N/A	STRGHT N S												29
NO RPT			N																							000		00
No	45	23	6.32 -122 41 41.99						06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
															02	NONE 9 N/A	STOP N S									012		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
03439	N	N	N			8/24/2015 Mon 4P	5.68	SW STAFFORD RD- 30013	INTER E	3-LEG 0	N STOP SIGN	N N	CLR DRY	ANGL-STP TURN	01	NONE 0 PRVTE	TURN-L N E												08
NONE			N																							000		00
No	45	23	6.31 -122 41 41.99						06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	49	M	OR-Y OR<25		002	000		08
															02	NONE 0 PRVTE	STOP E W									012		00
																PSNGR CAR		01	DRVR	NONE	55	M	OR-Y OR<25		000	000		00
00473	N	N	N			2/6/2018 Tue 4P 0	5.68	SW STAFFORD RD- 30013	INTER CN	3-LEG 0	N STOP SIGN	N N	CLR DRY	S-1STOP REAR	01	NONE 0 PRVTE	STRGHT N S												29
NO RPT			N																							000		00
No	45	23	6.31 -122 41 41.99						01	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	24	M	OR-Y OR<25		026	000		29
															02	NONE 0 PRVTE	STOP N S									012		00
																PSNGR CAR		01	DRVR	INJC	32	M	OR-Y OR<25		000	000		00
01689	N	N	N			5/11/2018 Fri 4P	5.68	SW STAFFORD RD- 30013	INTER CN	3-LEG 0	N STOP SIGN	N N	CLR DRY	O-1 L-TURN TURN	01	NONE 9 N/A	STRGHT S N												02,08
NONE			N																							000		00
No	45	23	6.31 -122 41 42.00						03	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Johnson Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG / MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
															02	NONE 9 N/A	TURN-L N SE									000		00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK UNK		000	000		00
01786	N	N	N	N	N	5/9/2014	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	RAIN	O-1 L-TURN	01	NONE 0	STRGHT											02
COUNTY		N				Fri 5P			CN		UNKNOWN	N	WET	TURN		PRVTE	S N									000		00
No	*45*	*23*		*6.31*	*-122*	*41 41.99*			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	45	M	OR-Y OR<25		000	000		00
															02	NONE 0 PRVTE	TURN-L N E									000		00
																PSNGR CAR		01	DRVR	NONE	56	M	OR-Y OR<25		028,004	000		02
00288	N	N	N			1/20/2017	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLD	O-1 L-TURN	01	NONE 0	STRGHT											02,08
COUNTY		N				Fri 2P			CN		STOP SIGN	N	DRY	TURN		PRVTE	S N									000		00
No	*45*	*23*		*6.31*	*-122*	*41 41.99*			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	65	M	OR-Y OR<25		000	000		00
															02	NONE 0 PRVTE	TURN-L N E									000		00
																PSNGR CAR		01	DRVR	NONE	16	F	OR-Y OR<25		028,004	000		02,08
00297	N	N	N			1/20/2017	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 0	STRGHT											02,08
COUNTY		N				Fri 3P			CN		STOP SIGN	N	DRY	TURN		PRVTE	S N									000		00
No	*45*	*23*		*6.31*	*-122*	*41 41.99*			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	70	M	OR-Y OR<25		000	000		00
															02	NONE 0 PRVTE	TURN-L N E									000		00
																PSNGR CAR		01	DRVR	NONE	27	M	OR-Y OR<25		028,004	000		02,08
02519	N	N	N	N	N	7/20/2018	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 0	STRGHT											02,08
COUNTY		N				Fri 3P			CN		STOP SIGN	N	DRY	TURN		PRVTE	S N									000		00
No	*45*	*23*		*6.32*	*-122*	*41 41.99*			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	28	M	OR-Y OR<25		000	000		00
															02	NONE 0 PRVTE	TURN-L N E									000		00
																PSNGR CAR		01	DRVR	NONE	46	M	OR-Y OR<25		028,004	000		02,08
																		02	PSNG	INJC	35	M			000	000		00

CLACKAMAS COUNTY

Intersectional Crashes at Stafford Rd & Johnson Rd
January 1, 2014 through December 31, 2018

SER# / INVEST / UNLOC?	SPEED	ALC	DRUG/MJ	SCHL	WORK	DATE / DAY/TIME / *LAT/LONG*	MILEPNT / DIST FROM / INTERSECT	COUNTY ROADS FIRST STREET / SECOND STREET / INTERSECTION SEQ #	RD CHAR / DIRECT / LOCTN	INT-TYP (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFF-RD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH TYP / COLL TYP / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	AGE	SEX	LICNS RES	PED LOC	ERROR	ACTN	EVENT	CAUSE
03434	N	N	N	N	N	9/26/2018	5.68	SW STAFFORD RD- 30013	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 9	STRGHT											02,08
COUNTY			N			Wed 5P			CN		NONE	N	DRY	TURN		N/A	S N											00
No						*45 23 6.31 -122 41 41.99*			04	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																								UNK				
															02	NONE 9	TURN-L											
																N/A	N E											00
																PSNGR CAR		01	DRVR	NONE	00	U	UNK		000	000		00
																								UNK				

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
000	NONE	NO ACTION OR NON-WARRANTED
001	SKIDDED	SKIDDED
002	ON/OFF V	GETTING ON OR OFF STOPPED OR PARKED VEHICLE
003	LOAD OVR	OVERHANGING LOAD STRUCK ANOTHER VEHICLE, ETC.
006	SLOW DN	SLOWED DOWN
007	AVOIDING	AVOIDING MANEUVER
008	PAR PARK	PARALLEL PARKING
009	ANG PARK	ANGLE PARKING
010	INTERFERE	PASSENGER INTERFERING WITH DRIVER
011	STOPPED	STOPPED IN TRAFFIC NOT WAITING TO MAKE A LEFT TURN
012	STP/L TRN	STOPPED BECAUSE OF LEFT TURN SIGNAL OR WAITING, ETC.
013	STP TURN	STOPPED WHILE EXECUTING A TURN
014	EMR V PKD	EMERGENCY VEHICLE LEGALLY PARKED IN THE ROADWAY
015	GO A/STOP	PROCEED AFTER STOPPING FOR A STOP SIGN/FLASHING RED.
016	TRN A/RED	TURNED ON RED AFTER STOPPING
017	LOSTCTRL	LOST CONTROL OF VEHICLE
018	EXIT DWY	ENTERING STREET OR HIGHWAY FROM ALLEY OR DRIVEWAY
019	ENTR DWY	ENTERING ALLEY OR DRIVEWAY FROM STREET OR HIGHWAY
020	STR ENTR	BEFORE ENTERING ROADWAY, STRUCK PEDESTRIAN, ETC. ON SIDEWALK OR SHOULDER
021	NO DRVR	CAR RAN AWAY - NO DRIVER
022	PREV COL	STRUCK, OR WAS STRUCK BY, VEHICLE OR PEDESTRIAN IN PRIOR COLLISION BEFORE ACC. STABILIZED
023	STALLED	VEHICLE STALLED OR DISABLED
024	DRVR DEAD	DEAD BY UNASSOCIATED CAUSE
025	FATIGUE	FATIGUED, SLEEPY, ASLEEP
026	SUN	DRIVER BLINDED BY SUN
027	HDLGHTS	DRIVER BLINDED BY HEADLIGHTS
028	ILLNESS	PHYSICALLY ILL
029	THRU MED	VEHICLE CROSSED, PLUNGED OVER, OR THROUGH MEDIAN BARRIER
030	PURSUIT	PURSUING OR ATTEMPTING TO STOP A VEHICLE
031	PASSING	PASSING SITUATION
032	PRKOFFRD	VEHICLE PARKED BEYOND CURB OR SHOULDER
033	CROS MED	VEHICLE CROSSED EARTH OR GRASS MEDIAN
034	X N/SGNL	CROSSING AT INTERSECTION - NO TRAFFIC SIGNAL PRESENT
035	X W/ SGNL	CROSSING AT INTERSECTION - TRAFFIC SIGNAL PRESENT
036	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
037	BTWN INT	CROSSING BETWEEN INTERSECTIONS
038	DISTRACT	DRIVER'S ATTENTION DISTRACTED
039	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
040	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
041	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
042	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
043	PLAYINRD	PLAYING IN STREET OR ROAD
044	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
045	WORK ON	WORKING IN ROADWAY OR ALONG SHOULDER
046	W/ TRAFIC	NON-MOTORIST WALKING, RUNNING, RIDING, ETC. WITH TRAFFIC
047	A/ TRAFIC	NON-MOTORIST WALKING, RUNNING, RIDING, ETC. FACING TRAFFIC
050	LAY ON RD	STANDING OR LYING IN ROADWAY
051	ENT OFFRD	ENTERING / STARTING IN TRAFFIC LANE FROM OFF ROAD
052	MERGING	MERGING

ACTION CODE TRANSLATION LIST

ACTION CODE	SHORT DESCRIPTION	LONG DESCRIPTION
055	SPRAY	BLINDED BY WATER SPRAY
088	OTHER	OTHER ACTION
099	UNK	UNKNOWN ACTION

CAUSE CODE TRANSLATION LIST

CAUSE CODE	SHORT DESCRIPTION	LONG DESCRIPTION
00	NO CODE	NO CAUSE ASSOCIATED AT THIS LEVEL
01	TOO-FAST	TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED
02	NO-YIELD	DID NOT YIELD RIGHT-OF-WAY
03	PAS-STOP	PASSED STOP SIGN OR RED FLASHER
04	DIS SIG	DISREGARDED TRAFFIC SIGNAL
05	LEFT-CTR	DROVE LEFT OF CENTER ON TWO-WAY ROAD; STRADDLING
06	IMP-OVER	IMPROPER OVERTAKING
07	TOO-CLOS	FOLLOWED TOO CLOSELY
08	IMP-TURN	MADE IMPROPER TURN
09	DRINKING	ALCOHOL OR DRUG INVOLVED
10	OTHR-IMP	OTHER IMPROPER DRIVING
11	MECH-DEF	MECHANICAL DEFECT
12	OTHER	OTHER (NOT IMPROPER DRIVING)
13	IMP LN C	IMPROPER CHANGE OF TRAFFIC LANES
14	DIS TCD	DISREGARDED OTHER TRAFFIC CONTROL DEVICE
15	WRNG WAY	WRONG WAY ON ONE-WAY ROAD; WRONG SIDE DIVIDED RO
16	FATIGUE	DRIVER DROWSY/FATIGUED/SLEEPY
17	ILLNESS	PHYSICAL ILLNESS
18	IN RDWY	NON-MOTORIST ILLEGALLY IN ROADWAY
19	NT VISBL	NON-MOTORIST NOT VISIBLE; NON-REFLECTIVE CLOTHIN
20	IMP PKNG	VEHICLE IMPROPERLY PARKED
21	DEF STER	DEFECTIVE STEERING MECHANISM
22	DEF BRKE	INADEQUATE OR NO BRAKES
24	LOADSHFT	VEHICLE LOST LOAD OR LOAD SHIFTED
25	TIREFAIL	TIRE FAILURE
26	PHANTOM	PHANTOM / NON-CONTACT VEHICLE
27	INATTENT	INATTENTION
28	NM INATT	NON-MOTORIST INATTENTION
29	F AVOID	FAILED TO AVOID VEHICLE AHEAD
30	SPEED	DRIVING IN EXCESS OF POSTED SPEED
31	RACING	SPEED RACING (PER PAR)
32	CARELESS	CARELESS DRIVING (PER PAR)
33	RECKLESS	RECKLESS DRIVING (PER PAR)
34	AGGRESV	AGGRESSIVE DRIVING (PER PAR)
35	RD RAGE	ROAD RAGE (PER PAR)
40	VIEW OBS	VIEW OBSCURED
50	USED MDN	IMPROPER USE OF MEDIAN OR SHOULDER
51	FAIL LN	FAILED TO MAINTAIN LANE
52	OFF RD	RAN OFF ROAD

COLLISION TYPE CODE TRANSLATION LIST

COLL CODE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OTH	MISCELLANEOUS
-	BACK	BACKING
0	PED	PEDESTRIAN
1	ANGL	ANGLE
2	HEAD	HEAD-ON
3	REAR	REAR-END
4	SS-M	SIDESWIPE - MEETING
5	SS-O	SIDESWIPE - OVERTAKING
6	TURN	TURNING MOVEMENT
7	PARK	PARKING MANEUVER
8	NCOL	NON-COLLISION
9	FIX	FIXED OBJECT OR OTHER OBJECT

CRASH TYPE CODE TRANSLATION LIST

CRASH TYPE	SHORT DESCRIPTION	LONG DESCRIPTION
&	OVERTURN	OVERTURNED
0	NON-COLL	OTHER NON-COLLISION
1	OTH RDWY	MOTOR VEHICLE ON OTHER ROADWAY
2	PRKD MV	PARKED MOTOR VEHICLE
3	PED	PEDESTRIAN
4	TRAIN	RAILWAY TRAIN
6	BIKE	PEDALCYCLIST
7	ANIMAL	ANIMAL
8	FIX OBJ	FIXED OBJECT
9	OTH OBJ	OTHER OBJECT
A	ANGL-STP	ENTERING AT ANGLE - ONE VEHICLE STOPPED
B	ANGL-OTH	ENTERING AT ANGLE - ALL OTHERS
C	S-STRGHT	FROM SAME DIRECTION - BOTH GOING STRAIGHT
D	S-1TURN	FROM SAME DIRECTION - ONE TURN, ONE STRAIGHT
E	S-1STOP	FROM SAME DIRECTION - ONE STOPPED
F	S-OTHER	FROM SAME DIRECTION-ALL OTHERS, INCLUDING PARKING
G	O-STRGHT	FROM OPPOSITE DIRECTION - BOTH GOING STRAIGHT
H	O-1 L-TURN	FROM OPPOSITE DIRECTION-ONE LEFT TURN,ONE STRAIGHT
I	O-1STOP	FROM OPPOSITE DIRECTION - ONE STOPPED
J	O-OTHER	FROM OPPOSITE DIRECTION-ALL OTHERS INCL. PARKING

DRIVER LICENSE CODE TRANSLATION LIST

LIC CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NOT LICENSED (HAD NEVER BEEN LICENSED)
1	OR-Y	VALID OREGON LICENSE
2	OTH-Y	VALID LICENSE, OTHER STATE OR COUNTRY
3	SUSP	SUSPENDED/REVOKED
4	EXP	EXPIRED
8	N-VAL	OTHER NON-VALID LICENSE
9	UNK	UNKNOWN IF DRIVER WAS LICENSED AT TIME OF CRASH

DRIVER RESIDENCE CODE TRANSLATION LIST

RES CODE	SHORT DESC	LONG DESCRIPTION
1	OR<25	OREGON RESIDENT WITHIN 25 MILE OF HOME
2	OR>25	OREGON RESIDENT 25 OR MORE MILES FROM HOME
3	OR-?	OREGON RESIDENT - UNKNOWN DISTANCE FROM HOME
4	N-RES	NON-RESIDENT
9	UNK	UNKNOWN IF OREGON RESIDENT

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
000	NONE	NO ERROR
001	WIDE TRN	WIDE TURN
002	CUT CORN	CUT CORNER ON TURN
003	FAIL TRN	FAILED TO OBEY MANDATORY TRAFFIC TURN SIGNAL, SIGN OR LANE MARKINGS
004	L IN TRF	LEFT TURN IN FRONT OF ONCOMING TRAFFIC
005	L PROHIB	LEFT TURN WHERE PROHIBITED
006	FRM WRNG	TURNED FROM WRONG LANE
007	TO WRONG	TURNED INTO WRONG LANE
008	ILLEG U	U-TURNED ILLEGALLY
009	IMP STOP	IMPROPERLY STOPPED IN TRAFFIC LANE
010	IMP SIG	IMPROPER SIGNAL OR FAILURE TO SIGNAL
011	IMP BACK	BACKING IMPROPERLY (NOT PARKING)
012	IMP PARK	IMPROPERLY PARKED
013	UNPARK	IMPROPER START LEAVING PARKED POSITION
014	IMP STRT	IMPROPER START FROM STOPPED POSITION
015	IMP LGHT	IMPROPER OR NO LIGHTS (VEHICLE IN TRAFFIC)
016	INATTENT	INATTENTION (FAILURE TO DIM LIGHTS PRIOR TO 4/1/97)
017	UNSF VEH	DRIVING UNSAFE VEHICLE (NO OTHER ERROR APPARENT)
018	OTH PARK	ENTERING/EXITING PARKED POSITION W/ INSUFFICIENT CLEARANCE; OTHER IMPROPER PARKING MANEUVER
019	DIS DRIV	DISREGARDED OTHER DRIVER'S SIGNAL
020	DIS SGNL	DISREGARDED TRAFFIC SIGNAL
021	RAN STOP	DISREGARDED STOP SIGN OR FLASHING RED
022	DIS SIGN	DISREGARDED WARNING SIGN, FLARES OR FLASHING AMBER
023	DIS OFCR	DISREGARDED POLICE OFFICER OR FLAGMAN
024	DIS EMER	DISREGARDED SIREN OR WARNING OF EMERGENCY VEHICLE
025	DIS RR	DISREGARDED RR SIGNAL, RR SIGN, OR RR FLAGMAN
026	REAR-END	FAILED TO AVOID STOPPED OR PARKED VEHICLE AHEAD OTHER THAN SCHOOL BUS
027	BIKE ROW	DID NOT HAVE RIGHT-OF-WAY OVER PEDALCYCLIST
028	NO ROW	DID NOT HAVE RIGHT-OF-WAY
029	PED ROW	FAILED TO YIELD RIGHT-OF-WAY TO PEDESTRIAN
030	PAS CURV	PASSING ON A CURVE
031	PAS WRNG	PASSING ON THE WRONG SIDE
032	PAS TANG	PASSING ON STRAIGHT ROAD UNDER UNSAFE CONDITIONS
033	PAS X-WK	PASSED VEHICLE STOPPED AT CROSSWALK FOR PEDESTRIAN
034	PAS INTR	PASSING AT INTERSECTION
035	PAS HILL	PASSING ON CREST OF HILL
036	N/PAS ZN	PASSING IN "NO PASSING" ZONE
037	PAS TRAF	PASSING IN FRONT OF ONCOMING TRAFFIC
038	CUT-IN	CUTTING IN (TWO LANES - TWO WAY ONLY)
039	WRNGSIDE	DRIVING ON WRONG SIDE OF THE ROAD (2-WAY UNDIVIDED ROADWAYS)

ERROR CODE TRANSLATION LIST

ERROR CODE	SHORT DESCRIPTION	FULL DESCRIPTION
040	THRU MED	DRIVING THROUGH SAFETY ZONE OR OVER ISLAND
041	F/ST BUS	FAILED TO STOP FOR SCHOOL BUS
042	F/SLO MV	FAILED TO DECREASE SPEED FOR SLOWER MOVING VEHICLE
043	TOO CLOSE	FOLLOWING TOO CLOSELY (MUST BE ON OFFICER'S REPORT)
044	STRDL LN	STRADDLING OR DRIVING ON WRONG LANES
045	IMP CHG	IMPROPER CHANGE OF TRAFFIC LANES
046	WRNG WAY	WRONG WAY ON ONE-WAY ROADWAY; WRONG SIDE DIVIDED ROAD
047	BASCRULE	DRIVING TOO FAST FOR CONDITIONS (NOT EXCEEDING POSTED SPEED)
048	OPN DOOR	OPENED DOOR INTO ADJACENT TRAFFIC LANE
049	IMPEDING	IMPEDING TRAFFIC
050	SPEED	DRIVING IN EXCESS OF POSTED SPEED
051	RECKLESS	RECKLESS DRIVING (PER PAR)
052	CARELESS	CARELESS DRIVING (PER PAR)
053	RACING	SPEED RACING (PER PAR)
054	X N/SGNL	CROSSING AT INTERSECTION, NO TRAFFIC SIGNAL PRESENT
055	X W/SGNL	CROSSING AT INTERSECTION, TRAFFIC SIGNAL PRESENT
056	DIAGONAL	CROSSING AT INTERSECTION - DIAGONALLY
057	BTWN INT	CROSSING BETWEEN INTERSECTIONS
059	W/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC
060	A/TRAF-S	WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC
061	W/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC
062	A/TRAF-P	WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC
063	PLAYINRD	PLAYING IN STREET OR ROAD
064	PUSH MV	PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER
065	WORK IN RD	WORKING IN ROADWAY OR ALONG SHOULDER
070	LAY ON RD	STANDING OR LYING IN ROADWAY
071	NM IMP USE	IMPROPER USE OF TRAFFIC LANE BY NON-MOTORIST
073	ELUDING	ELUDING / ATTEMPT TO ELUDE
079	F NEG CURV	FAILED TO NEGOTIATE A CURVE
080	FAIL LN	FAILED TO MAINTAIN LANE
081	OFF RD	RAN OFF ROAD
082	NO CLEAR	DRIVER MISJUDGED CLEARANCE
083	OVRSTEER	OVER-CORRECTING
084	NOT USED	CODE NOT IN USE
085	OVRLOAD	OVERLOADING OR IMPROPER LOADING OF VEHICLE WITH CARGO OR PASSENGERS
097	UNA DIS TC	UNABLE TO DETERMINE WHICH DRIVER DISREGARDED TRAFFIC CONTROL DEVICE

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
001	FEL/JUMP	OCCUPANT FELL, JUMPED OR WAS EJECTED FROM MOVING VEHICLE
002	INTERFER	PASSENGER INTERFERED WITH DRIVER
003	BUG INTF	ANIMAL OR INSECT IN VEHICLE INTERFERED WITH DRIVER
004	INDRCT PED	PEDESTRIAN INDIRECTLY INVOLVED (NOT STRUCK)
005	SUB-PED	"SUB-PED": PEDESTRIAN INJURED SUBSEQUENT TO COLLISION, ETC.
006	INDRCT BIK	PEDALCYCLIST INDIRECTLY INVOLVED (NOT STRUCK)
007	HITCHIKR	HITCHHIKER (SOLICITING A RIDE)
008	PSNGR TOW	PASSENGER OR NON-MOTORIST BEING TOWED OR PUSHED ON CONVEYANCE
009	ON/OFF V	GETTING ON/OFF STOPPED/PARKED VEHICLE (OCCUPANTS ONLY; MUST HAVE PHYSICAL CONTACT W/ VEHIC
010	SUB OTRN	OVERTURNED AFTER FIRST HARMFUL EVENT
011	MV PUSHD	VEHICLE BEING PUSHED
012	MV TOWED	VEHICLE TOWED OR HAD BEEN TOWING ANOTHER VEHICLE
013	FORCED	VEHICLE FORCED BY IMPACT INTO ANOTHER VEHICLE, PEDALCYCLIST OR PEDESTRIAN
014	SET MOTN	VEHICLE SET IN MOTION BY NON-DRIVER (CHILD RELEASED BRAKES, ETC.)
015	RR ROW	AT OR ON RAILROAD RIGHT-OF-WAY (NOT LIGHT RAIL)
016	LT RL ROW	AT OR ON LIGHT-RAIL RIGHT-OF-WAY
017	RR HIT V	TRAIN STRUCK VEHICLE
018	V HIT RR	VEHICLE STRUCK TRAIN
019	HIT RR CAR	VEHICLE STRUCK RAILROAD CAR ON ROADWAY
020	JACKNIFE	JACKKNIFE; TRAILER OR TOWED VEHICLE STRUCK TOWING VEHICLE
021	TRL OTRN	TRAILER OR TOWED VEHICLE OVERTURNED
022	CN BROKE	TRAILER CONNECTION BROKE
023	DETACH TRL	DETACHED TRAILING OBJECT STRUCK OTHER VEHICLE, NON-MOTORIST, OR OBJECT
024	V DOOR OPN	VEHICLE DOOR OPENED INTO ADJACENT TRAFFIC LANE
025	WHEELOFF	WHEEL CAME OFF
026	HOOD UP	HOOD FLEW UP
028	LOAD SHIFT	LOST LOAD, LOAD MOVED OR SHIFTED
029	TIREFAIL	TIRE FAILURE
030	PET	PET: CAT, DOG AND SIMILAR
031	LVSTOCK	STOCK: COW, CALF, BULL, STEER, SHEEP, ETC.
032	HORSE	HORSE, MULE, OR DONKEY
033	HRSE&RID	HORSE AND RIDER
034	GAME	WILD ANIMAL, GAME (INCLUDES BIRDS; NOT DEER OR ELK)
035	DEER ELK	DEER OR ELK, WAPITI
036	ANML VEH	ANIMAL-DRAWN VEHICLE
037	CULVERT	CULVERT, OPEN LOW OR HIGH MANHOLE
038	ATENUATN	IMPACT ATTENUATOR
039	PK METER	PARKING METER
040	CURB	CURB (ALSO NARROW SIDEWALKS ON BRIDGES)
041	JIGGLE	JIGGLE BAR OR TRAFFIC SNAKE FOR CHANNELIZATION
042	GDRL END	LEADING EDGE OF GUARDRAIL
043	GARDRAIL	GUARD RAIL (NOT METAL MEDIAN BARRIER)
044	BARRIER	MEDIAN BARRIER (RAISED OR METAL)
045	WALL	RETAINING WALL OR TUNNEL WALL
046	BR RAIL	BRIDGE RAILING OR PARAPET (ON BRIDGE OR APPROACH)
047	BR ABUTMNT	BRIDGE ABUTMENT (INCLUDED "APPROACH END" THRU 2013)
048	BR COLMN	BRIDGE PILLAR OR COLUMN
049	BR GIRDR	BRIDGE GIRDER (HORIZONTAL BRIDGE STRUCTURE OVERHEAD)
050	ISLAND	TRAFFIC RAISED ISLAND
051	GORE	GORE
052	POLE UNK	POLE - TYPE UNKNOWN
053	POLE UTL	POLE - POWER OR TELEPHONE
054	ST LIGHT	POLE - STREET LIGHT ONLY
055	TRF SGNL	POLE - TRAFFIC SIGNAL AND PED SIGNAL ONLY
056	SGN BRDG	POLE - SIGN BRIDGE
057	STOPSIGN	STOP OR YIELD SIGN

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
058	OTH SIGN	OTHER SIGN, INCLUDING STREET SIGNS
059	HYDRANT	HYDRANT
060	MARKER	DELINEATOR OR MARKER (REFLECTOR POSTS)
061	MAILBOX	MAILBOX
062	TREE	TREE, STUMP OR SHRUBS
063	VEG OHED	TREE BRANCH OR OTHER VEGETATION OVERHEAD, ETC.
064	WIRE/CBL	WIRE OR CABLE ACROSS OR OVER THE ROAD
065	TEMP SGN	TEMPORARY SIGN OR BARRICADE IN ROAD, ETC.
066	PERM SGN	PERMANENT SIGN OR BARRICADE IN/OFF ROAD
067	SLIDE	SLIDES, FALLEN OR FALLING ROCKS
068	FRGN OBJ	FOREIGN OBSTRUCTION/DEBRIS IN ROAD (NOT GRAVEL)
069	EQP WORK	EQUIPMENT WORKING IN/OFF ROAD
070	OTH EQP	OTHER EQUIPMENT IN OR OFF ROAD (INCLUDES PARKED TRAILER, BOAT)
071	MAIN EQP	WRECKER, STREET SWEEPER, SNOW PLOW OR SANDING EQUIPMENT
072	OTHER WALL	ROCK, BRICK OR OTHER SOLID WALL
073	IRRGL PVMT	OTHER BUMP (NOT SPEED BUMP), POTHOLE OR PAVEMENT IRREGULARITY (PER PAR)
074	OVERHD OBJ	OTHER OVERHEAD OBJECT (HIGHWAY SIGN, SIGNAL HEAD, ETC.); NOT BRIDGE
075	CAVE IN	BRIDGE OR ROAD CAVE IN
076	HI WATER	HIGH WATER
077	SNO BANK	SNOW BANK
078	LO-HI EDGE	LOW OR HIGH SHOULDER AT PAVEMENT EDGE
079	DITCH	CUT SLOPE OR DITCH EMBANKMENT
080	OBJ FRM MV	STRUCK BY ROCK OR OTHER OBJECT SET IN MOTION BY OTHER VEHICLE (INCL. LOST LOADS)
081	FLY-OBJ	STRUCK BY ROCK OR OTHER MOVING OR FLYING OBJECT (NOT SET IN MOTION BY VEHICLE)
082	VEH HID	VEHICLE OBSCURED VIEW
083	VEG HID	VEGETATION OBSCURED VIEW
084	BLDG HID	VIEW OBSCURED BY FENCE, SIGN, PHONE BOOTH, ETC.
085	WIND GUST	WIND GUST
086	IMMERSED	VEHICLE IMMERSED IN BODY OF WATER
087	FIRE/EXP	FIRE OR EXPLOSION
088	FENC/BLD	FENCE OR BUILDING, ETC.
089	OTHR CRASH	CRASH RELATED TO ANOTHER SEPARATE CRASH
090	TO 1 SIDE	TWO-WAY TRAFFIC ON DIVIDED ROADWAY ALL ROUTED TO ONE SIDE
091	BUILDING	BUILDING OR OTHER STRUCTURE
092	PHANTOM	OTHER (PHANTOM) NON-CONTACT VEHICLE
093	CELL PHONE	CELL PHONE (ON PAR OR DRIVER IN USE)
094	VIOL GDL	TEENAGE DRIVER IN VIOLATION OF GRADUATED LICENSE PGM
095	GUY WIRE	GUY WIRE
096	BERM	BERM (EARTHEN OR GRAVEL MOUND)
097	GRAVEL	GRAVEL IN ROADWAY
098	ABR EDGE	ABRUPT EDGE
099	CELL WTNSD	CELL PHONE USE WITNESSED BY OTHER PARTICIPANT
100	UNK FIXD	FIXED OBJECT, UNKNOWN TYPE.
101	OTHER OBJ	NON-FIXED OBJECT, OTHER OR UNKNOWN TYPE
102	TEXTING	TEXTING
103	WZ WORKER	WORK ZONE WORKER
104	ON VEHICLE	PASSENGER RIDING ON VEHICLE EXTERIOR
105	PEDAL PSGR	PASSENGER RIDING ON PEDALCYCLE
106	MAN WHLCHR	PEDESTRIAN IN NON-MOTORIZED WHEELCHAIR
107	MTR WHLCHR	PEDESTRIAN IN MOTORIZED WHEELCHAIR
108	OFFICER	LAW ENFORCEMENT / POLICE OFFICER
109	SUB-BIKE	"SUB-BIKE": PEDALCYCLIST INJURED SUBSEQUENT TO COLLISION, ETC.
110	N-MTR	NON-MOTORIST STRUCK VEHICLE
111	S CAR VS V	STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM) STRUCK VEHICLE
112	V VS S CAR	VEHICLE STRUCK STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM)
113	S CAR ROW	AT OR ON STREET CAR OR TROLLEY RIGHT-OF-WAY

EVENT CODE TRANSLATION LIST

EVENT CODE	SHORT DESCRIPTION	LONG DESCRIPTION
114	RR EQUIP	VEHICLE STRUCK RAILROAD EQUIPMENT (NOT TRAIN) ON TRACKS
115	DSTRCT GPS	DISTRACTED BY NAVIGATION SYSTEM OR GPS DEVICE
116	DSTRCT OTH	DISTRACTED BY OTHER ELECTRONIC DEVICE
117	RR GATE	RAIL CROSSING DROP-ARM GATE
118	EXPNSN JNT	EXPANSION JOINT
119	JERSEY BAR	JERSEY BARRIER
120	WIRE BAR	WIRE OR CABLE MEDIAN BARRIER
121	FENCE	FENCE
123	OBJ IN VEH	LOOSE OBJECT IN VEHICLE STRUCK OCCUPANT
124	SLIPPERY	SLIDING OR SWERVING DUE TO WET, ICY, SLIPPERY OR LOOSE SURFACE (NOT GRAVEL)
125	SHLDR	SHOULDER GAVE WAY
126	BOULDER	ROCK(S), BOULDER (NOT GRAVEL; NOT ROCK SLIDE)
127	LAND SLIDE	ROCK SLIDE OR LAND SLIDE
128	CURVE INV	CURVE PRESENT AT CRASH LOCATION
129	HILL INV	VERTICAL GRADE / HILL PRESENT AT CRASH LOCATION
130	CURVE HID	VIEW OBSCURED BY CURVE
131	HILL HID	VIEW OBSCURED BY VERTICAL GRADE / HILL
132	WINDOW HID	VIEW OBSCURED BY VEHICLE WINDOW CONDITIONS
133	SPRAY HID	VIEW OBSCURED BY WATER SPRAY
134	TORRENTIAL	TORRENTIAL RAIN (EXCEPTIONALLY HEAVY RAIN)
135	RAIL OCC	INJURED OCCUPANT OF RAILWAY TRAIN, LIGHT RAIL, STREET CAR OR CABLE CAR

FUNCTIONAL CLASSIFICATION TRANSLATION LIST

FUNC CLASS	DESCRIPTION
01	RURAL PRINCIPAL ARTERIAL - INTERSTATE
02	RURAL PRINCIPAL ARTERIAL - OTHER
06	RURAL MINOR ARTERIAL
07	RURAL MAJOR COLLECTOR
08	RURAL MINOR COLLECTOR
09	RURAL LOCAL
11	URBAN PRINCIPAL ARTERIAL - INTERSTATE
12	URBAN PRINCIPAL ARTERIAL - OTHER FREEWAYS AND EXP
14	URBAN PRINCIPAL ARTERIAL - OTHER
16	URBAN MINOR ARTERIAL
17	URBAN MAJOR COLLECTOR
18	URBAN MINOR COLLECTOR
19	URBAN LOCAL
78	UNKNOWN RURAL SYSTEM
79	UNKNOWN RURAL NON-SYSTEM
98	UNKNOWN URBAN SYSTEM
99	UNKNOWN URBAN NON-SYSTEM

HIGHWAY COMPONENT TRANSLATION LIST

CODE	DESCRIPTION
0	MAINLINE STATE HIGHWAY
1	COUPLET
3	FRONTAGE ROAD
6	CONNECTION
8	HIGHWAY - OTHER

INJURY SEVERITY CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
1	KILL	FATAL INJURY (K)
2	INJA	SUSPECTED SERIOUS INJURY (A)
3	INJB	SUSPECTED MINOR INJURY (B)
4	INJC	POSSIBLE INJURY (C)
5	PRI	DIED PRIOR TO CRASH
7	NO<5	NO INJURY - 0 TO 4 YEARS OF AGE
9	NONE	NO APPARENT INJURY (O)

LIGHT CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	DAY	DAYLIGHT
2	DLIT	DARKNESS - WITH STREET LIGHTS
3	DARK	DARKNESS - NO STREET LIGHTS
4	DAWN	DAWN (TWILIGHT)
5	DUSK	DUSK (TWILIGHT)

MEDIAN TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	NONE	NO MEDIAN
1	RSDMD	SOLID MEDIAN BARRIER
2	DIVMD	EARTH, GRASS OR PAVED MEDIAN

MILEAGE TYPE CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
0	REGULAR MILEAGE
T	TEMPORARY
Y	SPUR
Z	OVERLAPPING

MOVEMENT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	STRGHT	STRAIGHT AHEAD
2	TURN-R	TURNING RIGHT
3	TURN-L	TURNING LEFT
4	U-TURN	MAKING A U-TURN
5	BACK	BACKING
6	STOP	STOPPED IN TRAFFIC
7	PRKD-P	PARKED - PROPERLY
8	PRKD-I	PARKED - IMPROPERLY
9	PARKNG	PARKING MANEUVER

NON-MOTORIST LOCATION CODE TRANSLATION LIST

CODE	LONG DESCRIPTION
00	AT INTERSECTION - NOT IN ROADWAY
01	AT INTERSECTION - INSIDE CROSSWALK
02	AT INTERSECTION - IN ROADWAY, OUTSIDE CROSSWALK
03	AT INTERSECTION - IN ROADWAY, XWALK AVAIL UNKNWN
04	NOT AT INTERSECTION - IN ROADWAY
05	NOT AT INTERSECTION - ON SHOULDER
06	NOT AT INTERSECTION - ON MEDIAN
07	NOT AT INTERSECTION - WITHIN TRAFFIC RIGHT-OF-WAY
08	NOT AT INTERSECTION - IN BIKE PATH OR PARKING LANE
09	NOT-AT INTERSECTION - ON SIDEWALK
10	OUTSIDE TRAFFICWAY BOUNDARIES
13	AT INTERSECTION - IN BIKE LANE
14	NOT AT INTERSECTION - IN BIKE LANE
15	NOT AT INTERSECTION - INSIDE MID-BLOCK CROSSWALK
16	NOT AT INTERSECTION - IN PARKING LANE
18	OTHER, NOT IN ROADWAY
99	UNKNOWN LOCATION

ROAD CHARACTER CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	INTER	INTERSECTION
2	ALLEY	DRIVEWAY OR ALLEY
3	STRGHT	STRAIGHT ROADWAY
4	TRANS	TRANSITION
5	CURVE	CURVE (HORIZONTAL CURVE)
6	OPENAC	OPEN ACCESS OR TURNOUT
7	GRADE	GRADE (VERTICAL CURVE)
8	BRIDGE	BRIDGE STRUCTURE
9	TUNNEL	TUNNEL

PARTICIPANT TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	OCC	UNKNOWN OCCUPANT TYPE
1	DRVR	DRIVER
2	PSNG	PASSENGER
3	PED	PEDESTRIAN
4	CONV	PEDESTRIAN USING A PEDESTRIAN CONVEYA
5	PTOW	PEDESTRIAN TOWING OR TRAILERING AN OB
6	BIKE	PEDALCYCLIST
7	BTOW	PEDALCYCLIST TOWING OR TRAILERING AN
8	PRKD	OCCUPANT OF A PARKED MOTOR VEHICLE
9	OTHR	OTHER TYPE OF NON-MOTORIST

TRAFFIC CONTROL DEVICE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
000	NONE	NO CONTROL
001	TRF SIGNAL	TRAFFIC SIGNALS
002	FLASHBCN-R	FLASHING BEACON - RED (STOP)
003	FLASHBCN-A	FLASHING BEACON - AMBER (SLOW)
004	STOP SIGN	STOP SIGN
005	SLOW SIGN	SLOW SIGN
006	REG-SIGN	REGULATORY SIGN
007	YIELD	YIELD SIGN
008	WARNING	WARNING SIGN
009	CURVE	CURVE SIGN
010	SCHL X-ING	SCHOOL CROSSING SIGN OR SPECIAL SIGNAL
011	OFCR/FLAG	POLICE OFFICER, FLAGMAN - SCHOOL PATROL
012	BRDG-GATE	BRIDGE GATE - BARRIER
013	TEMP-BARR	TEMPORARY BARRIER
014	NO-PASS-ZN	NO PASSING ZONE
015	ONE-WAY	ONE-WAY STREET
016	CHANNEL	CHANNELIZATION
017	MEDIAN BAR	MEDIAN BARRIER
018	PILOT CAR	PILOT CAR
019	SP PED SIG	SPECIAL PEDESTRIAN SIGNAL
020	X-BUCK	CROSSBUCK
021	THR-GN-SIG	THROUGH GREEN ARROW OR SIGNAL
022	L-GRN-SIG	LEFT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
023	R-GRN-SIG	RIGHT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL
024	WIGWAG	WIGWAG OR FLASHING LIGHTS W/O DROP-ARM GATE
025	X-BUCK WRN	CROSSBUCK AND ADVANCE WARNING
026	WW W/ GATE	FLASHING LIGHTS WITH DROP-ARM GATES
027	OVRHD SGNL	SUPPLEMENTAL OVERHEAD SIGNAL (RR XING ONLY)
028	SP RR STOP	SPECIAL RR STOP SIGN
029	ILUM GRD X	ILLUMINATED GRADE CROSSING
037	RAMP METER	METERED RAMPS
038	RUMBLE STR	RUMBLE STRIP
090	L-TURN REF	LEFT TURN REFUGE (WHEN REFUGE IS INVOLVED)
091	R-TURN ALL	RIGHT TURN AT ALL TIMES SIGN, ETC.
092	EMR SGN/FL	EMERGENCY SIGNS OR FLARES
093	ACCEL LANE	ACCELERATION OR DECELERATION LANES
094	R-TURN PRO	RIGHT TURN PROHIBITED ON RED AFTER STOPPING
095	BUS STPSGN	BUS STOP SIGN AND RED LIGHTS
099	UNKNOWN	UNKNOWN OR NOT DEFINITE

VEHICLE TYPE CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
00	PDO	NOT COLLECTED FOR PDO CRASHES
01	PSNGR CAR	PASSENGER CAR, PICKUP, LIGHT DELIVERY, ETC.
02	BOBTAIL	TRUCK TRACTOR WITH NO TRAILERS (BOBTAIL)
03	FARM TRCTR	FARM TRACTOR OR SELF-PROPELLED FARM EQUIPMENT
04	SEMI TOW	TRUCK TRACTOR WITH TRAILER/MOBILE HOME IN TOW
05	TRUCK	TRUCK WITH NON-DETACHABLE BED, PANEL, ETC.
06	MOPED	MOPED, MINIBIKE, SEATED MOTOR SCOOTER, MOTOR BIKE
07	SCHL BUS	SCHOOL BUS (INCLUDES VAN)
08	OTH BUS	OTHER BUS
09	MTRCYCLE	MOTORCYCLE, DIRT BIKE
10	OTHER	OTHER: FORKLIFT, BACKHOE, ETC.
11	MOTRHOME	MOTORHOME
12	TROLLEY	MOTORIZED STREET CAR/TROLLEY (NO RAILS/WIRES)
13	ATV	ATV
14	MTRSCTR	MOTORIZED SCOOTER (STANDING)
15	SNOWMOBILE	SNOWMOBILE
99	UNKNOWN	UNKNOWN VEHICLE TYPE

WEATHER CONDITION CODE TRANSLATION LIST

CODE	SHORT DESC	LONG DESCRIPTION
0	UNK	UNKNOWN
1	CLR	CLEAR
2	CLD	CLOUDY
3	RAIN	RAIN
4	SLT	SLEET
5	FOG	FOG
6	SNOW	SNOW
7	DUST	DUST
8	SMOK	SMOKE
9	ASH	ASH

APPENDIX E: Traffic Signal Truck Turning Figures

Design Vehicles - Fire Truck

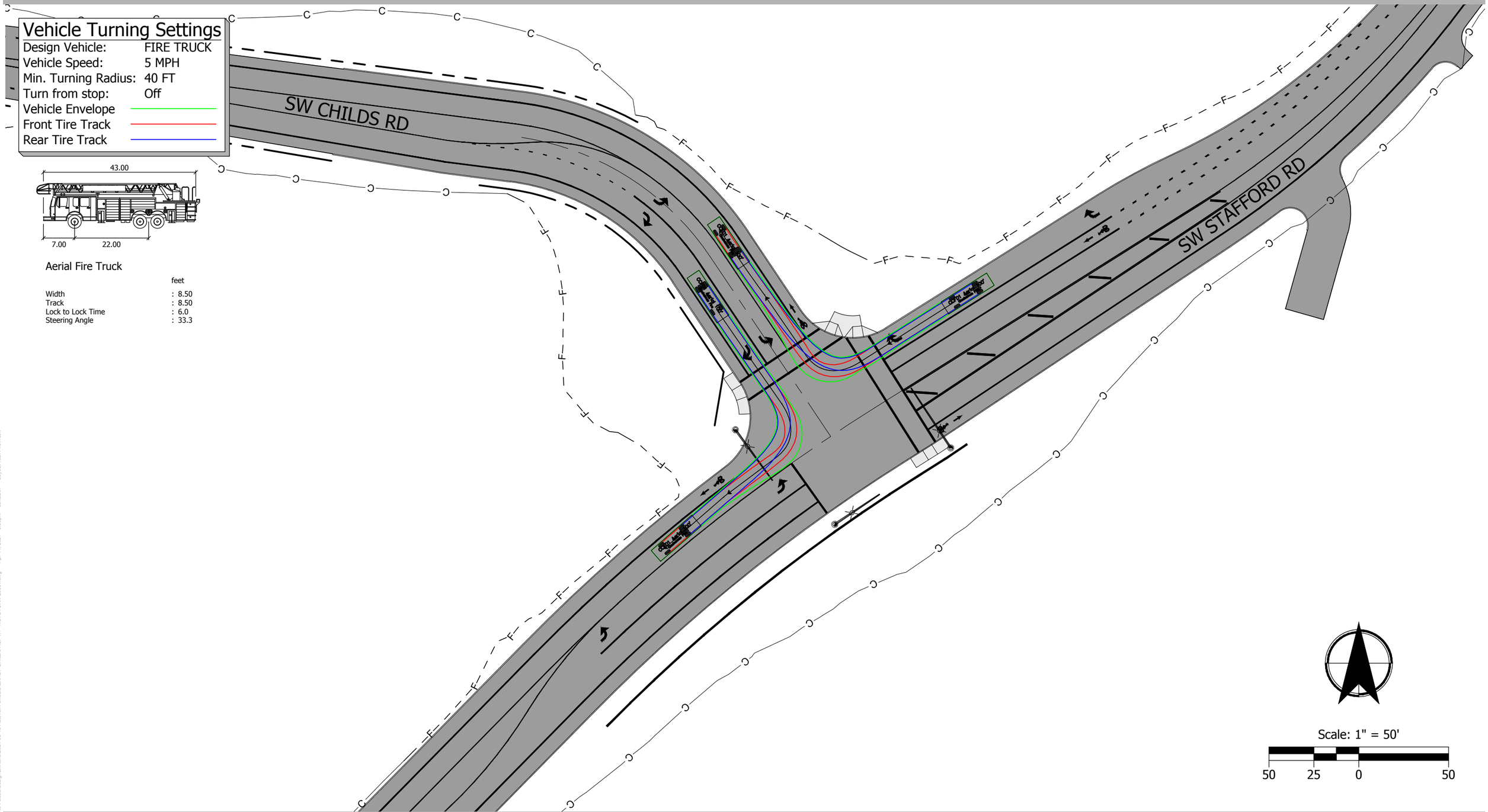
Preliminary Design Subject to Change
Date: 2021-04-09

Vehicle Turning Settings

Design Vehicle:	FIRE TRUCK
Vehicle Speed:	5 MPH
Min. Turning Radius:	40 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	

Aerial Fire Truck

	feet
Width	: 8.50
Track	: 8.50
Lock to Lock Time	: 6.0
Steering Angle	: 33.3



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25250594 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-19 AutoTurn Checks\EXHIBIT-CHILDS ALT 1.1 - AUTOTURN-25094.dwg Apr 14, 2021 - 8:55pm - dshadrin LayoutTab: FireTruck

Design Vehicles - WB-50

Preliminary Design Subject to Change
Date: 2021-04-09

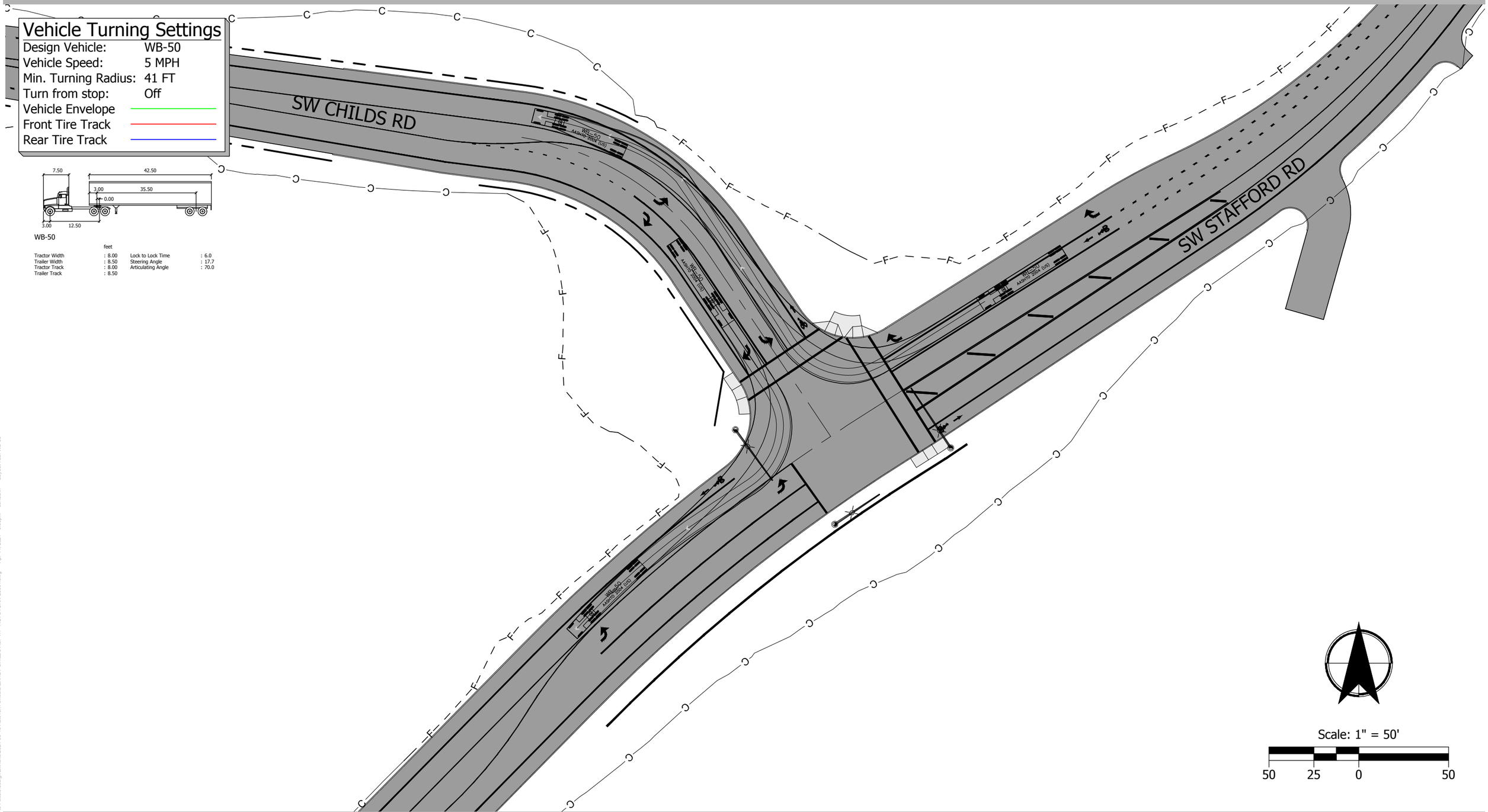
Vehicle Turning Settings

Design Vehicle:	WB-50
Vehicle Speed:	5 MPH
Min. Turning Radius:	41 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	

WB-50

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 17.7
Tractor Track	: 8.00	Articulating Angle	: 70.0
Trailer Track	: 8.50		



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25250594 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-19 AutoTurn Checks\EXHIBIT-CHILDS ALT 1.1 - AUTOTURN-25094.dwg Apr 14, 2021 - 8:55pm - dshadrin LayoutTab: WB-50

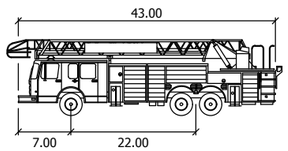
APPENDIX F: Roundabout Truck Turning Figures

Design Vehicles - Fire Truck

Preliminary Design Subject to Change
Date: 2021-03-19

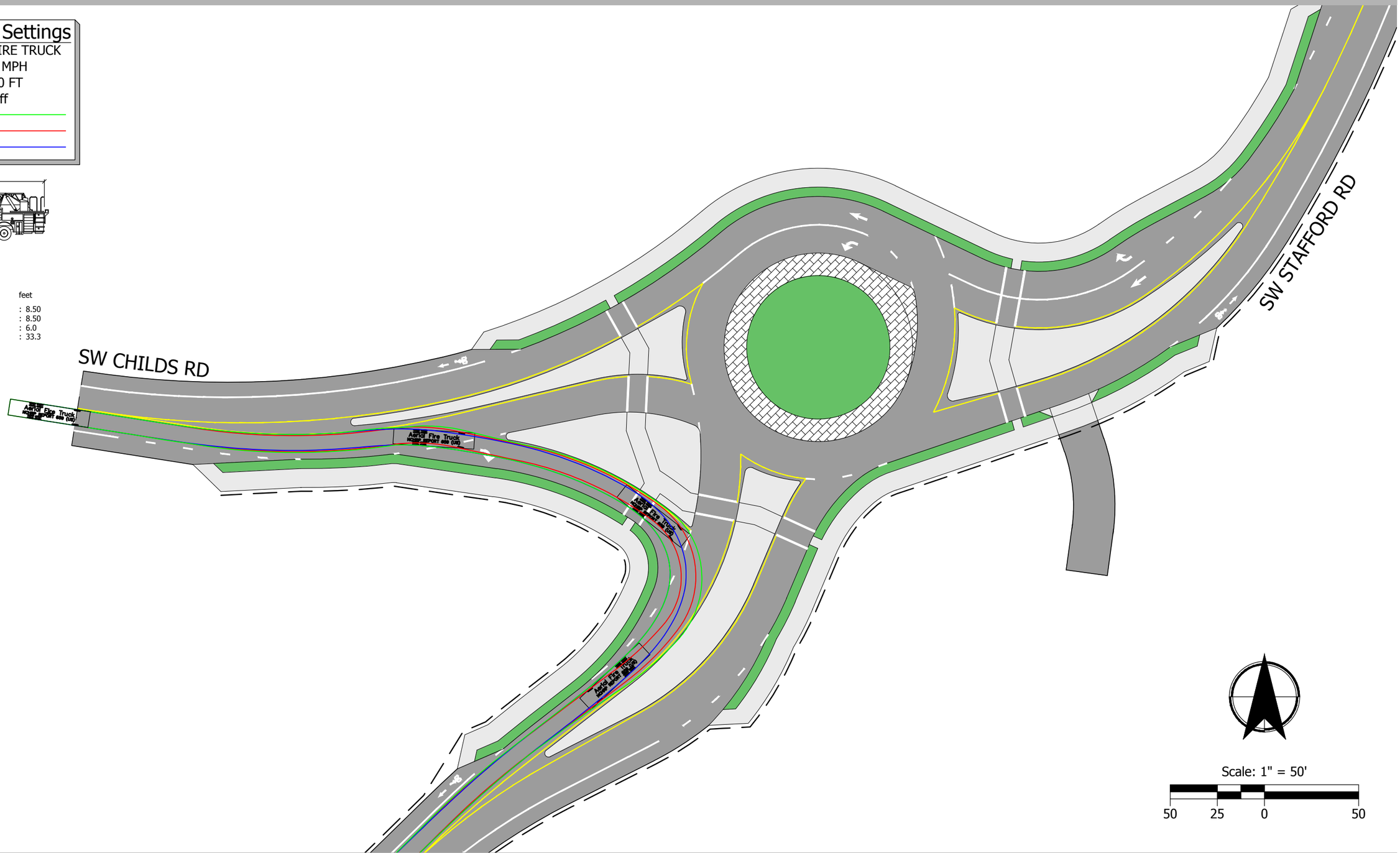
Vehicle Turning Settings

Design Vehicle:	FIRE TRUCK
Vehicle Speed:	5 MPH
Min. Turning Radius:	40 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	



Aerial Fire Truck

	feet
Width	: 8.50
Track	: 8.50
Lock to Lock Time	: 6.0
Steering Angle	: 33.3



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25025094 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-19 AutoTurn Checks\EXHBIT-CHILDS RBT ALT 2.3 - AUTOTURN-25094.dwg Mar 19, 2021 - 11:13am - cocx Layout Tab: FIRETRUCK

Design Vehicles - WB-50

Preliminary Design Subject to Change
Date: 2021-03-19

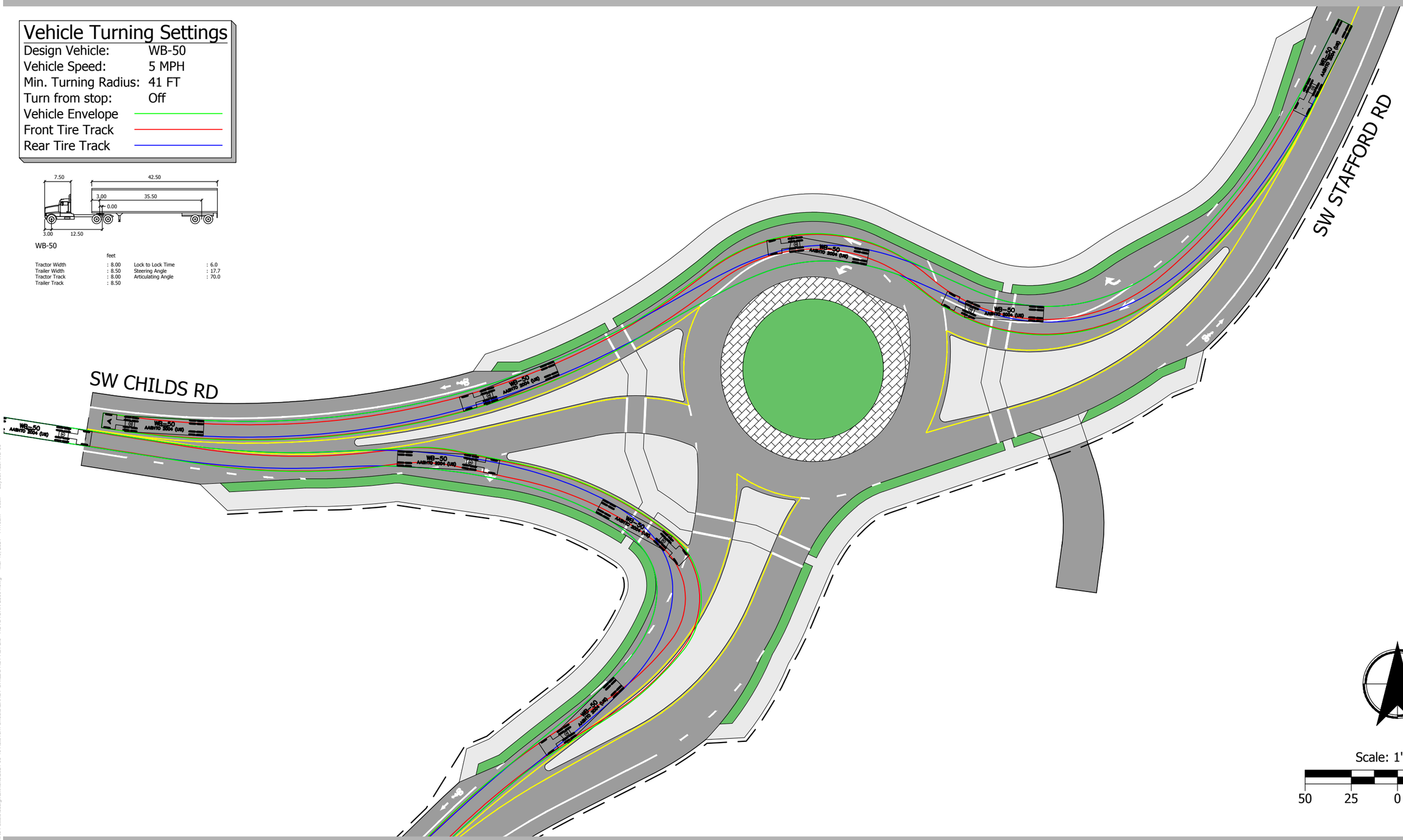
Vehicle Turning Settings

Design Vehicle:	WB-50
Vehicle Speed:	5 MPH
Min. Turning Radius:	41 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	

WB-50

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 17.7
Tractor Track	: 8.00	Articulating Angle	: 70.0
Trailer Track	: 8.50		



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

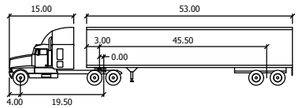
H:\25250294 - Stafford Road - Rosemont to Pattulo\design\E.Exhibits\2021-03-19 AutoTurn Checks\EXHBIT-CHILDS RBT ALT 2.3 - AUTOTURN-25094.dwg Mar 19, 2021 - 11:13am - cox Layout Tab: WB-50

Design Vehicles - WB-67

Preliminary Design Subject to Change
Date: 2021-03-19

Vehicle Turning Settings

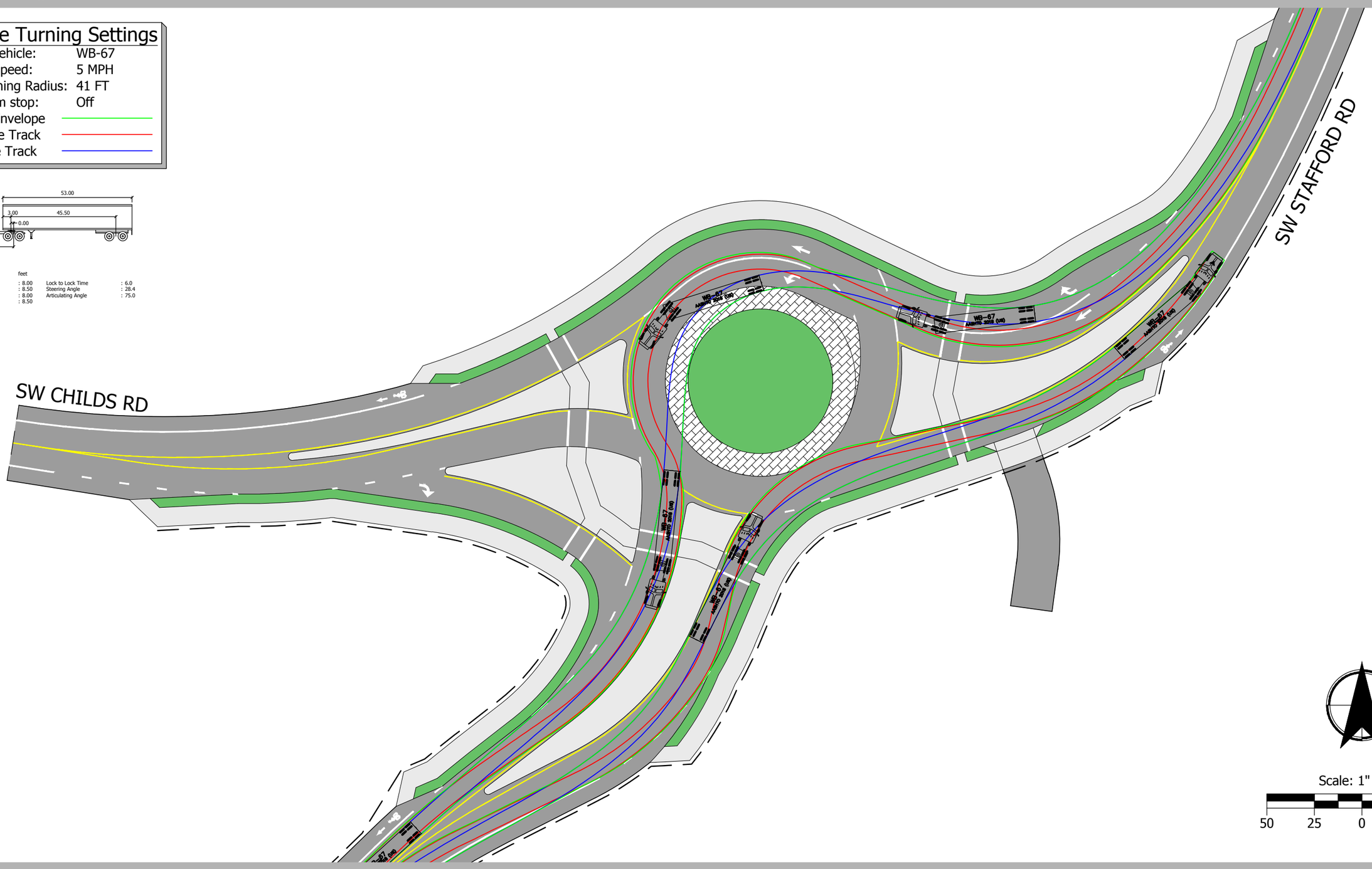
Design Vehicle:	WB-67
Vehicle Speed:	5 MPH
Min. Turning Radius:	41 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	



WB-67

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 28.4
Tractor Track	: 8.00	Articulating Angle	: 75.0
Trailer Track	: 8.50		



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25025064 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-19 AutoTurn Checks\EXHIBIT-CHILDS RBT ALT 2.3 - AUTOTURN-25094.dwg Mar 19, 2021 - 11:12am - ccox Layout Tab: WB-67

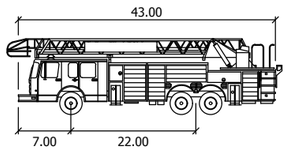
APPENDIX G: Expanded Side-Street Truck Turning Figures

Design Vehicles - Fire Truck

Preliminary Design Subject to Change
Date: 2021-04-09

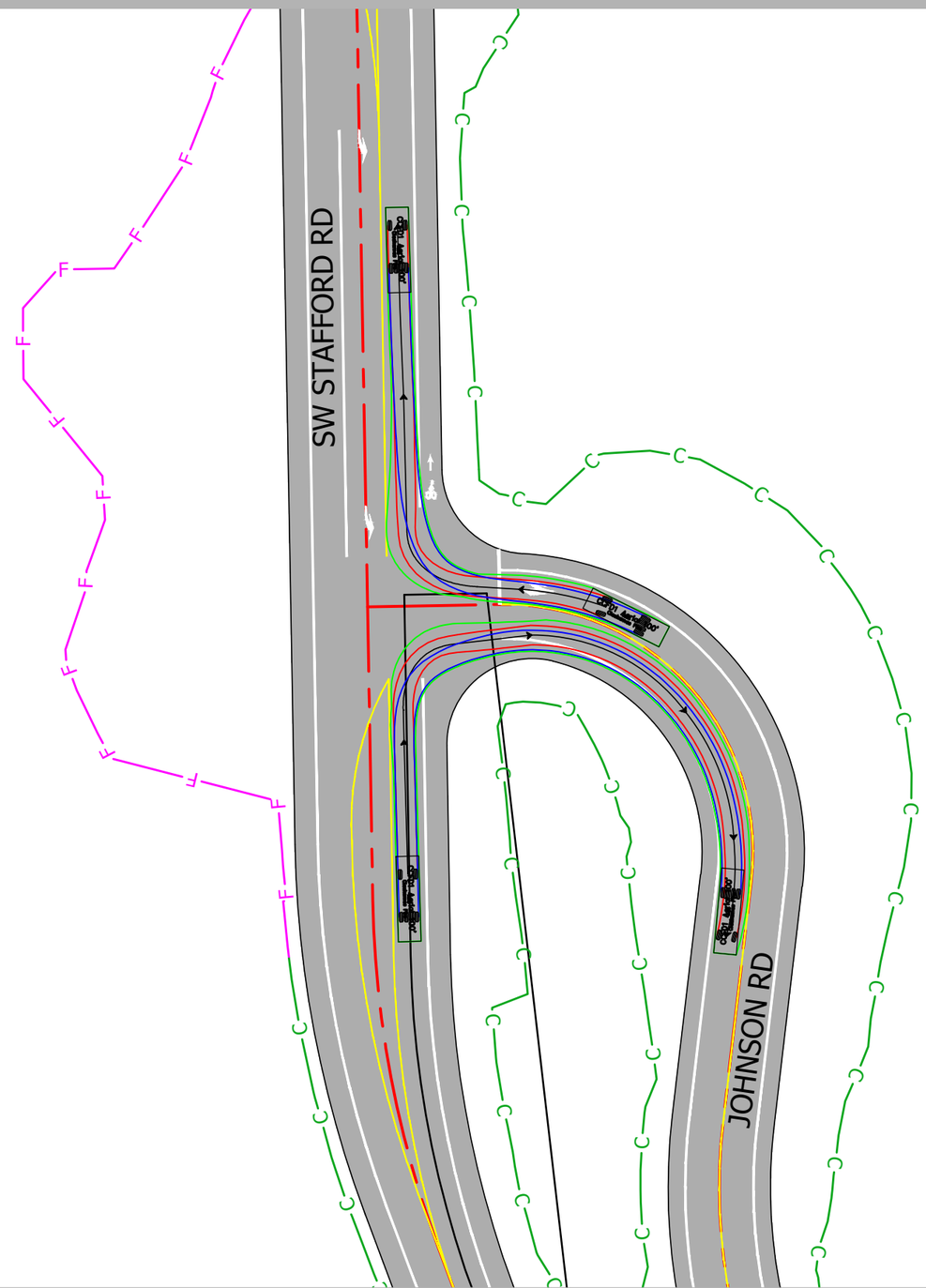
Vehicle Turning Settings

Design Vehicle:	FIRE TRUCK
Vehicle Speed:	5 MPH
Min. Turning Radius:	40 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	



Aerial Fire Truck

	feet
Width	: 8.50
Track	: 8.50
Lock to Lock Time	: 6.0
Steering Angle	: 33.3



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

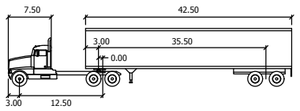
H:\25250\94 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-19 AutoTurn Checks\EXHIBIT-JOHNSON ALT 1.1 - AUTOTURN-25094.dwg Apr 14, 2021 - 8:34pm - dshastin Layout Tab: FireTruck

Design Vehicles - WB-50

Preliminary Design Subject to Change
Date: 2021-04-09

Vehicle Turning Settings

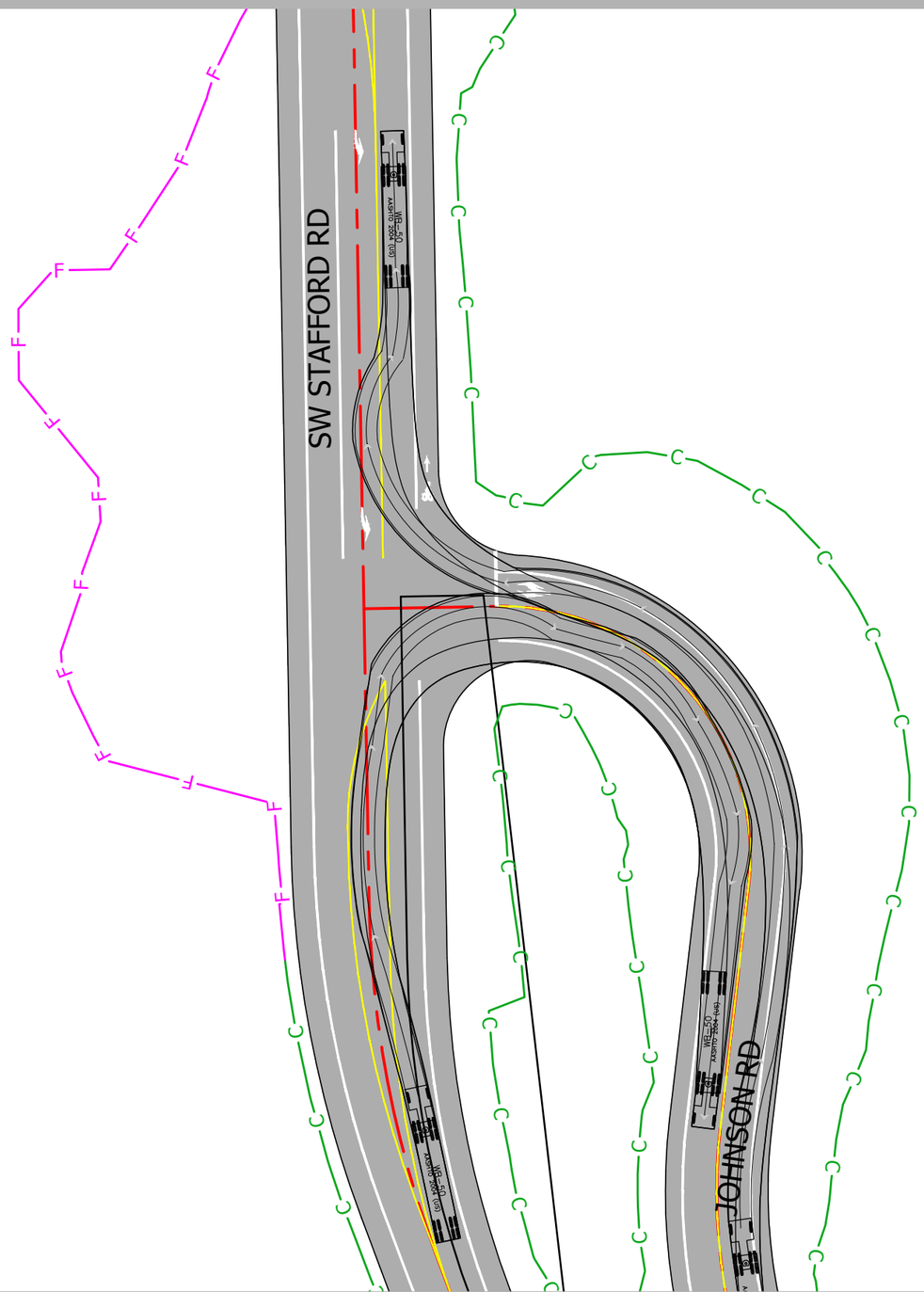
Design Vehicle:	WB-50
Vehicle Speed:	5 MPH
Min. Turning Radius:	41 FT
Turn from stop:	Off
Vehicle Envelope	
Front Tire Track	
Rear Tire Track	



WB-50

feet

Tractor Width	: 8.00	Lock to Lock Time	: 6.0
Trailer Width	: 8.50	Steering Angle	: 17.7
Tractor Track	: 8.00	Articulating Angle	: 70.0
Trailer Track	: 8.50		



Scale: 1" = 50'

50 25 0 50

KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Fred Wismer, Caleb Cox

Stafford Road (Pattulo to Rosemont) Improvements Project

Clackamas County, OR

H:\25\25094 - Stafford Road - Rosemont to Pattulo\design\Exhibits\2021-03-19 AutoTurn Checks\EXHIBIT-JOHNSON ALT 1.1 - AUTOTURN-25094.dwg Apr 14, 2021 - 8:35pm - dshastinn Layout Tab: WB-50

APPENDIX H: Existing and Future Traffic Operations Worksheets – SW Stafford Rd/SW Childs Rd

Intersection	
Int Delay, s/veh	9

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	45	89	170	585	565	209
Future Vol, veh/h	45	89	170	585	565	209
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	98	187	643	621	230

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1638	621	621	0	-	0
Stage 1	621	-	-	-	-	-
Stage 2	1017	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	111	487	960	-	-	0
Stage 1	536	-	-	-	-	0
Stage 2	349	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	77	487	960	-	-	-
Mov Cap-2 Maneuver	77	-	-	-	-	-
Stage 1	374	-	-	-	-	-
Stage 2	349	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s	85.1	2.2	0
HCM LOS	F		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	SWT
Capacity (veh/h)	960	-	175	-
HCM Lane V/C Ratio	0.195	-	0.841	-
HCM Control Delay (s)	9.7	0	85.1	-
HCM Lane LOS	A	A	F	-
HCM 95th %tile Q(veh)	0.7	-	5.9	-

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	45	89	170	585	565	209
Future Volume (vph)	45	89	170	585	565	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.23	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	431	1863	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	47	94	179	616	595	220
RTOR Reduction (vph)	0	66	0	0	0	88
Lane Group Flow (vph)	47	28	179	616	595	132
Turn Type	Prot	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	7.3	17.4	42.3	42.3	27.7	27.7
Effective Green, g (s)	7.3	17.4	42.3	42.3	27.7	27.7
Actuated g/C Ratio	0.12	0.30	0.72	0.72	0.47	0.47
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	220	591	541	1344	880	748
v/s Ratio Prot	c0.03	0.01	0.06	c0.33	c0.32	
v/s Ratio Perm		0.01	0.18			0.08
v/c Ratio	0.21	0.05	0.33	0.46	0.68	0.18
Uniform Delay, d1	23.1	14.7	5.1	3.4	12.0	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.0	0.4	0.2	2.1	0.1
Delay (s)	23.6	14.7	5.4	3.6	14.0	9.0
Level of Service	C	B	A	A	B	A
Approach Delay (s)	17.7			4.0	12.7	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	58.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	45	89	170	585	565	209
Future Volume (veh/h)	45	89	170	585	565	209
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	47	94	179	616	595	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	182	340	522	1232	798	
Arrive On Green	0.10	0.10	0.11	0.66	0.43	0.00
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	47	94	179	616	595	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	0.9	1.9	1.7	6.3	10.1	0.0
Cycle Q Clear(g_c), s	0.9	1.9	1.7	6.3	10.1	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	182	340	522	1232	798	
V/C Ratio(X)	0.26	0.28	0.34	0.50	0.75	
Avail Cap(c_a), veh/h	1064	1125	819	4395	3650	
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	0.00
Uniform Delay (d), s/veh	15.6	12.3	6.0	3.3	9.1	0.0
Incr Delay (d2), s/veh	0.7	0.4	0.4	0.3	1.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.6	3.2	0.3	0.2	4.4	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.3	12.8	6.3	3.6	10.5	0.0
LnGrp LOS	B	B	A	A	B	
Approach Vol, veh/h	141			795	595	A
Approach Delay, s/veh	14.0			4.2	10.5	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		29.3		8.4	8.7	20.6
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		88.5		22.5	10.5	73.5
Max Q Clear Time (g_c+I1), s		8.3		3.9	3.7	12.1
Green Ext Time (p_c), s		4.2		0.3	0.2	4.0

Intersection Summary	
HCM 6th Ctrl Delay	7.5
HCM 6th LOS	A

Notes

Unsignalized Delay for [SWR] is excluded from calculations of the approach delay and intersection delay.

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2021
Time Analyzed	7:15 - 8:15
Project Description	ALT 2: Single-Lane Roundab...

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment			LT								LT				T	
Volume (V), veh/h	0	45	0	89					0	170	585		0		565	209
Percent Heavy Vehicles, %	3	3	3	3					3	3	3		3		3	3
Flow Rate (v_{PCE}), pc/h	0	50	0	100					0	190	655		0		633	234
Right-Turn Bypass	Yielding				None				None				Yielding			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763	4.9763					4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087	2.6087					2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		50	100					845			633	234
Entry Volume, veh/h		49	97					820			615	227
Circulating Flow (v_c), pc/h	633			895			50			190		
Exiting Flow (v_{ex}), pc/h	0			190			705			633		
Capacity (c_{pce}), pc/h		724	724					1311			1137	1137
Capacity (c), veh/h		702	702					1273			1104	1104
v/c Ratio (x)		0.07	0.14					0.64			0.56	0.21

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.9	6.6					11.0			10.1	5.1
Lane LOS		A	A					B			B	A
95% Queue, veh		0.2	0.5					5.0			3.6	0.8
Approach Delay, s/veh	6.4						11.0			8.7		
Approach LOS	A						B			A		
Intersection Delay, s/veh | LOS	9.6						A					

Copyright © 2021 University of Florida. All Rights Reserved.

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2021
Time Analyzed	7:15 - 8:15
Project Description	ALT 3: Multi-Lane Roundabout

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	1	0	1	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	L		R						LT		T		T		TR	
Volume (V), veh/h	0	45		89					0	170	585		0		565	209
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (v_{PCE}), pc/h	0	50		100					0	190	655		0		633	234
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276					4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway (s)	2.6667	2.5352					2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	50	100					397	448		407	460	
Entry Volume, veh/h	49	97					386	435		396	446	
Circulating Flow (v_c), pc/h	633			895			50			190		
Exiting Flow (v_{ex}), pc/h	0			424			705			733		
Capacity (c_{pce}), pc/h	754	829					1357	1357		1195	1195	
Capacity (c), veh/h	732	805					1317	1317		1160	1160	
v/c Ratio (x)	0.07	0.12					0.29	0.33		0.34	0.38	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	5.6	5.7					5.3	5.7		6.4	7.0	
Lane LOS	A	A					A	A		A	A	
95% Queue, veh	0.2	0.4					1.2	1.5		1.5	1.8	
Approach Delay, s/veh	5.7						5.5			6.7		
Approach LOS	A						A			A		
Intersection Delay, s/veh | LOS	6.1						A					

Copyright © 2021 University of Florida. All Rights Reserved.

Intersection	
Int Delay, s/veh	50.7

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	79	274	86	643	669	65
Future Vol, veh/h	79	274	86	643	669	65
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	285	90	670	697	68

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1547	697	697	0	-	0
Stage 1	697	-	-	-	-	-
Stage 2	850	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	126	441	899	-	-	0
Stage 1	494	-	-	-	-	0
Stage 2	419	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	106	441	899	-	-	-
Mov Cap-2 Maneuver	106	-	-	-	-	-
Stage 1	415	-	-	-	-	-
Stage 2	419	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, s	249.2	1.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	SWT
Capacity (veh/h)	899	-	258	-
HCM Lane V/C Ratio	0.1	-	1.425	-
HCM Control Delay (s)	9.4	0	249.2	-
HCM Lane LOS	A	A	F	-
HCM 95th %tile Q(veh)	0.3	-	20.5	-

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	79	274	86	643	669	65
Future Volume (vph)	79	274	86	643	669	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.18	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	333	1863	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	83	288	91	677	704	68
RTOR Reduction (vph)	0	177	0	0	0	21
Lane Group Flow (vph)	83	111	91	677	704	47
Turn Type	Prot	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	10.1	16.5	41.4	41.4	30.5	30.5
Effective Green, g (s)	10.1	16.5	41.4	41.4	30.5	30.5
Actuated g/C Ratio	0.17	0.27	0.68	0.68	0.50	0.50
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	295	549	379	1274	939	798
v/s Ratio Prot	c0.05	0.02	0.03	c0.36	c0.38	
v/s Ratio Perm		0.05	0.14			0.03
v/c Ratio	0.28	0.20	0.24	0.53	0.75	0.06
Uniform Delay, d1	22.0	16.9	6.7	4.7	12.0	7.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	0.3	0.4	3.3	0.0
Delay (s)	22.6	17.1	7.0	5.2	15.3	7.7
Level of Service	C	B	A	A	B	A
Approach Delay (s)	18.3			5.4	14.6	
Approach LOS	B			A	B	

Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.5	Sum of lost time (s)	13.5
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	79	274	86	643	669	65
Future Volume (veh/h)	79	274	86	643	669	65
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	83	288	91	677	704	68
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	371	472	382	1178	858	728
Arrive On Green	0.21	0.21	0.09	0.63	0.46	0.46
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	83	288	91	677	704	68
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	2.2	8.7	1.2	11.7	18.1	1.3
Cycle Q Clear(g_c), s	2.2	8.7	1.2	11.7	18.1	1.3
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	371	472	382	1178	858	728
V/C Ratio(X)	0.22	0.61	0.24	0.57	0.82	0.09
Avail Cap(c_a), veh/h	721	785	559	2979	2474	2097
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	18.3	16.7	9.2	6.0	13.0	8.5
Incr Delay (d2), s/veh	0.3	1.3	0.3	0.4	2.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.4	12.3	0.5	4.4	9.9	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.6	18.0	9.6	6.4	15.1	8.6
LnGrp LOS	B	B	A	A	B	A
Approach Vol, veh/h	371			768	772	
Approach Delay, s/veh	18.1			6.8	14.5	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		39.5		16.1	9.5	30.0
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		88.5		22.5	10.5	73.5
Max Q Clear Time (g_c+I1), s		13.7		10.7	3.2	20.1
Green Ext Time (p_c), s		4.8		0.9	0.1	5.4

Intersection Summary		
HCM 6th Ctrl Delay	12.1	
HCM 6th LOS	B	

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2021
Time Analyzed	4:15 - 5-15
Project Description	ALT 2: Single-Lane Roundab...

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment			LT								LT				T	
Volume (V), veh/h	0	79	0	274					0	86	643		0		669	65
Percent Heavy Vehicles, %	3	3	3	3					3	3	3		3		3	3
Flow Rate (v_{PCE}), pc/h	0	88	0	307					0	96	720		0		749	73
Right-Turn Bypass	Yielding				None				None				Yielding			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763	4.9763					4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087	2.6087					2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		88	307					816			749	73
Entry Volume, veh/h		85	298					792			727	71
Circulating Flow (v_c), pc/h	749			904			88			96		
Exiting Flow (v_{ex}), pc/h	0			96			808			749		
Capacity (c_{pce}), pc/h		643	643					1262			1251	1251
Capacity (c), veh/h		624	624					1225			1215	1215
v/c Ratio (x)		0.14	0.48					0.65			0.60	0.06

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.4	13.3					11.4			10.3	3.4
Lane LOS		A	B					B			B	A
95% Queue, veh		0.5	2.6					5.0			4.2	0.2
Approach Delay, s/veh	12.0						11.4			9.7		
Approach LOS	B						B			A		
Intersection Delay, s/veh | LOS	10.8						B					

Copyright © 2021 University of Florida. All Rights Reserved.

HCS7 Roundabouts Report

General Information

Analyst	DZS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2021
Time Analyzed	4:15 - 5:15
Project Description	ALT 3: Multi-Lane Roundabout

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	1	0	1	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	L		R						LT		T		T		TR	
Volume (V), veh/h	0	79		274					0	86	643		0		669	65
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (v_{PCE}), pc/h	0	88		307					0	96	720		0		749	73
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276					4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway (s)	2.6667	2.5352					2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	88	307					384	432		386	436	
Entry Volume, veh/h	85	298					372	420		375	423	
Circulating Flow (v_c), pc/h	749			904			88			96		
Exiting Flow (v_{ex}), pc/h	0			169			808			1056		
Capacity (c_{pce}), pc/h	678	751					1311	1311		1301	1301	
Capacity (c), veh/h	658	729					1273	1273		1263	1263	
v/c Ratio (x)	0.13	0.41					0.29	0.33		0.30	0.33	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	6.9	10.3					5.5	5.9		5.5	6.0	
Lane LOS	A	B					A	A		A	A	
95% Queue, veh	0.4	2.0					1.2	1.5		1.3	1.5	
Approach Delay, s/veh	9.6						5.7			5.8		
Approach LOS	A						A			A		
Intersection Delay, s/veh | LOS	6.5						A					

Copyright © 2021 University of Florida. All Rights Reserved.

Intersection	
Int Delay, s/veh	113.9

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	60	118	225	774	747	277
Future Vol, veh/h	60	118	225	774	747	277
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	66	130	247	851	821	304

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2166	821	821	0	-	0
Stage 1	821	-	-	-	-	-
Stage 2	1345	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 52	374	808	-	-	0
Stage 1	432	-	-	-	-	0
Stage 2	243	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 22	374	808	-	-	-
Mov Cap-2 Maneuver	~ 22	-	-	-	-	-
Stage 1	181	-	-	-	-	-
Stage 2	243	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, $	1216.6	2.6	0
HCM LOS	F		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	SWT
Capacity (veh/h)	808	-	58	-
HCM Lane V/C Ratio	0.306	-	3.372	-
HCM Control Delay (s)	11.4	$	1216.6	-
HCM Lane LOS	B	A	F	-
HCM 95th %tile Q(veh)	1.3	-	20.7	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	60	118	225	774	747	277
Future Volume (vph)	60	118	225	774	747	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.14	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	258	1863	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	63	124	237	815	786	292
RTOR Reduction (vph)	0	89	0	0	0	79
Lane Group Flow (vph)	63	35	237	815	786	213
Turn Type	Prot	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	9.7	20.5	53.0	53.0	37.7	37.7
Effective Green, g (s)	9.7	20.5	53.0	53.0	37.7	37.7
Actuated g/C Ratio	0.14	0.29	0.74	0.74	0.53	0.53
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	239	551	418	1377	979	832
v/s Ratio Prot	c0.04	0.01	0.09	c0.44	c0.42	
v/s Ratio Perm		0.01	0.33			0.13
v/c Ratio	0.26	0.06	0.57	0.59	0.80	0.26
Uniform Delay, d1	27.8	18.6	10.2	4.3	14.0	9.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.0	1.8	0.7	4.8	0.2
Delay (s)	28.4	18.7	12.0	5.0	18.8	9.5
Level of Service	C	B	B	A	B	A
Approach Delay (s)	21.9			6.6	16.3	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	12.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	71.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	60	118	225	774	747	277
Future Volume (veh/h)	60	118	225	774	747	277
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	63	124	237	815	786	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	193	328	437	1323	966	
Arrive On Green	0.11	0.11	0.10	0.71	0.52	0.00
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	63	124	237	815	786	0
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	1.6	3.3	2.6	11.0	17.1	0.0
Cycle Q Clear(g_c), s	1.6	3.3	2.6	11.0	17.1	0.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	193	328	437	1323	966	
V/C Ratio(X)	0.33	0.38	0.54	0.62	0.81	
Avail Cap(c_a), veh/h	821	886	645	3391	2816	
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	0.00
Uniform Delay (d), s/veh	20.1	16.7	9.0	3.7	9.8	0.0
Incr Delay (d2), s/veh	1.0	0.7	1.0	0.5	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.1	0.1	1.4	1.3	8.0	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	21.1	17.4	10.0	4.2	11.6	0.0
LnGrp LOS	C	B	B	A	B	
Approach Vol, veh/h	187			1052	786	A
Approach Delay, s/veh	18.6			5.5	11.6	
Approach LOS	B			A	B	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		39.0		9.8	9.3	29.7
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		88.5		22.5	10.5	73.5
Max Q Clear Time (g_c+I1), s		13.0		5.3	4.6	19.1
Green Ext Time (p_c), s		6.6		0.5	0.3	6.1

Intersection Summary	
HCM 6th Ctrl Delay	9.1
HCM 6th LOS	A

Notes

Unsignalized Delay for [SWR] is excluded from calculations of the approach delay and intersection delay.

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2040
Time Analyzed	7:15 - 8:15
Project Description	ALT 2: Single-Lane Roundab...

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment			LT								LT				T	
Volume (V), veh/h	0	60	0	118					0	225	774		0		747	277
Percent Heavy Vehicles, %	1	1	1	1					1	1	1		1		1	1
Flow Rate (v_{PCE}), pc/h	0	66	0	130					0	247	850		0		820	304
Right-Turn Bypass	Yielding				None				None				Yielding			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763	4.9763					4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087	2.6087					2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		66	130					1097			820	304
Entry Volume, veh/h		65	129					1086			812	301
Circulating Flow (v_c), pc/h	820			1163			66			247		
Exiting Flow (v_{ex}), pc/h	0			247			916			820		
Capacity (c_{pce}), pc/h		598	598					1290			1073	1073
Capacity (c), veh/h		592	592					1277			1062	1062
v/c Ratio (x)		0.11	0.22					0.85			0.76	0.28

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.4	8.8					20.4			17.3	6.1
Lane LOS		A	A					C			C	A
95% Queue, veh		0.4	0.8					11.5			7.8	1.2
Approach Delay, s/veh	8.4						20.4			14.3		
Approach LOS	A						C			B		
Intersection Delay, s/veh | LOS	16.6						C					

Copyright © 2021 University of Florida. All Rights Reserved.

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2040
Time Analyzed	7:15 - 8:15
Project Description	ALT 3: Multi_Lane Roundabout

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	1	0	1	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	L		R						LT		T		T		TR	
Volume (V), veh/h	0	60		118					0	225	774		0		747	277
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (v_{PCE}), pc/h	0	67		132					0	252	867		0		836	310
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276					4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway (s)	2.6667	2.5352					2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	67	132					526	593		539	607	
Entry Volume, veh/h	65	128					511	576		523	590	
Circulating Flow (v_c), pc/h	836			1186			67			252		
Exiting Flow (v_{ex}), pc/h	0			562			934			968		
Capacity (c_{pce}), pc/h	626	698					1336	1336		1129	1129	
Capacity (c), veh/h	607	677					1297	1297		1096	1096	
v/c Ratio (x)	0.11	0.19					0.39	0.44		0.48	0.54	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	7.2	7.5					6.5	7.2		8.6	9.7	
Lane LOS	A	A					A	A		A	A	
95% Queue, veh	0.4	0.7					1.9	2.3		2.6	3.3	
Approach Delay, s/veh	7.4						6.9			9.2		
Approach LOS	A						A			A		
Intersection Delay, s/veh | LOS	8.0						A					

Copyright © 2021 University of Florida. All Rights Reserved.

Intersection	
Int Delay, s/veh	264.4

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	105	363	114	851	885	86
Future Vol, veh/h	105	363	114	851	885	86
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	109	378	119	886	922	90

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2046	922	922	0	-	0
Stage 1	922	-	-	-	-	-
Stage 2	1124	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	~ 62	~ 327	741	-	-	0
Stage 1	387	-	-	-	-	0
Stage 2	310	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 42	~ 327	741	-	-	-
Mov Cap-2 Maneuver	~ 42	-	-	-	-	-
Stage 1	265	-	-	-	-	-
Stage 2	310	-	-	-	-	-

Approach	EB	NE	SW
HCM Control Delay, $	1306.9	1.3	0
HCM LOS	F		

Minor Lane/Major Mvmt	NEL	NET	EBLn1	SWT
Capacity (veh/h)	741	-	130	-
HCM Lane V/C Ratio	0.16	-	3.75	-
HCM Control Delay (s)	10.8	$	1306.9	-
HCM Lane LOS	B	A	F	-
HCM 95th %tile Q(veh)	0.6	-	48.5	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	105	363	114	851	885	86
Future Volume (vph)	105	363	114	851	885	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	139	1863	1863	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	382	120	896	932	91
RTOR Reduction (vph)	0	105	0	0	0	19
Lane Group Flow (vph)	111	277	120	896	932	72
Turn Type	Prot	pm+ov	pm+pt	NA	NA	Perm
Protected Phases	4	5	5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	16.0	25.5	64.0	64.0	50.0	50.0
Effective Green, g (s)	16.0	25.5	64.0	64.0	50.0	50.0
Actuated g/C Ratio	0.18	0.29	0.72	0.72	0.56	0.56
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	318	533	274	1339	1046	889
v/s Ratio Prot	0.06	c0.06	0.05	c0.48	c0.50	
v/s Ratio Perm		0.12	0.27			0.05
v/c Ratio	0.35	0.52	0.44	0.67	0.89	0.08
Uniform Delay, d1	31.9	26.6	16.1	6.8	17.1	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.9	1.1	1.3	9.7	0.0
Delay (s)	32.6	27.5	17.2	8.1	26.8	9.0
Level of Service	C	C	B	A	C	A
Approach Delay (s)	28.6			9.1	25.2	
Approach LOS	C			A	C	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	105	363	114	851	885	86
Future Volume (veh/h)	105	363	114	851	885	86
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	111	382	120	896	932	91
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	436	474	236	1229	1035	877
Arrive On Green	0.24	0.24	0.05	0.66	0.55	0.55
Sat Flow, veh/h	1781	1585	1781	1870	1870	1585
Grp Volume(v), veh/h	111	382	120	896	932	91
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1870	1870	1585
Q Serve(g_s), s	4.6	20.4	2.4	28.9	40.6	2.5
Cycle Q Clear(g_c), s	4.6	20.4	2.4	28.9	40.6	2.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	436	474	236	1229	1035	877
V/C Ratio(X)	0.25	0.81	0.51	0.73	0.90	0.10
Avail Cap(c_a), veh/h	438	476	343	1808	1501	1272
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	27.9	29.6	19.3	10.3	18.2	9.7
Incr Delay (d2), s/veh	0.3	9.8	1.7	0.8	5.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.4	24.7	2.5	14.2	22.8	1.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	28.2	39.4	21.0	11.2	23.9	9.7
LnGrp LOS	C	D	C	B	C	A
Approach Vol, veh/h	493			1016	1023	
Approach Delay, s/veh	36.9			12.3	22.6	
Approach LOS	D			B	C	

Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		64.7		26.9	9.5	55.2
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		88.5		22.5	10.5	73.5
Max Q Clear Time (g_c+I1), s		30.9		22.4	4.4	42.6
Green Ext Time (p_c), s		7.8		0.0	0.1	8.0

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2040
Time Analyzed	4:15 - 5-15
Project Description	ALT 2: Single-Lane Roundab...

Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment			LT								LT				T	
Volume (V), veh/h	0	105	0	363					0	114	851		0		885	86
Percent Heavy Vehicles, %	1	1	1	1					1	1	1		1		1	1
Flow Rate (v_{PCE}), pc/h	0	115	0	399					0	125	934		0		972	94
Right-Turn Bypass	Yielding				None				None				Yielding			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763	4.9763					4.9763			4.9763	4.9763
Follow-Up Headway (s)		2.6087	2.6087					2.6087			2.6087	2.6087

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		115	399					1059			972	94
Entry Volume, veh/h		114	395					1049			962	93
Circulating Flow (v_c), pc/h	972			1174			115			125		
Exiting Flow (v_{ex}), pc/h	0			125			1049			972		
Capacity (c_{pce}), pc/h		512	512					1227			1215	1215
Capacity (c), veh/h		507	507					1215			1203	1203
v/c Ratio (x)		0.22	0.78					0.86			0.80	0.08

Delay and Level of Service

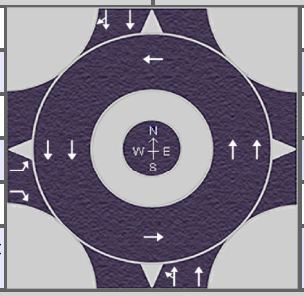
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		10.3	31.7					22.3			17.7	3.6
Lane LOS		B	D					C			C	A
95% Queue, veh		0.9	7.0					12.0			9.2	0.3
Approach Delay, s/veh	26.9						22.3			16.5		
Approach LOS	D						C			C		
Intersection Delay, s/veh | LOS	20.8						C					

Copyright © 2021 University of Florida. All Rights Reserved.

HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	Clackamas County
Date Performed	1/21/2021
Analysis Year	2040
Time Analyzed	4:15 - 5:15
Project Description	ALT 3: Multi-Lane Roundabout



Site Information

Intersection	Stafford Rd & Childs Rd
E/W Street Name	Childs Rd
N/S Street Name	Stafford Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Clackamas County

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	1	0	1	0	0	0	0	0	0	2	0	0	0	2	0
Lane Assignment	L		R						LT		T		T		TR	
Volume (V), veh/h	0	105		363					0	114	851		0		885	86
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (v_{PCE}), pc/h	0	118		406					0	128	953		0		991	96
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276					4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway (s)	2.6667	2.5352					2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	118	406					508	573		511	576	
Entry Volume, veh/h	115	394					493	556		496	559	
Circulating Flow (v_c), pc/h	991			1199			118			128		
Exiting Flow (v_{ex}), pc/h	0			224			1071			1397		
Capacity (c_{pce}), pc/h	542	612					1275	1275		1264	1264	
Capacity (c), veh/h	527	594					1238	1238		1227	1227	
v/c Ratio (x)	0.22	0.66					0.40	0.45		0.40	0.46	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	9.8	20.5					6.8	7.5		6.9	7.6	
Lane LOS	A	C					A	A		A	A	
95% Queue, veh	0.8	4.9					1.9	2.4		2.0	2.4	
Approach Delay, s/veh	18.1						7.2			7.3		
Approach LOS	C						A			A		
Intersection Delay, s/veh | LOS	9.4						A					

Copyright © 2021 University of Florida. All Rights Reserved.

APPENDIX I: Signal Warrant Analysis – SW Stafford Rd/SW Childs Rd

Signal Warrant Assessment

Based on 2009 Edition of the MUTCD

Project #:	25094
Project Name:	Stafford Road - Rosemont to Pattulo
Analyst:	DZS
Date:	4/13/2021
Intersection:	Stafford Road/Childs Road
Scenario:	2021 PMPK

Volume Adjustment Factor =	1.0
North-South Approach =	Major
East-West Approach =	Minor
Major Street Thru Lanes =	1
Minor Street Thru Lanes =	1
Speed > 40 mph?	No
Population < 10,000?	No
Warrant Factor	100%
Peak Hour or Daily Count?	Peak Hour

Warrant Summary

Warrant	Name	Analyzed?	Met?
#1	Eight-Highest	Yes	Yes
#2	Four-Hour	Yes	Yes
#3	Peak Hour	Yes	Yes

**This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.*

Select Type Of Major Street Approach From Dropdown Menu	Urban Minor Arterial
Select Type Of Minor Street Approach From Dropdown Menu	Rural Major Collector

Note: traffic volume profile for weekday (if weekend is desired, tab "vol profile" needs to be adjusted)

Traffic Volumes

Hour		Major Street		Minor Street		Major St.	Minor St.
Begin	End	NB	SB	EB	WB	Adj. Factor	Adj. Factor
8:00 AM	9:00 AM	729	734	353	0	1.00	1.00
2nd Highest Hour		690	695	315	0	0.95	0.89
3rd Highest Hour		680	685	273	0	0.93	0.77
4th Highest Hour		651	656	269	0	0.89	0.76
5th Highest Hour		642	646	239	0	0.88	0.68
6th Highest Hour		642	646	235	0	0.88	0.67
7th Highest Hour		612	617	228	0	0.84	0.65
8th Highest Hour		603	607	209	0	0.83	0.59
9th Highest Hour		583	587	197	0	0.80	0.56
10th Highest Hour		544	548	190	0	0.75	0.54
11th Highest Hour		525	528	186	0	0.72	0.53
12th Highest Hour		515	519	186	0	0.71	0.53
13th Highest Hour		496	499	182	0	0.68	0.52
14th Highest Hour		428	431	152	0	0.59	0.43
15th Highest Hour		340	343	148	0	0.47	0.42
16th Highest Hour		321	323	106	0	0.44	0.30
17th Highest Hour		224	225	106	0	0.31	0.30
18th Highest Hour		185	186	72	0	0.25	0.20
19th Highest Hour		97	98	46	0	0.13	0.13
20th Highest Hour		68	69	38	0	0.09	0.11
21st Highest Hour		58	59	19	0	0.08	0.05
22nd Highest Hour		39	39	15	0	0.05	0.04
23rd Highest Hour		19	20	15	0	0.03	0.04
24th Highest Hour		19	20	11	0	0.03	0.03

Data Input

Traffic Volumes

Hour Begin	Hour End	Major Street NB	Major Street SB	Minor Street EB	Minor Street WB
8:00 AM	9:00 AM	729	734	353	0
2nd Highest Hour		690	695	315	0
3rd Highest Hour		680	685	273	0
4th Highest Hour		651	656	269	0
5th Highest Hour		642	646	239	0
6th Highest Hour		642	646	235	0
7th Highest Hour		612	617	228	0
8th Highest Hour		603	607	209	0
9th Highest Hour		583	587	197	0
10th Highest Hour		544	548	190	0
11th Highest Hour		525	528	186	0
12th Highest Hour		515	519	186	0
13th Highest Hour		496	499	182	0
14th Highest Hour		428	431	152	0
15th Highest Hour		340	343	148	0
16th Highest Hour		321	323	106	0
17th Highest Hour		224	225	106	0
18th Highest Hour		185	186	72	0
19th Highest Hour		97	98	46	0
20th Highest Hour		68	69	38	0
21st Highest Hour		58	59	19	0
22nd Highest Hour		39	39	15	0
23rd Highest Hour		19	20	15	0
24th Highest Hour		19	20	11	0

100% Warrant Met

70% Warrant Met

Number of lanes for moving traffic on each approach (Major Street)	1
Number of lanes for moving traffic on each approach (Minor Street)	1
Warrant Factor	100%
Row Index for VLOOKUP	1

Calculations

Combined Major Street	Higher Minor Street	Major Plus Minor	Hourly Rank	Condition A 100%	Condition A 80%	Condition A 70%	Condition A 56%	Condition B 100%	Condition B 80%	Condition B 70%	Condition B 56%
1463	353	1816	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1385	315	1700	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1365	273	1639	3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1307	269	1576	4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1287	239	1527	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1287	235	1523	6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1229	228	1457	7	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1209	209	1418	8	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1170	197	1368	9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1092	190	1282	10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1053	186	1239	11	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
1034	186	1220	12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
995	182	1177	13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
858	152	1010	14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
683	148	831	15	N	Yes	Yes	Yes	N	Yes	Yes	Yes
644	106	750	16	N	N	Yes	Yes	N	Yes	Yes	Yes
449	106	555	17	N	N	Yes	Yes	N	N	N	Yes
371	72	443	18	N	N	N	N	N	N	N	N
195	46	241	19	N	N	N	N	N	N	N	N
137	38	175	20	N	N	N	N	N	N	N	N
117	19	136	21	N	N	N	N	N	N	N	N
78	15	93	22	N	N	N	N	N	N	N	N
39	15	54	23	N	N	N	N	N	N	N	N
39	11	50	24	N	N	N	N	N	N	N	N
				14	15	17	17	14	16	16	17

Lookup Table

Condition A - Minimum Vehicular Volume

Index	Lanes: Major Street	Lanes: Minor Street	Combined Major Street: 100%	80%	70%	56%	Higher Minor Street: 100%	80%	70%	56%
1	1	1	500	400	350	280	150	120	105	84
2	2 or more	1	600	480	420	336	150	120	105	84
3	2 or more	2 or more	600	480	420	336	200	160	140	112
4	1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Index	Lanes: Major Street	Lanes: Minor Street	Combined Major Street: 100%	80%	70%	56%	Higher Minor Street: 100%	80%	70%	56%
1	1	1	750	600	525	420	75	60	53	42
2	2 or more	1	900	720	630	504	75	60	53	42
3	2 or more	2 or more	900	720	630	504	100	80	70	56
4	1	2 or more	750	600	525	420	100	80	70	56

Vehicles per hour on major street (100% Volume)	500
Vehicles per hour on major street (80% Volume)	400
Vehicles per hour on major street (70% Volume)	350
Vehicles per hour on major street (56% Volume)	280
Vehicles per hour on higher-volume minor-street approach (100% Volume)	150
Vehicles per hour on higher-volume minor-street approach (80% Volume)	120
Vehicles per hour on higher-volume minor-street approach (70% Volume)	105
Vehicles per hour on higher-volume minor-street approach (56% Volume)	84
Vehicles per hour on major street (100% Volume)	750
Vehicles per hour on major street (80% Volume)	600
Vehicles per hour on major street (70% Volume)	525
Vehicles per hour on major street (56% Volume)	420
Vehicles per hour on higher-volume minor-street approach (100% Volume)	75
Vehicles per hour on higher-volume minor-street approach (80% Volume)	60
Vehicles per hour on higher-volume minor-street approach (70% Volume)	53
Vehicles per hour on higher-volume minor-street approach (56% Volume)	42

Warrant Summary

Warrant Factor	Condition	Major Street Requirement	Minor Street Requirement	Hours That Condition Is Met	Threshold	Condition for Warrant Factor Met?	Signal Warrant Met?
100%	A	500	150	14	8	Yes	**Yes**
	B	750	75	14	8	Yes	
80%	A	400	120	15	8	Yes	**Yes**
	B	600	60	16	8	Yes	
70%	A	350	105	17	8	Yes	**Yes**
	B	525	53	16	8	Yes	
56%	A	280	84	17	8	Yes	**Yes**
	B	420	42	17	8	Yes	

Is Warrant #1 met based on the applicable warrant factor? **Yes**

Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
8:00 AM	9:00 AM	729	734	353	0
2nd Highest Hour		690	695	315	0
3rd Highest Hour		680	685	273	0
4th Highest Hour		651	656	269	0
5th Highest Hour		642	646	239	0
6th Highest Hour		642	646	235	0
7th Highest Hour		612	617	228	0
8th Highest Hour		603	607	209	0
9th Highest Hour		583	587	197	0
10th Highest Hour		544	548	190	0
11th Highest Hour		525	528	186	0
12th Highest Hour		515	519	186	0
13th Highest Hour		496	499	182	0
14th Highest Hour		428	431	152	0
15th Highest Hour		340	343	148	0
16th Highest Hour		321	323	106	0
17th Highest Hour		224	225	106	0
18th Highest Hour		185	186	72	0
19th Highest Hour		97	98	46	0
20th Highest Hour		68	69	38	0
21st Highest Hour		58	59	19	0
22nd Highest Hour		39	39	15	0
23rd Highest Hour		19	20	15	0
24th Highest Hour		19	20	11	0

Calculations

Combined Major Street	Higher Minor Street	Threshold	Is Threshold Met?
1463	353	80	Yes
1385	315	80	Yes
1365	273	80	Yes
1307	269	80	Yes
1287	239	80	Yes
1287	235	80	Yes
1229	228	80	Yes
1209	209	80	Yes
1170	197	80	Yes
1092	190	82	Yes
1053	186	88	Yes
1034	186	92	Yes
995	182	99	Yes
858	152	132	Yes
683	148	187	No
644	106	202	No
449	106	285	No
371	72	324	No
195	46	422	No
137	38	459	No
117	19	471	No
78	15	496	No
39	15	523	No
39	11	523	No
			14

Number of lanes for moving traffic on each approach (Major Street)	1
Number of lanes for moving traffic on each approach (Minor Street)	1
Warrant Factor	100%
Row Index for VLOOKUP	1

Lookup Table

Index	Major Street	Minor Street	Break Point	x^2	x	c	alt	
1	1	1	1100	0.00025	0.70119	549.643	80	100% Factor
2	2 or more	1	1380	0.00025	0.75657	654.704	80	
3	2 or more	2 or more	1290	0.00032	0.99411	875.600	115	
4	1	2 or more	1190	0.00028	0.80531	669.814	115	
5	1	1	780	0.00042	0.75589	394.893	60	70% Factor
6	2 or more	1	980	0.00040	0.81250	473.690	60	
7	2 or more	2 or more	890	0.00046	1.01643	620.143	80	
8	1	2 or more	790	0.00041	0.82464	476.500	80	

Is Warrant #2 met based on the applicable warrant factor?

Yes

Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
8:00 AM	9:00 AM	729	734	353	0
2nd Highest Hour		690	695	315	0
3rd Highest Hour		680	685	273	0
4th Highest Hour		651	656	269	0
5th Highest Hour		642	646	239	0
6th Highest Hour		642	646	235	0
7th Highest Hour		612	617	228	0
8th Highest Hour		603	607	209	0
9th Highest Hour		583	587	197	0
10th Highest Hour		544	548	190	0
11th Highest Hour		525	528	186	0
12th Highest Hour		515	519	186	0
13th Highest Hour		496	499	182	0
14th Highest Hour		428	431	152	0
15th Highest Hour		340	343	148	0
16th Highest Hour		321	323	106	0
17th Highest Hour		224	225	106	0
18th Highest Hour		185	186	72	0
19th Highest Hour		97	98	46	0
20th Highest Hour		68	69	38	0
21st Highest Hour		58	59	19	0
22nd Highest Hour		39	39	15	0
23rd Highest Hour		19	20	15	0
24th Highest Hour		19	20	11	0

Calculations

Combined Major Street	Higher Minor Street	Threshold	Is Threshold Met?
1463	353	106	Yes
1385	315	117	Yes
1365	273	120	Yes
1307	269	130	Yes
1287	239	134	Yes
1287	235	134	Yes
1229	228	146	Yes
1209	209	150	Yes
1170	197	159	Yes
1092	190	180	Yes
1053	186	191	No
1034	186	196	No
995	182	209	No
858	152	256	No
683	148	329	No
644	106	347	No
449	106	447	No
371	72	491	No
195	46	600	No
137	38	640	No
117	19	653	No
78	15	681	No
39	15	709	No
39	11	709	No
			10

Number of lanes for moving traffic on each approach (Major Street)	1
Number of lanes for moving traffic on each approach (Minor Street)	1
Warrant Factor	100%
Row Index for VLOOKUP	1

Lookup Table

Index	Major Street	Minor Street	Break Point	x^2	x	c	alt	
1	1	1	1490	0.00021	0.74456	737.483	100	100% Factor
2	2 or more	1	1940	0.00016	0.69501	820.599	100	
3	2 or more	2 or more	1670	0.00021	0.88413	1051.357	150	
4	1	2 or more	1490	0.00018	0.74004	840.841	150	
5	1	1	1090	0.00030	0.72083	500.179	75	70% Factor
6	2 or more	1	1290	0.00027	0.74307	590.636	75	
7	2 or more	2 or more	1190	0.00030	0.88720	740.149	100	
8	1	2 or more	1090	0.00033	0.83500	619.667	100	

Is Warrant #3 met based on the applicable warrant factor? **Yes**

Condition A Criteria

	EB	WB
Total Stopped Delay Per Vehicle On Minor Approach (sec)	15.8	38.2
Number Of Lanes On Minor Street Approach	1	1
Vehicle-Hours Of Stopped Delay On Minor Approach	1.55	0.00
	No	No
Volume on Minor Street Approach During Same Hour	353	0
	Yes	No
Total Entering Volume On All Approaches During Same Hour	1816	
Number of Approaches to Intersection	4	
	Yes	

Is Warrant #3 met based on Condition A criteria? **No**

APPENDIX J: Existing and Future Traffic Operations Worksheets – SW Stafford Rd/Johnson Rd

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	111	655	14	29	621
Future Vol, veh/h	35	111	655	14	29	621
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	39	123	728	16	32	690

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1490	736	0	0	744	0
Stage 1	736	-	-	-	-	-
Stage 2	754	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	136	419	-	-	864	-
Stage 1	474	-	-	-	-	-
Stage 2	465	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	128	419	-	-	864	-
Mov Cap-2 Maneuver	128	-	-	-	-	-
Stage 1	474	-	-	-	-	-
Stage 2	437	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	36.3	0	0.4
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	271	864	-
HCM Lane V/C Ratio	-	-	0.599	0.037	-
HCM Control Delay (s)	-	-	36.3	9.3	0
HCM Lane LOS	-	-	E	A	A
HCM 95th %tile Q(veh)	-	-	3.5	0.1	-

Intersection	
Int Delay, s/veh	3.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	35	111	655	14	29	621
Future Vol, veh/h	35	111	655	14	29	621
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	37	117	689	15	31	654

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1413	697	0	0	704	0
Stage 1	697	-	-	-	-	-
Stage 2	716	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	152	441	-	-	894	-
Stage 1	494	-	-	-	-	-
Stage 2	484	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	147	441	-	-	894	-
Mov Cap-2 Maneuver	147	-	-	-	-	-
Stage 1	494	-	-	-	-	-
Stage 2	467	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.3	0	0.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	298	894	-
HCM Lane V/C Ratio	-	-	0.516	0.034	-
HCM Control Delay (s)	-	-	29.3	9.2	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	2.8	0.1	-

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	146	655	14	29	621
Future Vol, veh/h	0	146	655	14	29	621
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	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	154	689	15	31	654

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	697	0	0	704	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	441	-	-	894	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	441	-	-	894	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.5	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	441	894	-
HCM Lane V/C Ratio	-	-	0.348	0.034	-
HCM Control Delay (s)	-	-	17.5	9.2	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1.5	0.1	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	35	111	655	14	29	621
Future Volume (vph)	35	111	655	14	29	621
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.90		1.00	0.85	1.00	1.00
Flt Protected	0.99		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1652		1863	1583	1770	1863
Flt Permitted	0.99		1.00	1.00	0.24	1.00
Satd. Flow (perm)	1652		1863	1583	444	1863
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	37	117	689	15	31	654
RTOR Reduction (vph)	101	0	0	6	0	0
Lane Group Flow (vph)	53	0	689	9	31	654
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	7.3		30.1	30.1	36.6	36.6
Effective Green, g (s)	7.3		30.1	30.1	36.6	36.6
Actuated g/C Ratio	0.14		0.57	0.57	0.69	0.69
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	227		1060	900	357	1288
v/s Ratio Prot	c0.03		c0.37		0.00	c0.35
v/s Ratio Perm				0.01	0.06	
v/c Ratio	0.23		0.65	0.01	0.09	0.51
Uniform Delay, d1	20.3		7.8	4.9	4.5	3.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5		1.4	0.0	0.1	0.3
Delay (s)	20.8		9.2	4.9	4.6	4.2
Level of Service	C		A	A	A	A
Approach Delay (s)	20.8		9.1			4.2
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	52.9	Sum of lost time (s)	13.5
Intersection Capacity Utilization	50.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	35	111	655	14	29	621
Future Volume (veh/h)	35	111	655	14	29	621
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	37	117	689	15	31	654
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	47	148	914	774	396	1203
Arrive On Green	0.12	0.12	0.49	0.49	0.04	0.64
Sat Flow, veh/h	389	1230	1870	1585	1781	1870
Grp Volume(v), veh/h	155	0	689	15	31	654
Grp Sat Flow(s),veh/h/ln	1630	0	1870	1585	1781	1870
Q Serve(g_s), s	3.5	0.0	11.4	0.2	0.3	7.3
Cycle Q Clear(g_c), s	3.5	0.0	11.4	0.2	0.3	7.3
Prop In Lane	0.24	0.75		1.00	1.00	
Lane Grp Cap(c), veh/h	196	0	914	774	396	1203
V/C Ratio(X)	0.79	0.00	0.75	0.02	0.08	0.54
Avail Cap(c_a), veh/h	449	0	3215	2724	821	3951
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.3	0.0	7.9	5.0	5.9	3.7
Incr Delay (d2), s/veh	6.9	0.0	1.3	0.0	0.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.5	0.0	4.6	0.1	0.1	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	23.2	0.0	9.2	5.0	6.0	4.1
LnGrp LOS	C	A	A	A	A	A
Approach Vol, veh/h	155		704			685
Approach Delay, s/veh	23.2		9.1			4.2
Approach LOS	C		A			A

Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	5.9	23.1			29.0	9.1
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5
Max Green Setting (Gmax), s	10.5	65.5			80.5	10.5
Max Q Clear Time (g_c+I1), s	2.3	13.4			9.3	5.5
Green Ext Time (p_c), s	0.0	5.3			4.8	0.2

Intersection Summary	
HCM 6th Ctrl Delay	8.3
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	Stafford-Johnson - 2021 Existing PM.xtw
Analyst:	
Agency:	
Date Performed:	2/25/2021
Time Analyzed:	2021 Existing PM
Jurisdiction:	
Analysis Year:	2021
Project Description:	
Units:	U.S. Customary
Intersection Name:	Stafford/Johnson
Major Street Direction:	North-South
East/West Street Name:	Johnson
North/South Street Name:	Stafford
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6	
	U	L	T	R	U	L	T	R	
Volume			672	191		234	735		
Peak Hour Factor, PHF					0.98				
Hourly Flow Rtae, HFR			686	195		239	750		
Percent Heavy Vehicles						2			
Number of Lanes	0	0	1	0	0	0	1	0	
Lane Configuration				TR		LT			
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:							
Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume	20		45				
Peak Hour Factor, PHF				0.98			
Hourly Flow Rtae, HFR	20		46				
Percent Heavy Vehicles	2		2				
Number of Lanes	0	1	0		0	0	0
Lane Configuration		LR					
RT channelized?							
Flared Approach | Storage	No	|			|	
Percent Grade		0					

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				LT		LR				
Flow Rate				239		66				
Lane Capacity				768		84				
v/c				0.31		0.79				
95% Queue Length				1.3		4.0				
Control Delay				11.8		133.3				
LOS				B		F				
Approach Delay				7.6		133.3				
Approach LOS						F				
Intersction Delay	8.5									

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound				SouthBound			
Priority	1U	1	2	3	4U	4	5	6	
Movement	U	L	T	R	U	L	T	R	
Minor Street:									

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			672	191		234	735	
Flow Rate, v_x			686	195		239	750	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x	20		45			
Flow Rate, v_x	20		46			

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			686	195		239	750	
Conflicting Flow, v_c,x						881		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x	20		46			
Conflicting Flow, v_c,x	2011		783			

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base										
Single Stage				4.1	7.1		6.2			
Stage I										
Stage II										
t_c,HV				1.0	1.0		1.0			
P_HV				0.02	0.02		0.02			
t_c,G					0.2		0.1			
G					0		0			
t_3,LT				0.0	0.7		0.0			
t_c										
Single Stage				4.12	6.42		6.22			
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2	3.5		3.3			
t_f,HV				0.9	0.9		0.9			
P_HV				0.02	0.02		0.02			
t_f				2.22	3.52		3.32			

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				881	2011		783			
t_c,x				4.12	6.42		6.22			
t_f,x				2.22	3.52		3.32			
c_p,x				768	65		394			

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements		1	4
Conflicting Flow, v_c,x			881
Potential Capacity, c_p,x			768
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			768
Probability of Queue-free State, p_0,j			0.689
Major L-Shared Probability Queue-free State, p*_0,j			0.467

Minor-Street Right-Turn Movements		9	12
Conflicting Flow, v_c,x		783	
Potential Capacity, c_p,x		394	
Pedestrian Impedance Factor, p_p,x		1.000	
Movement Capacity, c_m,x		394	
Probability of Queue-free State, p_0,j		0.883	

Major-Street U-Turn Movements		1U	4U
Conflicting Flow, v_c,x			
Potential Capacity, c_p,x			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			
Shared L/U Capacity, c_SH			
Probability of Queue-free State, p_0,j			

Minor-Street Through Movements		8	11
Conflicting Flow, v_c,x			
Potential Capacity, c_p,x			
Pedestrian Impedance Factor, p_p,x			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			
Probability of Queue-free State, p_0,j			

Minor-Street Left-Turn Movements		7	10
Conflicting Flow, v_c,x		2011	
Potential Capacity, c_p,x		65	
Pedestrian Impedance Factor, p_p,x		1.000	
Major L, Minor T Adjusted Impedance Factor, p"			
Major L, Minor T Impedance Factor, p'			
Capacity Adjustment Factor, f_x		0.467	
Movement Capacity, c_m,x		30	

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LR				
Shared Flow Rate, v_y		66				
Movement Capacity, c_m,x	30		394			
Shared Capacity, c_SH		84				

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				239	20		46			
Movement Capacity				768	30		394			
Lane Configuration				LT		LR				
Shared Capacity						84				
Control Delay				11.8		133.3				

CONTROL DELAY TO RANK 1 MOVEMENTS

Approach		NB	SB
Movement		2	5
Number of Major Street Through Lanes, N		1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j			0.467
Delay to Major Left-turning Vehicles, d_MLT			11.8
Major Street Through Vehicles in Shared Lane, v_i1			750
Major Street Turning Vehicles in Shared Lane, v_i2			239
Saturation Flow Rate for Major Street Through, s_i1		1800	1800

Saturation Flow Rate for Major Street Right-Turn, s_i2	1500
Delay to Rank 1 Vehicles, d_Rank1	6.3

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				LT		LR				
Flow Rate				239		66				
Lane Capacity				768		84				
v/c				0.31		0.79				
95% Queue Length				1.3		4.0				
Control Delay				11.8		133.3				
LOS				B		F				
Approach Delay				7.6		133.3				
Approach LOS						F				
Intersction Delay	8.5									

This TWSC text report was created in HCS™ TWSC Version 7.8.5 on 2/25/2021 9:52:03 AM

Intersection	
Int Delay, s/veh	4.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	20	45	672	191	234	735
Future Vol, veh/h	20	45	672	191	234	735
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	47	707	201	246	774

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2074	808	0	0	908	0
Stage 1	808	-	-	-	-	-
Stage 2	1266	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	59	381	-	-	750	-
Stage 1	438	-	-	-	-	-
Stage 2	265	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	40	381	-	-	750	-
Mov Cap-2 Maneuver	40	-	-	-	-	-
Stage 1	438	-	-	-	-	-
Stage 2	178	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	88.2	0	2.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	105	750	-
HCM Lane V/C Ratio	-	-	0.652	0.328	-
HCM Control Delay (s)	-	-	88.2	12.1	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	3.3	1.4	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	65	672	191	234	735
Future Vol, veh/h	0	65	672	191	234	735
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	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	68	707	201	246	774

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	808	0	0	908	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	381	-	-	750	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	381	-	-	750	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.5	0	2.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	381	750	-
HCM Lane V/C Ratio	-	-	0.18	0.328	-
HCM Control Delay (s)	-	-	16.5	12.1	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.6	1.4	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	20	45	672	191	234	735
Future Volume (vph)	20	45	672	191	234	735
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.91		1.00	0.85	1.00	1.00
Flt Protected	0.98		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1663		1863	1583	1770	1863
Flt Permitted	0.98		1.00	1.00	0.21	1.00
Satd. Flow (perm)	1663		1863	1583	394	1863
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	47	707	201	246	774
RTOR Reduction (vph)	44	0	0	78	0	0
Lane Group Flow (vph)	24	0	707	123	246	774
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	3.8		31.0	31.0	43.8	43.8
Effective Green, g (s)	3.8		31.0	31.0	43.8	43.8
Actuated g/C Ratio	0.07		0.55	0.55	0.77	0.77
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	111		1020	867	506	1441
v/s Ratio Prot	c0.01		c0.38		0.07	c0.42
v/s Ratio Perm				0.08	0.30	
v/c Ratio	0.22		0.69	0.14	0.49	0.54
Uniform Delay, d1	25.0		9.3	6.3	5.3	2.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0		2.1	0.1	0.7	0.4
Delay (s)	26.0		11.4	6.4	6.1	2.9
Level of Service	C		B	A	A	A
Approach Delay (s)	26.0		10.3			3.6
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	56.6	Sum of lost time (s)	13.5
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	20	45	672	191	234	735
Future Volume (veh/h)	20	45	672	191	234	735
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	21	47	707	201	246	774
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	33	74	935	792	492	1346
Arrive On Green	0.07	0.07	0.50	0.50	0.11	0.72
Sat Flow, veh/h	500	1120	1870	1585	1781	1870
Grp Volume(v), veh/h	69	0	707	201	246	774
Grp Sat Flow(s),veh/h/ln	1644	0	1870	1585	1781	1870
Q Serve(g_s), s	1.7	0.0	12.7	3.0	2.3	8.3
Cycle Q Clear(g_c), s	1.7	0.0	12.7	3.0	2.3	8.3
Prop In Lane	0.30	0.68		1.00	1.00	
Lane Grp Cap(c), veh/h	108	0	935	792	492	1346
V/C Ratio(X)	0.64	0.00	0.76	0.25	0.50	0.58
Avail Cap(c_a), veh/h	411	0	2920	2475	738	3589
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	0.0	8.4	6.0	7.1	2.8
Incr Delay (d2), s/veh	6.1	0.0	1.3	0.2	0.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.3	0.0	5.7	1.1	0.7	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	25.2	0.0	9.7	6.2	7.9	3.2
LnGrp LOS	C	A	A	A	A	A
Approach Vol, veh/h	69		908			1020
Approach Delay, s/veh	25.2		8.9			4.3
Approach LOS	C		A			A

Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	9.2	25.5			34.7	7.3
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5
Max Green Setting (Gmax), s	10.5	65.5			80.5	10.5
Max Q Clear Time (g_c+I1), s	4.3	14.7			10.3	3.7
Green Ext Time (p_c), s	0.4	6.2			6.3	0.1

Intersection Summary	
HCM 6th Ctrl Delay	7.1
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	26

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	147	867	19	38	822
Future Vol, veh/h	46	147	867	19	38	822
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	51	163	963	21	42	913

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1971	974	0	0	984	0
Stage 1	974	-	-	-	-	-
Stage 2	997	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	69	306	-	-	702	-
Stage 1	366	-	-	-	-	-
Stage 2	357	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	61	306	-	-	702	-
Mov Cap-2 Maneuver	61	-	-	-	-	-
Stage 1	366	-	-	-	-	-
Stage 2	314	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	258.6	0	0.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	156	702	-
HCM Lane V/C Ratio	-	-	1.375	0.06	-
HCM Control Delay (s)	-	-	258.6	10.5	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	13.3	0.2	-

Intersection	
Int Delay, s/veh	15.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	147	867	19	38	822
Future Vol, veh/h	46	147	867	19	38	822
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	155	913	20	40	865

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1868	923	0	0	933	0
Stage 1	923	-	-	-	-	-
Stage 2	945	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	80	327	-	-	734	-
Stage 1	387	-	-	-	-	-
Stage 2	378	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	76	327	-	-	734	-
Mov Cap-2 Maneuver	76	-	-	-	-	-
Stage 1	387	-	-	-	-	-
Stage 2	358	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	151.6	0	0.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	183	734	-
HCM Lane V/C Ratio	-	-	1.11	0.054	-
HCM Control Delay (s)	-	-	151.6	10.2	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	10.1	0.2	-

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	193	867	19	38	822
Future Vol, veh/h	0	193	867	19	38	822
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	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	203	913	20	40	865

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	923	0	0	933	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	327	-	-	734	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	327	-	-	734	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	32.5	0	0.5
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	327	734	-
HCM Lane V/C Ratio	-	-	0.621	0.054	-
HCM Control Delay (s)	-	-	32.5	10.2	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	3.9	0.2	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	46	147	867	19	38	822
Future Volume (vph)	46	147	867	19	38	822
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.90		1.00	0.85	1.00	1.00
Flt Protected	0.99		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1651		1863	1583	1770	1863
Flt Permitted	0.99		1.00	1.00	0.14	1.00
Satd. Flow (perm)	1651		1863	1583	265	1863
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	48	155	913	20	40	865
RTOR Reduction (vph)	113	0	0	5	0	0
Lane Group Flow (vph)	90	0	913	15	40	865
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	8.8		41.8	41.8	49.4	49.4
Effective Green, g (s)	8.8		41.8	41.8	49.4	49.4
Actuated g/C Ratio	0.13		0.62	0.62	0.74	0.74
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	216		1158	984	264	1369
v/s Ratio Prot	c0.05		c0.49		0.01	c0.46
v/s Ratio Perm				0.01	0.10	
v/c Ratio	0.42		0.79	0.02	0.15	0.63
Uniform Delay, d1	26.8		9.4	4.8	7.9	4.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3		3.6	0.0	0.3	1.0
Delay (s)	28.1		13.1	4.9	8.1	5.4
Level of Service	C		B	A	A	A
Approach Delay (s)	28.1		12.9			5.5
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	67.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	64.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	46	147	867	19	38	822
Future Volume (veh/h)	46	147	867	19	38	822
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	155	913	20	40	865
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	58	187	1080	916	300	1300
Arrive On Green	0.15	0.15	0.58	0.58	0.04	0.70
Sat Flow, veh/h	383	1237	1870	1585	1781	1870
Grp Volume(v), veh/h	204	0	913	20	40	865
Grp Sat Flow(s),veh/h/ln	1628	0	1870	1585	1781	1870
Q Serve(g_s), s	7.1	0.0	23.6	0.3	0.5	15.4
Cycle Q Clear(g_c), s	7.1	0.0	23.6	0.3	0.5	15.4
Prop In Lane	0.24	0.76		1.00	1.00	
Lane Grp Cap(c), veh/h	247	0	1080	916	300	1300
V/C Ratio(X)	0.83	0.00	0.85	0.02	0.13	0.67
Avail Cap(c_a), veh/h	291	0	2088	1770	546	2566
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.1	0.0	10.2	5.3	9.6	5.1
Incr Delay (d2), s/veh	15.5	0.0	1.9	0.0	0.2	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	6.3	0.0	11.2	0.1	0.3	5.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	39.6	0.0	12.1	5.3	9.8	5.7
LnGrp LOS	D	A	B	A	A	A
Approach Vol, veh/h	204		933			905
Approach Delay, s/veh	39.6		12.0			5.8
Approach LOS	D		B			A

Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	6.9	38.4			45.3	13.4
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5
Max Green Setting (Gmax), s	10.5	65.5			80.5	10.5
Max Q Clear Time (g_c+I1), s	2.5	25.6			17.4	9.1
Green Ext Time (p_c), s	0.0	8.3			7.7	0.1

Intersection Summary	
HCM 6th Ctrl Delay	12.0
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	Stafford-Johnson - 2040 No-Build PM.xtw
Analyst:	
Agency:	
Date Performed:	2/25/2021
Time Analyzed:	2040 No-Build PM
Jurisdiction:	
Analysis Year:	2040
Project Description:	
Units:	U.S. Customary
Intersection Name:	Stafford/Johnson
Major Street Direction:	North-South
East/West Street Name:	Johnson
North/South Street Name:	Stafford
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume			889	253		310	972	
Peak Hour Factor, PHF				0.98				
Hourly Flow Rtae, HFR			907	258		316	992	
Percent Heavy Vehicles						2		
Number of Lanes	0	0	1	0	0	0	1	0
Lane Configuration				TR		LT		
Median Type				Undivided				
Median Storage								
RT channelized?								
Left-Turn Lane Storage								
Upstream Signal?				Not Present				

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	26		60			
Peak Hour Factor, PHF			0.98			
Hourly Flow Rtae, HFR	27		61			
Percent Heavy Vehicles	2		2			
Number of Lanes	0	1	0	0	0	0
Lane Configuration		LR				
RT channelized?						
Flared Approach | Storage	No	|		|	
Percent Grade		0				

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				LT		LR				
Flow Rate				316		88				
Lane Capacity				599						
v/c				0.53						
95% Queue Length				3.1						
Control Delay				17.5						
LOS				C						
Approach Delay				4.2						
Approach LOS										
Intersction Delay										

Step 1: MOVEMENT PRIORITIES

Major Street:

Approach	NorthBound				SouthBound			
Priority	1U	1	2	3	4U	4	5	6
Movement	U	L	T	R	U	L	T	R

Minor Street:

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			889	253		310	972	
Flow Rate, v_x			907	258		316	992	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x	26		60			
Flow Rate, v_x	27		61			

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			907	258		316	992	
Conflicting Flow, v_c,x						1165		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x	27		61			
Conflicting Flow, v_c,x	2661		1036			

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base										
Single Stage				4.1	7.1		6.2			
Stage I										
Stage II										
t_c,HV				1.0	1.0		1.0			
P_HV				0.02	0.02		0.02			
t_c,G					0.2		0.1			
G					0		0			
t_3,LT				0.0	0.7		0.0			
t_c										
Single Stage				4.12	6.42		6.22			
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2	3.5		3.3			
t_f,HV				0.9	0.9		0.9			
P_HV				0.02	0.02		0.02			
t_f				2.22	3.52		3.32			

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				1165	2661		1036			
t_c,x				4.12	6.42		6.22			
t_f,x				2.22	3.52		3.32			
c_p,x				599	25		281			

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				
Major-Street Left-Turn Movements		1	4	
Conflicting Flow, v_c,x			1165	
Potential Capacity, c_p,x			599	
Pedestrian Impedance Factor, p_p,x			1.000	
Movement Capacity, c_m,x			599	
Probability of Queue-free State, p_0,j			0.472	
Major L-Shared Probability Queue-free State, p*_0,j				
Minor-Street Right-Turn Movements		9	12	
Conflicting Flow, v_c,x		1036		
Potential Capacity, c_p,x		281		
Pedestrian Impedance Factor, p_p,x		1.000		
Movement Capacity, c_m,x		281		
Probability of Queue-free State, p_0,j		0.782		
Major-Street U-Turn Movements		1U	4U	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Shared L/U Capacity, c_SH				
Probability of Queue-free State, p_0,j				
Minor-Street Through Movements		8	11	
Conflicting Flow, v_c,x				
Potential Capacity, c_p,x				
Pedestrian Impedance Factor, p_p,x				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				
Probability of Queue-free State, p_0,j				
Minor-Street Left-Turn Movements		7	10	
Conflicting Flow, v_c,x		2661		
Potential Capacity, c_p,x		25		
Pedestrian Impedance Factor, p_p,x		1.000		
Major L, Minor T Adjusted Impedance Factor, p"				
Major L, Minor T Impedance Factor, p'				
Capacity Adjustment Factor, f_x				
Movement Capacity, c_m,x				

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LR				
Shared Flow Rate, v_y		88				
Movement Capacity, c_m,x			281			
Shared Capacity, c_SH						

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				316	27		61			
Movement Capacity				599			281			
Lane Configuration				LT		LR				
Shared Capacity										
Control Delay				17.5						

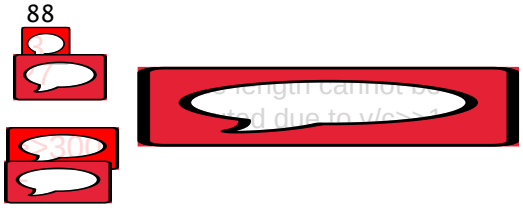
CONTROL DELAY TO RANK 1 MOVEMENTS

Approach	NB	SB
Movement	2	5
Number of Major Street Through Lanes, N	1	1
Proportion of Rank 1 vehicles not blocked, p*_0,j		
Delay to Major Left-turning Vehicles, d_MLT		17.5
Major Street Through Vehicles in Shared Lane, v_i1		992
Major Street Turning Vehicles in Shared Lane, v_i2		316
Saturation Flow Rate for Major Street Through, s_i1	1800	1800

Saturation Flow Rate for Major Street Right-Turn, s_i2 1500
Delay to Rank 1 Vehicles, d_Rank1

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				LT		LR				
Flow Rate				316		88				
Lane Capacity				599						
v/c				0.53						
95% Queue Length				3.1						
Control Delay				17.5						
LOS				C						
Approach Delay				4.2						
Approach LOS										
Intersction Delay										



This TWSC text report was created in HCS™ TWSC Version 7.8.5 on 2/25/2021 9:39:42 AM

Intersection	
Int Delay, s/veh	43

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	26	60	889	253	310	972
Future Vol, veh/h	26	60	889	253	310	972
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	63	936	266	326	1023

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2744	1069	0	0	1202	0
Stage 1	1069	-	-	-	-	-
Stage 2	1675	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	~ 22	269	-	-	581	-
Stage 1	330	-	-	-	-	-
Stage 2	167	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 10	269	-	-	581	-
Mov Cap-2 Maneuver	~ 10	-	-	-	-	-
Stage 1	330	-	-	-	-	-
Stage 2	73	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, $	1186.4	0	4.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	30	581	-
HCM Lane V/C Ratio	-	-	3.018	0.562	-
HCM Control Delay (s)	-	-	$ 1186.4	18.8	-
HCM Lane LOS	-	-	F	C	-
HCM 95th %tile Q(veh)	-	-	10.7	3.5	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	86	889	253	310	972
Future Vol, veh/h	0	86	889	253	310	972
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	-	-	120	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	91	936	266	326	1023

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	1069	0	0	1202	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.22	-	-	4.12	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	0	269	-	-	581	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	269	-	-	581	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25	0	4.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	269	581	-
HCM Lane V/C Ratio	-	-	0.337	0.562	-
HCM Control Delay (s)	-	-	25	18.8	-
HCM Lane LOS	-	-	D	C	-
HCM 95th %tile Q(veh)	-	-	1.4	3.5	-

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	26	60	889	253	310	972
Future Volume (vph)	26	60	889	253	310	972
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	0.91		1.00	0.85	1.00	1.00
Flt Protected	0.99		1.00	1.00	0.95	1.00
Satd. Flow (prot)	1662		1863	1583	1770	1863
Flt Permitted	0.99		1.00	1.00	0.11	1.00
Satd. Flow (perm)	1662		1863	1583	209	1863
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	27	63	936	266	326	1023
RTOR Reduction (vph)	58	0	0	68	0	0
Lane Group Flow (vph)	32	0	936	198	326	1023
Turn Type	Prot		NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases				2	6	
Actuated Green, G (s)	5.5		44.6	44.6	59.5	59.5
Effective Green, g (s)	5.5		44.6	44.6	59.5	59.5
Actuated g/C Ratio	0.07		0.60	0.60	0.80	0.80
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	123		1122	954	387	1497
v/s Ratio Prot	c0.02		0.50		c0.12	0.55
v/s Ratio Perm				0.12	c0.56	
v/c Ratio	0.26		0.83	0.21	0.84	0.68
Uniform Delay, d1	32.3		11.7	6.7	19.0	3.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		5.5	0.1	15.2	1.3
Delay (s)	33.4		17.2	6.8	34.3	4.5
Level of Service	C		B	A	C	A
Approach Delay (s)	33.4		14.9			11.7
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	26	60	889	253	310	972
Future Volume (veh/h)	26	60	889	253	310	972
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	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	27	63	936	266	326	1023
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	34	79	1124	953	395	1455
Arrive On Green	0.07	0.07	0.60	0.60	0.10	0.78
Sat Flow, veh/h	487	1136	1870	1585	1781	1870
Grp Volume(v), veh/h	91	0	936	266	326	1023
Grp Sat Flow(s),veh/h/ln	1641	0	1870	1585	1781	1870
Q Serve(g_s), s	3.2	0.0	23.6	4.7	3.5	15.8
Cycle Q Clear(g_c), s	3.2	0.0	23.6	4.7	3.5	15.8
Prop In Lane	0.30	0.69		1.00	1.00	
Lane Grp Cap(c), veh/h	114	0	1124	953	395	1455
V/C Ratio(X)	0.80	0.00	0.83	0.28	0.83	0.70
Avail Cap(c_a), veh/h	292	0	2077	1760	533	2552
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.0	0.0	9.4	5.6	12.7	3.2
Incr Delay (d2), s/veh	11.8	0.0	1.7	0.2	7.7	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.7	0.0	10.8	1.9	5.7	1.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	38.8	0.0	11.1	5.8	20.4	3.8
LnGrp LOS	D	A	B	A	C	A
Approach Vol, veh/h	91		1202			1349
Approach Delay, s/veh	38.8		9.9			7.9
Approach LOS	D		A			A

Timer - Assigned Phs	1	2			6	8
Phs Duration (G+Y+Rc), s	10.4	40.0			50.4	8.6
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5
Max Green Setting (Gmax), s	10.5	65.5			80.5	10.5
Max Q Clear Time (g_c+I1), s	5.5	25.6			17.8	5.2
Green Ext Time (p_c), s	0.5	9.9			10.9	0.1

Intersection Summary	
HCM 6th Ctrl Delay	9.9
HCM 6th LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

APPENDIX K: Conceptual Design Cost Estimates

STAFFORD ROAD IMPROVEMENTS:
Pattulo Way to Rosemont Road - Signal Alternative
Clackamas County Preliminary Cost Estimate

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE
TEMPORARY FEATURES AND APPURTENANCES					
1	MOBILIZATION	LS	1	$641,000.00	$641,000.00
2	TEMPORARY WORK ZONE TRAFFIC CONTROL, COMPLETE	LS	1	$417,000.00	$417,000.00
3	EROSION CONTROL	LS	1	$35,000.00	$35,000.00
				Subtotal	**$1,093,000.00**
ROADWORK					
4	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$35,000.00	$35,000.00
5	CLEARING AND GRUBBING	LS	1	$109,000.00	$109,000.00
6	GENERAL EXCAVATION	CY	28,772	$30.00	$863,160.00
				Subtotal	**$1,007,160.00**
DRAINAGE & SEWERS					
7	STORMWATER CONTROL, COMPLETE	LS	1	$300,000.00	$300,000.00
8	FISH PASSAGE BOX CULVERTS, COMPLETE	LS	1	$700,000.00	$700,000.00
				Subtotal	**$1,000,000.00**
BRIDGES					
9	RETAINING WALL, CUT - JOHNSON ROAD (SOLDIER PILE)	LS	1	$931,000.00	$931,000.00
10	RETAINING WALL, CUT - STAFFORD ROAD (SOLDIER PILE)	LS	1	$808,000.00	$808,000.00
11	RETAINING WALL, FILL - CHILDS ROAD (MSE)	LS	1	$344,000.00	$344,000.00
				Subtotal	**$2,083,000.00**
BASES					
12	COLD PLANE PAVEMENT REMOVAL, 2 INCHES DEEP	SQYD	6,975	$8.00	$55,800.00
13	COLD PLANE PAVEMENT REMOVAL, 4 INCHES DEEP	SQYD	674	$10.00	$6,740.00
14	AGGREGATE BASE	TON	11,989	$30.00	$359,670.00
				Subtotal	**$423,000.00**
WEARING SURFACES					
15	EMULSIFIED ASPHALT IN TACK COAT	TON	9	$750.00	$6,375.00
16	LEVEL 2, 1/2 INCH ACP MIXTURE	TON	854	$85.00	$72,590.00
17	LEVEL 3, 1/2 INCH ACP MIXTURE	TON	8,322	$88.00	$732,336.00
18	PLAIN CONCRETE PAVEMENT, DOWELED, 10 INCHES THICK	SQYD	0	$100.00	$0.00
19	EXTRA FOR ASPHALT APPROACHES	EA	6	$600.00	$3,600.00
20	EXTRA FOR NEW CURB RAMPS	LS	1	$8,000.00	$8,000.00
21	CONCRETE CURB & GUTTER	LS	1	$86,000.00	$86,000.00
22	CONCRETE WALKS	LS	1	$4,000.00	$4,000.00
				Subtotal	**$913,000.00**
PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES					
23	GUARDRAIL	LS	1	$67,000.00	$67,000.00
24	STRIPING, COMPLETE	LS	1	$35,000.00	$35,000.00
				Subtotal	**$102,000.00**
PERMANENT TRAFFIC CONTROL AND ILLUMINATION SYSTEMS					
25	PERMANENT SIGNING, COMPLETE	LS	1	$35,000.00	$35,000.00
26	ILLUMINATION, COMPLETE	LS	1	$0.00	$0.00
27	TRAFFIC SIGNAL, COMPLETE	LS	1	$350,000.00	$350,000.00
28	FIBER OPTIC INTERCONNECT, COMPLETE	LS	1	$75,000.00	$75,000.00
				Subtotal	**$460,000.00**
RIGHT-OF-WAY DEVELOPMENT AND CONTROL					
29	LANDSCAPING, COMPLETE	LS	1	$50,000.00	$50,000.00
30	STREAM/WETLAND RESTORATION, COMPLETE	LS	1	$95,000.00	$95,000.00
31	PERMANENT SEEDING	LS	1	$6,300.00	$6,300.00
				Subtotal	**$151,300.00**
SUBTOTAL FOR CONSTRUCTION					**$7,232,460.00**
	CONTINGENCY			30%	$2,169,738.00
TOTAL FOR CONSTRUCTION (ROUNDED)					**$9,403,000.00**

Assumptions:

1.) Assumes Grind and Inlay of Existing Roadway and 21.5" Pavement Section 7.5" ACP Over 14" Agg.) for Widening areas.
2.) Assumes 2:1 cut/fill slopes outside of roadside clear-zone.
3.) Assumes all excavated material is suitable to be used for embankment.
4.) Estimated stormwater costs to address both treatment and detention.

murraysmith

STAFFORD ROAD IMPROVEMENTS:
Pattulo Way to Rosemont Road - Signal Alternative

Clackamas County

30% Design Construction Cost Estimate

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE
TEMPORARY FEATURES AND APPURTENANCES					
1	MOBILIZATION	LS	1	$641,000.00	$641,000.00
2	TEMPORARY WORK ZONE TRAFFIC CONTROL, COMPLETE	LS	1	$417,000.00	$417,000.00
3	EROSION CONTROL	LS	1	$35,000.00	$35,000.00
				Subtotal	**$1,093,000.00**
ROADWORK					
4	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$35,000.00	$35,000.00
5	CLEARING AND GRUBBING	LS	1	$109,000.00	$109,000.00
6	GENERAL EXCAVATION	CY	28,772	$30.00	$863,160.00
				Subtotal	**$1,007,160.00**
DRAINAGE & SEWERS					
7	STORMWATER CONTROL, COMPLETE	LS	1	$300,000.00	$300,000.00
8	FISH PASSAGE BOX CULVERTS, COMPLETE	LS	1	$700,000.00	$700,000.00
				Subtotal	**$1,000,000.00**
BRIDGES					
9	RETAINING WALL, CUT - JOHNSON ROAD (SOLDIER PILE)	LS	1	$931,000.00	$931,000.00
10	RETAINING WALL, CUT - STAFFORD ROAD (SOLDIER PILE)	LS	1	$808,000.00	$808,000.00
11	RETAINING WALL, FILL - CHILDS ROAD (MSE)	LS	1	$344,000.00	$344,000.00
				Subtotal	**$2,083,000.00**
BASES					
12	COLD PLANE PAVEMENT REMOVAL, 2 INCHES DEEP	SQYD	6,975	$8.00	$55,800.00
13	COLD PLANE PAVEMENT REMOVAL, 4 INCHES DEEP	SQYD	674	$10.00	$6,740.00
14	AGGREGATE BASE	TON	11,989	$30.00	$359,670.00
				Subtotal	**$423,000.00**
WEARING SURFACES					
15	EMULSIFIED ASPHALT IN TACK COAT	TON	9	$750.00	$6,375.00
16	LEVEL 2, 1/2 INCH ACP MIXTURE	TON	854	$85.00	$72,590.00
17	LEVEL 3, 1/2 INCH ACP MIXTURE	TON	8,322	$88.00	$732,336.00
18	PLAIN CONCRETE PAVEMENT, DOWELED, 10 INCHES THICK	SQYD	0	$100.00	$0.00
19	EXTRA FOR ASPHALT APPROACHES	EA	6	$600.00	$3,600.00
20	EXTRA FOR NEW CURB RAMPS	LS	1	$8,000.00	$8,000.00
21	CONCRETE CURB & GUTTER	LS	1	$86,000.00	$86,000.00
22	CONCRETE WALKS	LS	1	$4,000.00	$4,000.00
				Subtotal	**$913,000.00**
PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES					
23	GUARDRAIL	LS	1	$67,000.00	$67,000.00
24	STRIPING, COMPLETE	LS	1	$35,000.00	$35,000.00
				Subtotal	**$102,000.00**
PERMANENT TRAFFIC CONTROL AND ILLUMINATION SYSTEMS					
25	PERMANENT SIGNING, COMPLETE	LS	1	$35,000.00	$35,000.00
26	ILLUMINATION, COMPLETE	LS	1	$0.00	$0.00
27	TRAFFIC SIGNAL, COMPLETE	LS	1	$350,000.00	$350,000.00
28	FIBER OPTIC INTERCONNECT, COMPLETE	LS	1	$75,000.00	$75,000.00
				Subtotal	**$460,000.00**
RIGHT-OF-WAY DEVELOPMENT AND CONTROL					
29	LANDSCAPING, COMPLETE	LS	1	$50,000.00	$50,000.00
30	STREAM/WETLAND RESTORATION, COMPLETE	LS	1	$95,000.00	$95,000.00
31	PERMANENT SEEDING	LS	1	$6,300.00	$6,300.00
				Subtotal	**$151,300.00**
SUBTOTAL FOR CONSTRUCTION					**$7,232,460.00**
	CONTINGENCY			30%	$2,169,738.00
TOTAL FOR CONSTRUCTION (ROUNDED)					**$9,403,000.00**

Assumptions:

1.) Assumes Grind and Inlay of Existing Roadway and 21.5" Pavement Section 7.5" ACP Over 14" Agg.) for Widening areas.
2.) Assumes 2:1 cut/fill slopes outside of roadside clear-zone.
3.) Assumes all excavated material is suitable to be used for embankment.
4.) Estimated stormwater costs to address both treatment and detention.

murraysmith

STAFFORD ROAD IMPROVEMENTS:
Pattulo Way to Rosemont Road - Roundabout 2.1 Alternative
Clackamas County Preliminary Cost Estimate

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE
TEMPORARY FEATURES AND APPURTENANCES					
1	MOBILIZATION	LS	1	$730,000.00	$730,000.00
2	TEMPORARY WORK ZONE TRAFFIC CONTROL, COMPLETE	LS	1	$514,000.00	$514,000.00
3	EROSION CONTROL	LS	1	$41,000.00	$41,000.00
				Subtotal	**$1,285,000.00**
ROADWORK					
4	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$41,000.00	$41,000.00
5	CLEARING AND GRUBBING	LS	1	$104,000.00	$104,000.00
6	GENERAL EXCAVATION	CY	28,114	$30.00	$843,420.00
				Subtotal	**$988,420.00**
DRAINAGE & SEWERS					
7	STORMWATER CONTROL, COMPLETE	LS	1	$490,000.00	$490,000.00
8	FISH PASSAGE BOX CULVERTS, COMPLETE	LS	1	$810,000.00	$810,000.00
				Subtotal	**$1,300,000.00**
BRIDGES					
9	RETAINING WALL, CUT - JOHNSON ROAD (SOLDIER PILE)	LS	1	$931,000.00	$931,000.00
10	RETAINING WALL, CUT - STAFFORD ROAD (SOLDIER PILE)	LS	1	$852,000.00	$852,000.00
11	RETAINING WALL, FILL - CHILDS ROAD (MSE)	LS	1	$440,000.00	$440,000.00
				Subtotal	**$2,223,000.00**
BASES					
12	COLD PLANE PAVEMENT REMOVAL, 2 INCHES DEEP	SQYD	2,141	$8.00	$17,128.00
13	COLD PLANE PAVEMENT REMOVAL, 4 INCHES DEEP	SQYD	674	$10.00	$6,740.00
14	AGGREGATE BASE	TON	13,419	$30.00	$402,570.00
				Subtotal	**$427,000.00**
WEARING SURFACES					
15	EMULSIFIED ASPHALT IN TACK COAT	TON	8	$750.00	$6,300.00
16	LEVEL 2, 1/2 INCH ACP MIXTURE	TON	854	$85.00	$72,590.00
17	LEVEL 3, 1/2 INCH ACP MIXTURE	TON	6,333	$88.00	$557,304.00
18	PLAIN CONCRETE PAVEMENT, DOWELED, 10 INCHES THICK	SQYD	2,174	$100.00	$217,400.00
19	EXTRA FOR ASPHALT APPROACHES	EA	6	$600.00	$3,600.00
20	EXTRA FOR NEW CURB RAMPS	LS	1	$20,900.00	$20,900.00
21	CONCRETE CURB & GUTTER	LS	1	$52,923.00	$52,923.00
22	CONCRETE WALKS	LS	1	$386,673.00	$386,673.00
				Subtotal	**$1,318,000.00**
PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES					
23	GUARDRAIL	LS	1	$67,000.00	$67,000.00
24	STRIPING, COMPLETE	LS	1	$41,000.00	$41,000.00
				Subtotal	**$108,000.00**
PERMANENT TRAFFIC CONTROL AND ILLUMINATION SYSTEMS					
25	PERMANENT SIGNING, COMPLETE	LS	1	$41,000.00	$41,000.00
26	ILLUMINATION, COMPLETE	LS	1	$150,000.00	$150,000.00
27	TRAFFIC SIGNAL, COMPLETE	LS	1	$0.00	$0.00
28	FIBER OPTIC INTERCONNECT, COMPLETE	LS	1	$75,000.00	$75,000.00
				Subtotal	**$266,000.00**
RIGHT-OF-WAY DEVELOPMENT AND CONTROL					
29	LANDSCAPING, COMPLETE	LS	1	$115,000.00	$115,000.00
30	STREAM/WETLAND RESTORATION, COMPLETE	LS	1	$100,000.00	$100,000.00
31	PERMANENT SEEDING	LS	1	$6,300.00	$6,300.00
				Subtotal	**$221,300.00**
SUBTOTAL FOR CONSTRUCTION					**$8,136,720.00**
	CONTINGENCY			30%	$2,441,016.00
TOTAL FOR CONSTRUCTION (ROUNDED)					**$10,578,000.00**

Assumptions:

1.) Assumes Grind and Inlay of Existing Roadway and 21.5" Pavement Section 7.5" ACP Over 14" Agg.) for Widening areas.
2.) Assumes 2:1 cut/fill slopes outside of roadside clear-zone.
3.) Assumes all excavated material is suitable to be used for embankment.
4.) Estimated stormwater costs to address both treatment and detention.

murraysmith

STAFFORD ROAD IMPROVEMENTS:
Pattulo Way to Rosemont Road - Roundabout 2.2 Alternative
Clackamas County Preliminary Cost Estimate

ITEM NO.	ITEM	UNIT	QUANTITY	UNIT COST	TOTAL PRICE
TEMPORARY FEATURES AND APPURTENANCES					
1	MOBILIZATION	LS	1	$665,000.00	$665,000.00
2	TEMPORARY WORK ZONE TRAFFIC CONTROL, COMPLETE	LS	1	$470,000.00	$470,000.00
3	EROSION CONTROL	LS	1	$36,000.00	$36,000.00
				Subtotal	**$1,171,000.00**
ROADWORK					
4	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LS	1	$36,000.00	$36,000.00
5	CLEARING AND GRUBBING	LS	1	$126,000.00	$126,000.00
6	GENERAL EXCAVATION	CY	28,990	$30.00	$869,700.00
				Subtotal	**$1,031,700.00**
DRAINAGE & SEWERS					
7	STORMWATER CONTROL, COMPLETE	LS	1	$360,000.00	$360,000.00
8	FISH PASSAGE BOX CULVERTS, COMPLETE	LS	1	$800,000.00	$800,000.00
				Subtotal	**$1,160,000.00**
BRIDGES					
9	RETAINING WALL, CUT - JOHNSON ROAD (SOLDIER PILE)	LS	1	$931,000.00	$931,000.00
10	RETAINING WALL, CUT - STAFFORD ROAD (SOLDIER PILE)	LS	1	$484,000.00	$484,000.00
11	RETAINING WALL, FILL - CHILDS ROAD (MSE)	LS	1	$530,000.00	$530,000.00
				Subtotal	**$1,945,000.00**
BASES					
12	COLD PLANE PAVEMENT REMOVAL, 2 INCHES DEEP	SQYD	2,141	$8.00	$17,128.00
13	COLD PLANE PAVEMENT REMOVAL, 4 INCHES DEEP	SQYD	674	$10.00	$6,740.00
14	AGGREGATE BASE	TON	13,332	$30.00	$399,960.00
				Subtotal	**$424,000.00**
WEARING SURFACES					
15	EMULSIFIED ASPHALT IN TACK COAT	TON	8	$750.00	$6,150.00
16	LEVEL 2, 1/2 INCH ACP MIXTURE	TON	854	$85.00	$72,590.00
17	LEVEL 3, 1/2 INCH ACP MIXTURE	TON	6,183	$88.00	$544,104.00
18	PLAIN CONCRETE PAVEMENT, DOWELED, 10 INCHES THICK	SQYD	1,820	$100.00	$182,000.00
19	EXTRA FOR ASPHALT APPROACHES	EA	6	$600.00	$3,600.00
20	EXTRA FOR NEW CURB RAMPS	LS	1	$20,900.00	$20,900.00
21	CONCRETE CURB & GUTTER	LS	1	$51,331.00	$51,331.00
22	CONCRETE WALKS	LS	1	$230,057.00	$230,057.00
				Subtotal	**$1,111,000.00**
PERMANENT TRAFFIC SAFETY AND GUIDANCE DEVICES					
23	GUARDRAIL	LS	1	$67,000.00	$67,000.00
24	STRIPING, COMPLETE	LS	1	$36,000.00	$36,000.00
				Subtotal	**$103,000.00**
PERMANENT TRAFFIC CONTROL AND ILLUMINATION SYSTEMS					
25	PERMANENT SIGNING, COMPLETE	LS	1	$36,000.00	$36,000.00
26	ILLUMINATION, COMPLETE	LS	1	$150,000.00	$150,000.00
27	TRAFFIC SIGNAL, COMPLETE	LS	1	$0.00	$0.00
28	FIBER OPTIC INTERCONNECT, COMPLETE	LS	1	$75,000.00	$75,000.00
				Subtotal	**$261,000.00**
RIGHT-OF-WAY DEVELOPMENT AND CONTROL					
29	LANDSCAPING, COMPLETE	LS	1	$115,000.00	$115,000.00
30	STREAM/WETLAND RESTORATION, COMPLETE	LS	1	$100,000.00	$100,000.00
31	PERMANENT SEEDING	LS	1	$5,400.00	$5,400.00
				Subtotal	**$220,400.00**
SUBTOTAL FOR CONSTRUCTION					**$7,427,100.00**
	CONTINGENCY			30%	$2,228,130.00
TOTAL FOR CONSTRUCTION (ROUNDED)					**$9,656,000.00**

Assumptions:

1.) Assumes Grind and Inlay of Existing Roadway and 21.5" Pavement Section 7.5" ACP Over 14" Agg.) for Widening areas.
2.) Assumes 2:1 cut/fill slopes outside of roadside clear-zone.
3.) Assumes all excavated material is suitable to be used for embankment.
4.) Estimated stormwater costs to address both treatment and detention.

murraysmith

APPENDIX L: Documentation of Cost per Crash Calculation

The Intersection Control Evaluation (ICE) tool was used for the analysis of SW Stafford Rd and SW Childs Rd is a modified version of the Life-Cycle Cost Estimating Tool (LCCET) that was developed as part of NCHRP Project 03-110. The objective of NCHRP Project 3-110 was to develop a spreadsheet-based tool that can be used to compare the life-cycle costs of different intersection control strategies.

This tool relies on a *cost per crash* value to calculate the safety benefit, or cost, of alternatives. The methodology uses a *cost per fatal and injury crash*, as well as a *cost per property damage only crash*.

ODOT provides comprehensive economic value per crash estimates for *fatal and severe (injury A) crashes, moderate (injury B) and minor (injury C) crashes*, and *property damage only (PDO) crashes.* Because ODOT's values provide separate cost per injury crash based on severity, these must be combined through a weighted average to estimate the overall *cost per fatal and injury crash* for use in the ICE tool.

ODOT only provides economic value per crash for highways. This analysis assumed the cost per crash in a rural area for an off-system facility. Based on ODOT's most current Benefit/Cost analysis spreadsheet available on its website, the current cost per crash in urban areas on off system facility is as follows:

- Cost per fatal and severe injury crashes: $1940,000
- Cost per moderate or minor injury crash: $93,200
- Cost per property damage only crash: $21,800

Comprehensive Economic Value per Crash [2,3]		
Highway Type	Urban	Rural
PDO		
All facilities	$21,800	$21,800
Moderate (Injury B) and Minor (Injury C) Injury		
Interstate	$77,800	$89,200
Other State Highway	$80,800	$91,900
Off System	$81,300	$93,200
Fatal and Serious (Injury A) Injury		
Interstate	$1,530,000	$2,260,000
Other State Highway	$1,490,000	$2,140,000
Off System	$1,110,000	$1,940,000

Notes

1. If a CRF Value is shown as #, check the ODOT CRF List and enter the CRF value manually in Column V of the appropriate countermeasure in "Fields" Worksheet.

2. Economic costs per crash are calculated using cost source and procedures shown in Appendix 4A of the Highway Safety Manual, updated to 2019 dollars.

3. PDO value is adjusted with an under reporting factor of 2.0.

Of the 15 crashes reported by ODOT 10 were classified as injury B or injury C, no crashes were reported as severe or fatal. Has there is no way to use this intersection to determine the weighted average ratio of cost of crashes Kittelson assumed the following breakdown of fatal and injury crashes:

- 10% fatal and injury A
- 90% injury B or injury C

The weighted average used to develop the overall *cost per fatal and injury crash* is calculated as follows:

=(0.10*$1,940,000)+(0.90*$93,200)

=$277,880 per fatal or injury crash

No calculations are needed for the cost per PDO crash; the $21,800 ODOT estimate was assumed.

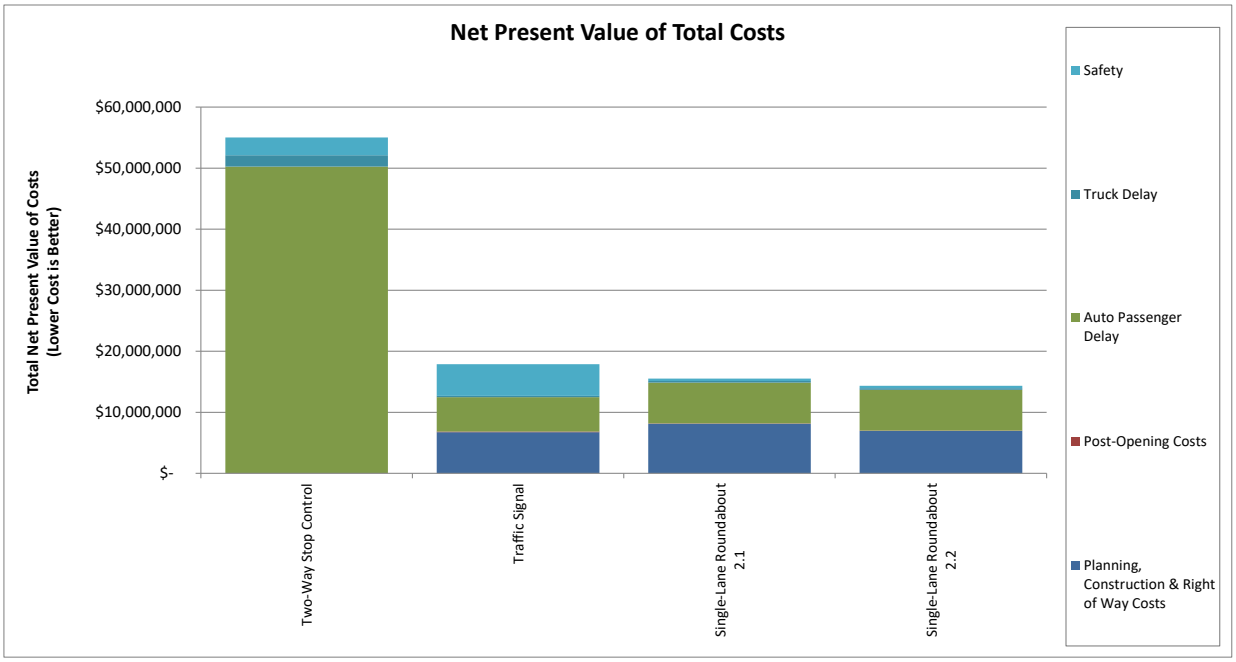
Although this method does not account for the change in crash severity distribution (among fatal/injury crashes) that may be associated with different alternatives, it provides a reasonable method for estimating the cost per fatal/injury crash at this site.

APPENDIX M: Life-Cycle Cost Analysis Output

Agency:	Clackamas County
Project Name:	Stafford Rd - Rosemont to Pattulo
Project Reference:	25094
Intersection:	SW Childs Rd and SW Stafford Rd
City:	
State:	Oregon
Performing Department or Organization:	Kittelson & Associates, Inc.
Date:	3/30/2021
Analyst:	DZS / FSW
Analysis Type	At-Grade Intersection

Analysis Summary

Cost Categories	Net Present Value of Costs			
	Two-Way Stop Control	Traffic Signal	Single-Lane Roundabout 2.1	Single-Lane Roundabout 2.2
Planning, Construction & Right of Way Costs	$ -	$ 6,745,084	$ 8,126,801	$ 6,946,094
Post-Opening Costs	$ 12,652	$ 86,070	$ 63,261	$ 63,261
Auto Passenger Delay	$ 50,228,660	$ 5,638,281	$ 6,683,459	$ 6,683,459
Truck Delay	$ 1,884,415	$ 211,530	$ 250,741	$ 250,741
Safety	$ 2,871,322	$ 5,187,448	$ 394,328	$ 394,328
Total cost	**$54,997,049**	**$17,868,413**	**$15,518,592**	**$14,337,885**



IMPORTANT INFORMATION

Important Information

About Your Geotechnical Report

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors that were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the Geoprofessional Business Association (https://www.geoprofessional.org)

REIMBURSABLE ON-THE-JOB and APPRENTICESHIP TRAINING

SECTION 1: ABBREVIATIONS AND DEFINITIONS

(a) Abbreviations

AGENCY - Clackamas County

BOLI - Bureau of Labor and Industries for the State of Oregon

EEO - Equal Employment Opportunity

OCR - Office of Civil Rights

ODOT – Oregon Department of Transportation

OJT - On-the-Job Training

(b) Definitions

Apprenticeship Training Program - A specific Apprenticeship Training Program, approved by BOLI, which provides a combination of field and classroom trade specific experience under the supervision of journey level workers. For this Contract, this is a Race and Gender Neutral program.

OJT Program - A specific on-the-job training program, approved by the Agency and ODOT, which provides a combination of field, and limited classroom, trade specific experience under the supervision of journey level workers. This is an Affirmative Action program that targets women and minorities.

Qualified Hours - Specific On-Site training hours (may include some classroom hours) completed by a properly registered and enrolled trainee consistent with the Contractor's OJT Program or an apprentice consistent with the Apprenticeship Training Program. The Contractor reports these Qualified Hours to the Agency for the OJT and Apprenticeship Training Goal.

Race and Gender Neutral - Employment and contracting practices where the ethnicity and the sex of a person are not considered in the evaluation of candidates for employment or bids for the Contract.

Training Goal - A fixed quantity of Qualified Hours set by the Agency and included in the bid schedule.

SECTION 2: POLICY STATEMENT

In order to increase the number of trained and skilled workers in highway construction the Agency will set a Training Goal for the Project.

It is the policy of the Agency that the Contractor shall take all necessary and reasonable steps to ensure that trainees and apprentices have the opportunity to participate on highway construction projects and to develop as journey-level workers in the given trade or job classification employed, and to meet this Training Goal.

The Contractor shall adopt the following policy:

> It shall be the policy of the Contractor to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, or national origin, age or disability. Such action shall include employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and on-the-job training.

The Training Goal is not intended, and shall not be used to discriminate against any applicant, whether members of a minority group or not.

SECTION 3: APPRENTICESHIP TRAINING PROGRAM

(a) General

Apprentices shall be paid the appropriate rates approved in connection with their stage in the Apprenticeship Training Program.

A valid certification by an appropriate apprenticeship committee that the Contractor is an approved training agent shall be prima facie proof of compliance.

(b) EEO Requirements

The Contractor shall ensure that, without discrimination, minorities and women have an equal employment opportunity to compete for and participate as apprentices while supporting a diverse workforce that is representative of the population.

(c) Reports

The Contractor and each Subcontractor with an Apprenticeship Training Program shall complete and submit the following reports to the Agency (Clackamas County and not to ODOT), according to the instructions provided in the respective forms:

- The "Training Program Approval Request (TPAR)" (Form 734-2880) shall be submitted prior to or at the preconstruction conference.
- Before an apprentice begins work, an "Apprentice/Trainee Approval Request (ATAR)" (Form 734-2878) shall be submitted.
- Each month the Contractor shall submit the "Monthly Employment Utilization Report" (Form 731-0668). This report is required of the Contractor and Subcontractors who have contracts that require certified payrolls, regardless of their participation in the apprenticeship.
- Each month the Contractor shall submit an "Apprentice/Trainee Monthly Progress Report (MPR)" (Form 734-2879) for each apprentice. This Form is used to report Qualified Hours for apprentices and will be the source document for estimated monthly progress payments to the Contractor.

Forms are published on the ODOT OCR website at:

https://www.oregon.gov/ODOT/Business/OCR/Pages/Forms.aspx

SECTION 4: OJT PROGRAM

(a) Training Requirements

The intent of these provisions is to provide real and meaningful training in the construction crafts. Off-Site training is permissible only when it is an integral part of an approved training program and does not comprise a significant part of the overall training. In addition:

- A Contractor, not registered as a training agent, may choose to adopt a standardized OJT Program. Standardized OJT Programs are published at the OCR website at: https://www.oregon.gov/ODOT/Business/OCR/Pages/Workforce-Development.aspx
- Some job classifications such as flagger, bookkeeper, clerk/typist or secretary are prohibited from OJT Programs.
- OJT Programs shall always maintain the approved ratio of trainees to journey level workers On-Site, as stated in the approved OJT Program.

- OJT Programs shall always maintain the approved types and numbers of equipment On-Site.
- No employee shall be registered as a trainee in any job classification the employee has completed leading to journey level status, or for any job classification in which the employee has been employed as a journey level worker. The Contractor shall keep records, and provide to the Agency, if requested, documents on each trainee.
- Trainees shall be pre-approved by the Agency.

OJT Program trainees shall be paid the journey level rate specified in the contract for the type of work performed.

(c) Reports

The Contractor and each Subcontractor with an OJT Program shall complete and submit the following reports to the Engineer according to the instructions on their respective forms:

- The training program forecast using the "Training Program Approval Request (TPAR)" (Form 734-2880) shall be submitted prior to or at the preconstruction conference.
- Before the trainee begins work, an "Apprentice/Trainee Approval Request (ATAR)" (Form 734-2878) shall be submitted. Attach a copy of the "Training Program Approval Request (TPAR)" (Form 734-2880) to the "Apprentice/Trainee Approval Request (ATAR)" (Form 734-2878). The Contractor and trainee must sign and return a copy of the training program that will be utilized. The Contractor shall provide certification to the trainee upon completion of the OJT Program. Upon completion of the Contract, a certification shall be given to each trainee and to the Agency to document the number of hours and training completed by the individual.
- Each month the Contractor shall submit the "Monthly Employment Utilization Report" (Form 731-0668). This report is required of the Contractor and Subcontractors (for contracts that require certified payrolls), regardless of their participation in the Apprenticeship or On-the-Job Training programs.
- Each month the Contractor shall submit an "Apprentice/Trainee Monthly Progress Report (MPR)" (Form 734-2879) for each trainee. This form is used to report Qualified Hours for trainees and will be the source document for estimated monthly progress payments to the Contractor.

Forms are published on the ODOT OCR website at:

https://www.oregon.gov/ODOT/Business/OCR/Pages/Forms.aspx

SECTION 5: MONITORING AND COMPLIANCE

The Contractor has the primary responsibility to monitor compliance levels throughout the Contract and to ensure the Training Goal is met. If the Contractor decides any of the training hours are to be provided by a Subcontractor, the Contractor shall ensure that the Subcontract contains the appropriate training clauses that obligate the Subcontractor. This shall not relieve the Contractor of the Contractor's primary responsibility.

At the request of the Agency, the Contractor will meet with the Agency to review records related to training. The Agency, through meetings and progress records provided by the Contractor, will provide the Contractor with informational compliance and reimbursement data including:

- The Contractor's training forecasts compared with the actual Qualified Hours achieved.
- Total Qualified Hours and payment reimbursement summary.
- For information purposes only, consolidated summary reports by OJT craft and apprenticeship crafts.

The Agency will track training activities provided by Contractor for the OJT trainees and apprentices.

SECTION 6: MEASUREMENT AND PAYMENT

(a) General

The quantity of Qualified Hours will be paid for at the Contract unit price of $20 per hour for the item "Training."

No separate or additional payment will be made for failure to achieve the Training Goal. See **(b)** below for Disincentive.

No separate or additional payment will be made for Qualified Hours achieved in excess of 150% of the Training Goal. No Disincentive applies.

If the Contractor achieves from 100% to 150% of the Training Goal, the Agency will reimburse the Contractor for Qualified Hours.

After the Second Notification, the Agency will review the final reports required and make adjustments. Any additional reimbursements will be paid on the next payment.
.

Examples of achieving the Training Goal:

Example A: Training Goal = 1,000 hours; Pay Item = $20/hr; Contractor achieves 100% of the Qualified Hours (fulfilled the goal): therefore 1,000 hours x $20.00/hr = $20,000 reimbursed (during progress of the Contract).

Example B: Training Goal = 1,000 hours; Pay Item = $20/hr; Contractor achieves 150% of the Qualified Hours or 1,500 hours (exceeded the goal): therefore 1,500 hours x $20.00/hr = $30,000 reimbursed (during progress of the Contract).

Example C: Training Goal = 1,000 hours; Pay Item = $20/hr; Contractor achieves an actual 1,525 Qualified Hours (exceeded even 150% of the goal): therefore 1,500 hours x $20.00/hr = pay of $30,000 reimbursed (during progress of the Contract).

(b) Disincentive

If, at the Second Notification, the Contractor has not achieved the Training Goal there will be no payment (disincentive) to the Contractor and no Qualified Hours as follows:

Regardless of all prior partial payments for the Pay Item "Training," a correction equal to 100% of the Pay Item goal times the Pay Item price will be subtracted from the final payment due the Contractor on the next Contract payment voucher.

Examples of *not* achieving the Training Goal:

Example A: Training Goal = 1,000 hours; Pay Item = $20/hr; Contractor achieves an actual 500 Qualified Hours (failed to meet the goal): A disincentive applies; therefore 1,000 hours x $20.00/hr = line item deduction of $20,000 will show on the next Contract payment voucher. The previously paid qualified hours (500 x $20 = $10,000) under the pay item on vouchers will remain and the net impact in this example will be the $20,000 deduction offset by the $10,000 qualified and paid hours for a net reduction of $10,000.

Example B: Training Goal = 1,000 hours; Pay Item = $20/hr; Contractor achieves zero Qualified Hours (failed to meet the goal): A disincentive applies; therefore 1,000 hours x $20.00/hr = line item deduction of $20,000 will show on the next Contract payment voucher.

If, as a result of a line item deduction, a net amount is due the Agency, the Contractor shall pay the Agency within 45 Calendar Days of notice of such deficiency.