RFP #849

PROFESSIONAL, TECHNICAL AND EXPERT SERVICES

Clark County Washington

RELEASE DATE: WEDNESDAY, FEBRUARY 22, 2023
DUE DATE: WEDNESDAY, MARCH 15, 2023 by 1:30 pm

Request for Proposal for:

SELECT DESIGN ENGINEERING SERVICES for NE 179th STREET IMPROVEMENTS from NE 15th AVENUE to NE 26th AVENUE (PRJ0001779 / CRP320122)

SUBMIT:
One (1) Original
Four (4) Complete Copies
One (1) Complete Electronic Copy (USB Flash Drive)

of the Proposal to:

Shipping Method of your Choice *or* Hand Delivery	**United States Postal Service**
Clark County ATTN: Office of Purchasing 1300 Franklin Street, 6th Floor, Suite 650 Vancouver WA 98660 564-397-2323	Clark County ATTN: Office of Purchasing PO Box 5000 Vancouver WA 98666-5000 564-397-2323

Office Hours: 8:00 am – 3:00 pm, Monday – Friday, except Legal Holidays.
No electronic submissions.

*****Proposals must be delivered to the Purchasing office – No Exceptions***
*****Proposals must be date and time stamped by Purchasing staff by 1:30 pm on due date.***
****Proposal shall be sealed and clearly marked on the package cover with RFP #, Title & Company Name**

Refer Questions to Project Manager:

Troy Pierce, PE
Capital Project Manager / Public Works
Troy.Pierce@clark.wa.gov
564-397-4403

ADMINISTRATIVE REQUIREMENTS - Contractors shall comply with all management and administrative requirements established by Washington Administrative Code (WAC), the Revised Code of the State of Washington (RCW), and any subsequent amendments or modifications, as applicable to providers licensed in the State of Washington.

ALL proposals submitted become the property of Clark County. It is understood and agreed that the prospective Proposer claims no proprietary rights to the ideas and written materials contained in or attached to the proposal submitted. Clark County has the right to reject or accept proprietary information.

AUTHORSHIP - Applicants must identify any assistance provided by agencies or individuals outside the proposers own organization in preparing the proposal. No contingent fees for such assistance will be allowed to be paid under any contract resulting from this RFP.

CANCELLATION OF AWARD - Clark County reserves the right to immediately cancel an award if the contractual agreement has not been entered into by both parties or if new state regulations or policy make it necessary to change the program purpose or content, discontinue such programs, or impose funding reductions. In those cases where negotiation of contract activities are necessary, Clark County reserves the right to limit the period of negotiation to sixty (60) days after which time funds may be unencumbered.

CONFIDENTIALLY - Proposer shall comply with all applicable state and federal laws governing the confidentiality of information.

CONFLICT OF INTEREST - All proposals submitted must contain a statement disclosing or denying any interest, financial or otherwise, that any employee or official of Clark County or the appropriate Advisory Board may have in the proposing agency or proposed project.

CONSORTIUM OF AGENCIES - Any consortium of companies or agencies submitting a proposal must certify that each company or agency of the consortium can meet the requirements set forth in the RFP.

COST OF PROPOSAL & AWARD - The contract award will not be final until Clark County and the prospective contractor have executed a contractual agreement. The contractual agreement consists of the following parts: (a) the basic provisions and general terms and conditions, (b) the special terms and conditions, (c) the project description and goals (Statement of Work), and (d) the budget and payment terms. Clark County is not responsible for any costs incurred prior to the effective date of the contract. Clark County reserves the right to make an award without further negotiation of the proposal submitted. Therefore, the proposal should be submitted in final form from a budgetary, technical, and programmatic standpoint.

DISPUTES - Clark County encourages the use of informal resolution to address complaints or disputes arising over any actions in implementing the provisions of this RFP. Written complaints should be addressed to Clark County – Purchasing, P.O. Box 5000, Vancouver, Washington 98666-5000.

DIVERSITY IN EMPLOYMENT AND CONTRACTING REQUIREMENTS - It is the policy of Clark County to require equal opportunity in employment and services subject to eligibility standards that may be required for a specific program. Clark County is an equal opportunity employer and is committed to providing equal opportunity in employment and in access to the provision of all county services. Clark County's Equal Employment Opportunity Plan is available at http://www.clark.wa.gov/hr/documents.html. This commitment applies regardless of race, color, religion, creed, sex, marital status, national origin, disability, age, veteran status, on-the-job injury, or sexual orientation. Employment decisions are made without consideration of these or any other factors that are prohibited by law. In compliance with department of Labor Regulations implementing Section 504 of the rehabilitation Act of 1973, as amended, no qualified handicapped individual shall be discriminated against in admission or access to any program or activity. The prospective contractor must agree to provide equal opportunity in the administration of the contract, and its subcontracts or other agreements.

ENVIRONMENTALLY RESPONSIBLE PURCHASING PROGRAM - Clark County has implemented an Environmentally Responsible Purchasing Policy with a goal to reduce negative impacts on human health and the environment. Negative environmental impacts include, but are not limited to, greenhouse gases, air pollution emissions, water contamination, waste from the manufacturing process and waste in packaging. This policy also seeks to increase: 1) water and energy efficiency; 2) renewable energy sources; 3) use of products with recycled content; 4) product durability; 5) use of products that can be recycled, reused, or composted at the end of its life cycle. Product criteria have been established on the Green Purchasing List https://clark.wa.gov/sites/default/files/dept/files/general-services/Purchasing/ERP%20Policy.pdf

INDEPENDENT PRICE DETERMINATION - The prospective contractor guarantees that, in connection with this proposal, the prices and/or cost data have been arrived at independently, without consultation, communication, or agreement for the purpose of restricting competition. This does not preclude or impede the formation of a consortium of companies and/or agencies for purposes of engaging in jointly sponsored proposals.

INTERLOCAL AGREEMENT - Clark County has made this RFP subject to Washington State statute RCW 39.34. Therefore, the proposer may, at the proposers option, extend identical prices and services to other public agencies wishing to participate in this RFP. Each public agency wishing to utilize this RFP will issue a purchase order (or contract) binding only their agency. Each contract is between the proposer and the individual agency with **no** liability to Clark County.

LIMITATION - This RFP does not commit Clark County to award a contract, to pay any costs incurred in the preparation of a response to this RFP, or to procure or contract for services or supplies.

LATE PROPOSALS - A proposal received after the date and time indicated above will not be accepted. No exceptions will be made.

ORAL PRESENTATIONS - An oral presentation may be required of those prospective contractors whose proposals are under consideration. Prospective contractors may be informed that an oral presentation is desired and will be notified of the date, time and location the oral presentation is to be conducted.

OTHER AUDIT/MONITORING REQUIREMENTS - In addition, auditing or monitoring for the following purposes will be conducted at the discretion of Clark County: Fund accountability; Contract compliance; and Program performance.

PRICE WARRANT - The proposer shall warrant that the costs quoted for services in response to the RFP are not in excess of those which would be charged any other individual or entity for the same services performed by the prospective contractor, in a similar socioeconomic, geographical region.

PROTESTS - Must be submitted to the Purchasing Department.

PUBLIC SAFETY - May require limiting access to public work sites, public facilities, and public offices, sometimes without advance notice. The successful Proposer's employees and agents shall carry sufficient identification to show by whom they are employed and display it upon request to security personnel. County project managers have discretion to require the successful Proposer's employees and agents to be escorted to and from any public office, facility or work site if national or local security appears to require it.

ACCEPTANCE or REJECTION OF PROPOSALS - Clark County reserves the right to accept or reject any or all proposals received as a result of this RFP, to negotiate with any or all prospective contractors on modifications to proposals, to waive formalities, to postpone award, or to cancel in part or in its entirety this RFP if it is in the best interest of Clark County to do so.

SUBCONTRACTING - No activities or services included as a part of this proposal may be subcontracted to another organization, firm, or individual without the approval of Clark County. Such intent to subcontract shall be clearly identified in the proposal. It is understood that the contractor is held responsible for the satisfactory accomplishment of the service or activities included in a subcontract.

VERBAL PROPOSALS - Verbal proposals will not be considered in making the award of any contract as a result of this RFP.

WORKERS COMPENSATION INSURANCE – The contractor shall comply with R.C.W. Title 51- with minimum coverage limits of $500,000 for each accident, or provide evidence that State law does not require such coverage.

FOR ALTERNATIVE FORMATS
Clark County ADA Office: V: 564-397-2322
ADA@clark.wa.gov

Request for Proposals
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Request for Proposal #849

Select Design Engineering Services for NE 179th St Improvements from NE 15th Ave to NE 26th Ave (PRJ0001779 / CRP320122)

Part I Proposal Requirements

Section IA	General Information
1. Introduction	The purpose of this Request for Proposal (RFP) is to obtain, in a full and open competition, proposals for required engineering services for the roadway improvements described herein. The required services are generally described below in Section 1B. Selected candidates based on the proposal review will be asked to interview to determine the final consultant selection. This segment of NE 179th Street begins approximately 0.33 mile east of Interstate 5. The project will widen NE 179th Street between NE 15th Avenue and NE 26th Avenue and will include a creek crossing and the development of retaining walls. The roadway is classified as a principal arterial (Pr-4cb), with four travel lanes as well as bike and pedestrian facilities. If your company contact details ***are not*** on the Plan Holder List at https://clark.wa.gov/internal-services/request-proposal-1 Attachment B, Letter of Interest must be submitted to participate in this RFP. Proposers shall respond to all sections to be considered. Clark County has made this Request for Proposal subject to Washington State statute RCW 39.34. Therefore, the proposer may, at the proposers' option, extend identical prices and services to other public agencies wishing to participate in this RFP. Each public agency wishing to utilize this proposal will issue a purchase order (or contract) binding only their agency. Each contract is between the proposer and the individual agency with no liability to Clark County.
2. Background	The NE 179th Street / I-5 Interchange area has several projects that have been planned by Clark County, the Washington State Department of Transportation (WSDOT), and private development. WSDOT plans to replace the NE 179th Street interchange on I-5 in the coming years, Clark County plans road improvement projects at intersections on both the east and west sides of the interchange as well as adjacent segments, and a private developer intends to construct a new intersection at NE 12th Avenue as part of an adjacent development. While not directly listed as a project necessary to lift urban holding, this project has a multi-project stormwater facility within its limits and must be constructed in coordination with the other county projects. Due to the anticipated change in the profile of the road, the stormwater facility cannot be constructed without raising the road and completing this project. Because of the stormwater reliance of the other projects, three projects are included under one NEPA, and it is therefore important to complete this project as quickly as possible. Efforts to accelerate its design will be made wherever possible.
3. Scope of Project	Clark County is seeking select engineering services to support the on-time and on-budget delivery of this project, which involves in its entirety the design/engineering, real property acquisition, and environmental documentation and permitting necessary to prepare a biddable and constructible set of plans and specifications, followed by the bidding and construction of the project by the county and its contractor. The required consultant engineering services are generally described below in Section 1B. The scope of the full project is the re-construction of a county principal arterial roadway, which will improve NE 179th Street between NE 15th Avenue and NE 26th Avenue. The project will not include the intersections at NE 15th Avenue and NE 29th Avenue, which are being completed

	under other county projects, but will tie into the work on either end. As noted, the roadway is classified as a principal arterial (Pr-4cb), with four travel lanes, center left-turn lane or median, and bike and pedestrian facilities. The work will include one crossing (structure and walls) of Whipple Creek; the current county preference is for a bridge, but the contract scope will include an alternatives analysis of the crossing to confirm this. Wetlands and riparian area impacts are likely near this crossing (environmental work will be completed by a separate consultant.) The profile of the roadway will be raised at the creek crossing but will generally match the existing profile elsewhere. An adjacent stormwater facility will also be designed and constructed; this facility will receive stormwater runoff from this and at least three other projects: NE 15th Avenue from NE 179th Street to NE 10th Avenue, NE Delfel Road from NE 179th Street to NE 184th Street, and NE 179th Street from I-5 to NE 15th Avenue.
4. Project Funding	A portion of this project is anticipated to receive federal funding and will be required to follow WSDOT's Environmental Procedures Manual for compliance with the National Environmental Procedures Manual for compliance with the National Environmental Policy Act (NEPA). Permits from local, state and federal regulators will be required. This project does not have mandatory consultant DBE goal, but documentation of voluntary SBE efforts will be required. The recipient, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252,42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR Part 26 will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, sex, handicap/disabled, age in consideration for an award. Clark County, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. El Condado de Clark, de acuerdo con las disposiciones del Título VI de la Ley de Derechos Civiles de 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d a 2000d-4) y el Reglamento, por la presente notifica a todos los postores que se asegurará afirmativamente de que cualquier contrato celebrado de conformidad con este anuncio, las empresas comerciales desfavorecidas tendrán la oportunidad plena y justa de presentar ofertas en respuesta a esta invitación y no serán discriminadas por motivos de raza, color u origen nacional en consideración a un laudo. La políza del condado de Clark es garantizar que ninguna persona por motivos de raza, color, origen nacional o sexo según lo dispuesto en el Title VI of the Civil Rights Act de 1964, según enmendada, sea excluida por participar en, ser negado los beneficios de, o ser discriminado por cualquier programa o actividad patrocinada por el condado. Para preguntas relacionadas con el programa de Title VI de Obras Públicas del condado de Clark, o para servicios de interpretación o traducción para personas que no hablan inglés. O para que los materiales estén disponibles en un formato alternativo, comuníquese con el coordinador del Title VI de Obras Públicas del condado de Clark por correo electrónico a CCPW-TitleVI@clark.wa.gov o por teléfono a 564-397-4944. Las personas con problemas de audición / habla pueden llamar a Washington Relay Center al 711. For questions regarding Clark County Public Works' Title VI Program, or for interpretation or translation services for non-English speakers, or otherwise making materials available in an

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<tr><td></td><td>alternate format, contact Clark County Public Works' Title VI Coordinator via email at CCPW-TitleVI@clark.wa.gov or phone at 564-397-4944. Hearing/speech impaired may call the Washington Relay Center at 711.</td></tr>
<tr><td>5. Timeline for Selection</td><td>The following dates are the <u>intended</u> timeline:

<table><tr><td>Proposals Due</td><td>March 15, 2023</td></tr><tr><td>Proposal Review/Evaluation Period</td><td>March 20 – 24, 2023</td></tr><tr><td>Interviews</td><td>April 4 – 6, 2023</td></tr><tr><td>Selection Committee Recommendation</td><td>April 10, 2023</td></tr><tr><td>Contract Negotiation/Execution</td><td>April 10 – 28, 2023</td></tr><tr><td>Contract Intended to Begin</td><td>May 10, 2023</td></tr></table></td></tr>
<tr><td>6. Employment Verification</td><td>To be considered <u>responsive</u> to this formal Clark County RFP, all proposers shall submit before, include with their response or within 48 hours after submittal, a recent copy of their E-Verify MOU or proof of pending enrollment. The awarded contractor shall be responsible to provide Clark County with the same E-Verify enrollment documentation for each sub-contractor ($25,000 or more) within thirty days after the sub-contractor starts work. Contractors and sub-contractors shall provide a report(s) showing status of new employees hired after the date of the MOU. The status report shall be directed to the county project manager at the end of the contract, or annually, whichever comes first. E-Verify information and enrollment is available at the Department of Homeland Security web page: www.dhs.gov/E-Verify

How to submit the MOU in advance of the submittal date:
1. Hand deliver to 1300 Franklin St, Suite 650, Vancouver, WA 98660, or;
2. E-mail: koni.odell@clark.wa.gov or priscilla.ricci@clark.wa.gov
Note : Sole Proprietors shall submit a letter stating exempt.</td></tr>
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Section IB	Work Requirements
1. Required Services	Clark County is requesting engineering professional services to join the in-house project team. The consultants will work closely with designated County personnel. Separate firms may provide the types of services listed below; however, the firms must be presented as a joint team for the proposal. Subcontracting amongst firms is acceptable; however, a single firm must be identified as the "prime" and subcontracts must include the necessary clauses required by the Clark County contract (WSDOT Local Agency A&E Professional Services Negotiated Hourly Rate Consultant Agreement). The required services (anticipated but not necessarily limited to) are described below: **Initiation, Coordination and Meetings:** Provide on-going consultant project management, coordination, and communication with the project design team and county staff throughout the project. Includes all coordination and communication necessary to successfully accomplish the project work. o Initial kick-off meeting with Clark County o Preapplication meeting with Regulatory Agencies o Up to 30 project team/ progress meetings through end of project term. o Up to 10 coordination meetings with the County QA/QC Design Engineer o Design review meetings at 65%, 90%, and 99% preliminary plan submittals **Public Outreach and Access Hearings:** Participate in public involvement activities managed by Clark County, throughout the project design phase, including: o Attend up to 2 open houses **Hydraulic Engineering:** o Provide support, data and engineering as needed for creek crossing alternatives analysis o Provide fish passage compliant culvert design, if culvert is selected o Possess knowledge of HEC-13 and HEC-23 o Evaluate streambed and bank protection needs, shear stresses and scour, streambed stone gradations and stream corridor design in accordance with FHWA Hydraulic Engineering Circulars; o Analyze the associated floodplain and prepare floodplain permit application with supporting documentation. o Submit plan sheets, specifications and cost estimates at 65%, 90%, 99% and final PS&E. Documents shall be biddable and constructible, taken through a QA/QC process and prepared and stamped by a professional engineer licensed in the State of Washington o Support Environmental Process with necessary documentation including fish passage and WDFW's stream design

	Geotechnical Engineering: o Conduct geotechnical investigations and analysis to evaluate subsurface conditions, slope stability hazards, walls and structures; groundwater evaluation; stream bed material analysis; evaluate subsurface conditions for stormwater treatment facilities o Determine roadway pavement section requirements o Provide support, data and engineering as needed for creek crossing alternatives analysis o Provide design parameters and make recommendations for bridge/culvert foundation design; o Provide necessary information for environmental documentation. o Provide support during construction with design clarifications, submittal reviews, change order drawings, etc. During construction, design lead team members must be available either in person, by phone, or by email. Design lead team members must be able to attend weekly on-site construction meetings in person. **Structural Engineering:** o Perform creek crossing alternatives analysis o Provide design of structures including bridge (or culvert) and retaining walls. o Coordinate with Geotech regarding soil parameters. o Submit plan sheets, specifications and cost estimates at 65%, 90%, 99% and final PS&E. Documents shall be biddable and constructible, taken through a QA/QC process and prepared and stamped by a professional engineer licensed in the State of Washington. o Support Environmental Process with necessary documentation. o Provide support during the bid period with response to inquiries, preparation of addendums, etc. o Provide support during construction with design clarifications, submittal reviews, change order drawings, etc. During construction, design lead team members must be available either in person, by phone, or by email. Design lead team members must be able to attend weekly on-site construction meetings in person. All consultants should be prepared to attend public meetings and hearings to present project information as representatives of Clark County Public Works. Note that the list of services described in this Request for Proposal is for informational purposes and is subject to change following final selection of a consultant.
2. County Performed Work	The work to be performed by County staff is listed below: o Management of the overall project, including the internal and consultant project team. o Needed surveys – topographic and boundary. o 50% preliminary road design layout. o Roadway design plans, including detour plans

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Stormwater design plans, including drainage system and stormwater treatment facilities, and written preliminary and final stormwater plans and Technical Information Reports.
Subsurface and overhead utility investigation, coordination and conflict resolution
Traffic counts, if necessary, and traffic modeling.
Development and review of specifications and other bid documents
Compilation of plans, specifications and cost estimates at 50%, 65%, 90%, 99% and final PS&E. Assist with the development and review of specifications and other bid documents.
Coordinate public involvement.
Acquire all property rights necessary for the projects.
Administer grants and project funding.
Obtain separate consultant for environmental documentation and permitting.
Prepare and Coordinate all environmental permitting submittals and correspondence with federal, state, and local agencies.
Manage construction of the projects and provide inspection.

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<tr><td>3. Deliverables & Schedule</td><td>The following schedule is preliminary and subject to change but provides a rough framework of timelines and expectations. Whenever possible, the project team will be looking to shorten these timelines and move up the construction schedule:
<table>
<tr><td>Permit Plans (65%) Submittal</td><td>June 2023</td></tr>
<tr><td>90% Design Submittal</td><td>March 2024</td></tr>
<tr><td>Permitting Process (Complete)</td><td>April 2025</td></tr>
<tr><td>Right-of-Way Acquisition</td><td>February 2024 – August, 2025</td></tr>
<tr><td>99% Design Submittal</td><td>August, 2025</td></tr>
<tr><td>PS&E Completed</td><td>January 2026</td></tr>
<tr><td>Bid Opening</td><td>February 2026</td></tr>
<tr><td>Construction (Excluding planting, if any)</td><td>April 2026 – December 2027</td></tr>
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</td></tr>
<tr><td>4. Place of Performance</td><td>Contract performance may take place in the County’s facility, the Proposer’s facility, a third-party location or any combination thereof.</td></tr>
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5. Period of Performance	A contract awarded as a result of this RFP will be for four (4) years and is intended to begin on May 2023 and end December 2027. Clark County reserves the right to extend the contract resulting from this RFP for a period of three (3) additional years, in one (1) year increments, with the same terms and conditions, by service of a written notice of its intention to do so prior to the contract termination date.
6. Prevailing Wage (When Applicable)	Contractors shall meet the requirements for Prevailing Wage and public works requirements, per RCW 39.04.350. Proposer shall be either exempt, by having a valid Washington business license for three years or more ***and*** completed three or more public works projects ***or*** received and completed training on prevailing wage and public works requirements. Pursuant to State of Washington RCW 39.12, all payment for salaries and wages shall conform to State of Washington Department of Labor and Industries as prevailing wage rates. For this project select the Clark County rates that apply on the proposal closing date from either of these sites: **http://www.wsdot.wa.gov/Design/ProjectDev/WageRates/default.htm** **http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates** Before payment is made by the Local Agency of any sums due under this contract, the Local Agency must receive from the Contractor and each Subcontractor a copy of "Statement of Intent to Pay Prevailing Wages" (Form L & I Number 700-29) approved by the Washington State Department of Labor and Industries. A fee of $45.00 per each "Statement of Intent to Pay Prevailing Wages" and "Affidavit of Wages Paid" is required to accompany each form submitted to this Department of Labor and Industries. The Contractor is responsible for payment of these fees and shall make all applications directly to the Department of Labor and Industries. These fees shall be incidental to all the proposed items of this contract.
7. Debarred/Suspended	Federally or Washington State debarred or suspended suppliers may not participate in this Request for Proposal. All proposer's must fill out, sign and submit the "Certification Regarding Debarment, Suspension, and Other Responsibility Matters" form with their proposal to be eligible to participate.
8. Americans with Disabilities Act (ADA) Information	Clark County in accordance with Section 504 of the Rehabilitation Act (Section 504) and the Americans with Disabilities Act (ADA), commits to nondiscrimination on the basis of disability, in all of its programs and activities. This material can be made available in an alternate format by emailing ADA@clark.wa.gov or by calling 564-397-2322.
9. Public Disclosure	This procurement is subject to the Washington Public Records Act (the "Act"), chapter 42.56 RCW. Once in the County's possession, all of the RFP Submittals shall be considered public records and available for public records inspection and copying, unless exempt under the Act. If a Respondent or Proposer considers any portion of an RFP Submittal to be protected under the law, whether in electronic or hard copy form, the Respondent or Proposer shall clearly identify each such portion with the word "PROPRIETARY". The County will notify the Respondent or Proposer in writing of the request and allow the Respondent or Proposer ten (10) days to obtain a court order enjoining release of the record(s). If the Respondent or

	Proposer does not take such action within the ten (10) day period, the County will release the portions of the RFP Submittal deemed subject to disclosure. All Respondents and Proposers who provide RFP Submittals for this procurement accept the procedures described above and agree that the County shall not be responsible or liable in any way for any losses that the party may incur from the disclosure of records to a third party who requests them.
10. Insurance/Bond	The firm awarded the contract will be required to have insurance in effect as specified in the contract under Section XII Legal Relations (See: https://wsdot.wa.gov/sites/default/files/2021-10/LP_AEPS-NegotiatedHourlyRate.pdf
11. Plan Holders List	All proposers are required to be listed on the plan holders list. ✓ Prior to submission of proposal, please confirm your organization is on the Plan Holders List below: To view the Plan Holders List, please click on the link below or copy and paste into your browser. Clark County RFP site: https://clark.wa.gov/internal-services/purchasing-overview • If your organization is NOT listed, submit Attachment B - Letter of Interest to ensure your inclusion. • Proposals received by Clark County by proposers not included on the Plan Holders List may be considered non-responsive.

Part II Proposal Preparation and Submittal

Section IIA	Pre-Submittal Meeting / Clarification
1. Pre-Submittal Meeting	There will be no pre-submittal meeting or site visit scheduled as part of this RFP.
2. Proposal Clarification	Questions and Requests for Clarification regarding this Request for Proposal must be directed in writing, via email, to the person listed on the cover page. The deadline for submitting such questions/clarifications is March 8, 2023 no later than Noon. An addendum will be issued no later than March 9, 2023 to all recorded holders of the RFP if a substantive clarification is in order. The Questions & Answers/Clarifications are available for review at the link below. Each proposer is strongly encouraged to review this document prior to submitting their proposal. Clark County RFP site: **https://clark.wa.gov/internal-services/request-proposal-1**
Section IIB	**Proposal Submission**
1. Proposals Due	Sealed proposals must be received no later than the date, time and location specified on the cover of this document. **The outside of the envelope/package shall clearly identify:** **1. RFP Number and;** **2. TITLE and;** **3. Name and Address of the Proposer.** Responses received after submittal time will not be considered and will be returned to the Proposer - unopened. Proposals received with insufficient copies (as noted on the cover of this document) cannot be properly disseminated to the Review Committee and other reviewers for necessary action, therefore, may not be accepted.
2. Proposal	Proposals must be clear, succinct and not exceed twelve (12) pages, excluding resumes, E-Verify, coversheet and debarment form. Proposer's who submit more than the pages indicated may not have the additional pages of the proposal read or considered. For purposes of review and in the interest of the County, the County encourages the use of submittal materials (i.e. paper, dividers, binders, brochures, etc.) that contain post-consumer recycled content and are readily recyclable. The County discourages the use of materials that cannot be readily recycled such as PVC (vinyl) binders, spiral bindings, and plastic or glossy covers or dividers. Alternative bindings such as reusable/recyclable binding posts, reusable binder clips or binder rings, and recyclable cardboard/paperboard binders are examples of preferable submittal materials.

	Proposers are encouraged to print/copy on both sides of a single sheet of paper wherever applicable; if sheets are printed on both sides, it is considered to be two pages. Color is acceptable, but content should not be lost by black-and-white printing or copying. All submittals will be evaluated on the completeness and quality of the content. Only those Proposers providing complete information as required will be considered for evaluation. The ability to follow these instructions demonstrates attention to detail. Additional support documents, such as sales brochures, should not be included with each copy unless otherwise specified.
Section IIC	**Proposal Content**
1. Cover Sheet	This form is to be used as your proposal Cover Sheet. See Cover Sheet - Attachment A
2. Project Team	Provide a summary describing the joint team organization, including the prime consultant and any sub-consultants. The summary should contain an organizational chart showing areas of responsibilities, professional titles of pertinent positions and which team member will be the "lead" in each area (structural, geotechnical, hydraulics, etc.). If the team includes members from different firms, include any past experience working together.
3. Management Approach	Provide a resume for all key team members that details professional standards in areas of expertise. Also include a list of all other team members that will work on the project – including technical expertise, title, years of experience and relevant project work. Describe how the team will be managed internally as well as within the overall County/Consultant project team. Include information about QA/QC processes.
4. Respondent's Capabilities	Provide three reference projects that demonstrate experience and competence in performing the type of work requested as identified in Section IB-1. Each discipline should be represented in three reference projects, either in combination with other disciplines or individually. Include name of project owner, address, telephone number, project title and contact person. Projects demonstrating efforts with joint consultant/local agency teams are preferred.
5. Project Approach and Understanding	Provide a description of the work to be performed based on the Required Services described in Section IB and project schedule provided. Include a description of key issues and challenges anticipated to be addressed during the development and execution of the specific project.
6. Proposed Cost	N/A

7. Employment Verification	**Please refer to section 1A.6. – E-Verify** **IMPORTANT NOTE:** Include this portion of the response immediately **AFTER** the cover page, if not already on file with Clark County. Current vendors on file can be viewed at: **https://clark.wa.gov/internal-services/purchasing-overview**

Part III Proposal Evaluation & Contract Award

<table>
<tr><th>Section IIIA</th><th>Proposal Review and Selection</th></tr>
<tr><td>1. Evaluation and Selection:</td><td>Proposals received in response to this RFP will be evaluated by a Review Committee. The Committee review results and recommendations may be presented to an appropriate advisory board prior to the consent process with the Clark County Council.

The County plans to conduct interviews as a result of this proposal review and recommendation. If a sufficient number of proposals are received the county intends to interview a minimum of three (3) consultant teams as part of the final selection process.

The interview alone will determine the final consultant selection. Points from this proposal review will not be carried over to the interview.</td></tr>
<tr><td>2. Evaluation Criteria Scoring</td><td>Each proposal received in response to the RFP will be objectively evaluated and rated according to a specified point system. The point system will be used to rank all proposals for each reviewer, and each proposal’s final ranking will be based on its ranking among all reviewers. Raw scores will be used in the unlikely event of a tie in the rankings.

A one hundred (100) point system will be used, weighted against the following criteria:

<table>
<tr><td>Proposal Quality</td><td>10</td></tr>
<tr><td>Project Team</td><td>20</td></tr>
<tr><td>Management Approach</td><td>20</td></tr>
<tr><td>Respondent’s Capabilities</td><td>20</td></tr>
<tr><td>Project Approach and Understanding</td><td>30</td></tr>
<tr><td>Total Points</td><td>100</td></tr>
</table>
</td></tr>
<tr><th>Section IIIB</th><th>Contract Award</th></tr>
<tr><td>1. Consultant Selection</td><td>The County will determine the most qualified proposer based on the evaluation criteria listed using predetermined weights, the attributes of the Proposers and the overall responsiveness of the Proposal. If the County does not reach a favorable agreement with the top Proposer, the County shall terminate negotiations and begin negotiations with the next qualified Proposer. If the County is unable to reach agreeable terms with either Proposer, they may opt to void the RFP and determine next steps.

Clark County reserves the right to accept or reject any or all proposals received, to negotiate with any or all prospective contractors on modifications to proposals, to waive formalities, to postpone award, or to cancel in part or in its entirety this RFP. Clark County reserves the right to award the contract based on the best interests of the County.</td></tr>
</table>

2. Contract Development	The proposal and all responses provided by the successful Proposer may become a part of the final contract. Contract execution is subject to Clark County Council approval. The form of contract shall be the Washington State Department of Transportation's Local Agency A&E Professional Services Negotiated Hourly Rate Consultant Agreement Template. https://wsdot.wa.gov/sites/default/files/2021-10/LP_AEPS-NegotiatedHourlyRate.pdf
3. Award Review	The public may view Request for Proposal documents by submitting a public records request at www.clark.wa.gov .
4. Orientation/Kick-off Meeting	Clark County intends to hold a project Kick-off meeting shortly after contract execution.

Request for Proposal #849

Select Design Engineering Services for NE 179th St Improvements from NE 15th Ave to NE 26th Ave (PRJ0001779 / CRP320122)

Attachment A: COVER SHEET

General Information:

Legal Name of Proposing Firm _____

Street Address _____ City _____ State _____ Zip _____

Contact Person _____ Title _____

Phone _____ Fax _____

Program Location (if different than above) _____

Email Address _____

Tax Identification Number _____

ADDENDUM:

Proposer shall acknowledge receipt of Addenda by checking the appropriate box(es).

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐

NOTE: Failure to do so, shall render the proposer non-responsive and therefore be rejected.

I certify that to the best of my knowledge the information contained in this proposal is accurate and complete and that I have the legal authority to commit this agency to a contractual agreement. I realize the final funding for any service is based upon funding levels, and the approval of the Clark County Council and required approvals.

_____ _____

Authorized Signature of Proposing Firm Date

_____ _____

Printed Name Title

Request for Proposal #849
Select Design Engineering Services for NE 179th St Improvements from NE 15th Ave to NE 26th Ave (PRJ0001779 / CRP320122)

Attachment B: LETTER OF INTEREST

Legal Name of Applicant Agency_____

Street Address_____

City_____ State _____ Zip _____

Contact Person _____ Title _____

Phone _____Fax_____

Program Location (if different than above) _____

Email Address _____

- All proposers are required to be included on the plan holders list.
- If your organization is NOT listed, submit the 'Letter of Interest" to ensure your inclusion.

Email Letter of Interest to*: Koni.Odell@clark.wa.gov and Priscilla.Ricci@clark.wa.gov*

Clark County web link: https://clark.wa.gov/internal-services/request-proposal-1

This document will only be used to add a proposer to the plan holders list. Submitting this document does not commit proposer to provide services to Clark County, nor is it required to be submitted with proposal.

Proposals may be considered non-responsive if the Proposer is not listed on the plan holders list.

Request for Proposal #849
Select Design Engineering Services for NE 179th St Improvements from NE 15th Ave to NE 26th Ave (PRJ0001779 / CRP320122)

Attachment C

Clark County, Washington

Certification Regarding
Debarment, Suspension and Other Responsibility Matters

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____
Company Name

_____
Typed Name & Title of Authorized Representative

_____ _____
Signature of Authorized Representative Date

☐ I am unable to certify to the above statements. My explanation is attached.

ATTACHMENT D - CONCEPTUAL AERIAL EXHIBIT (30%)

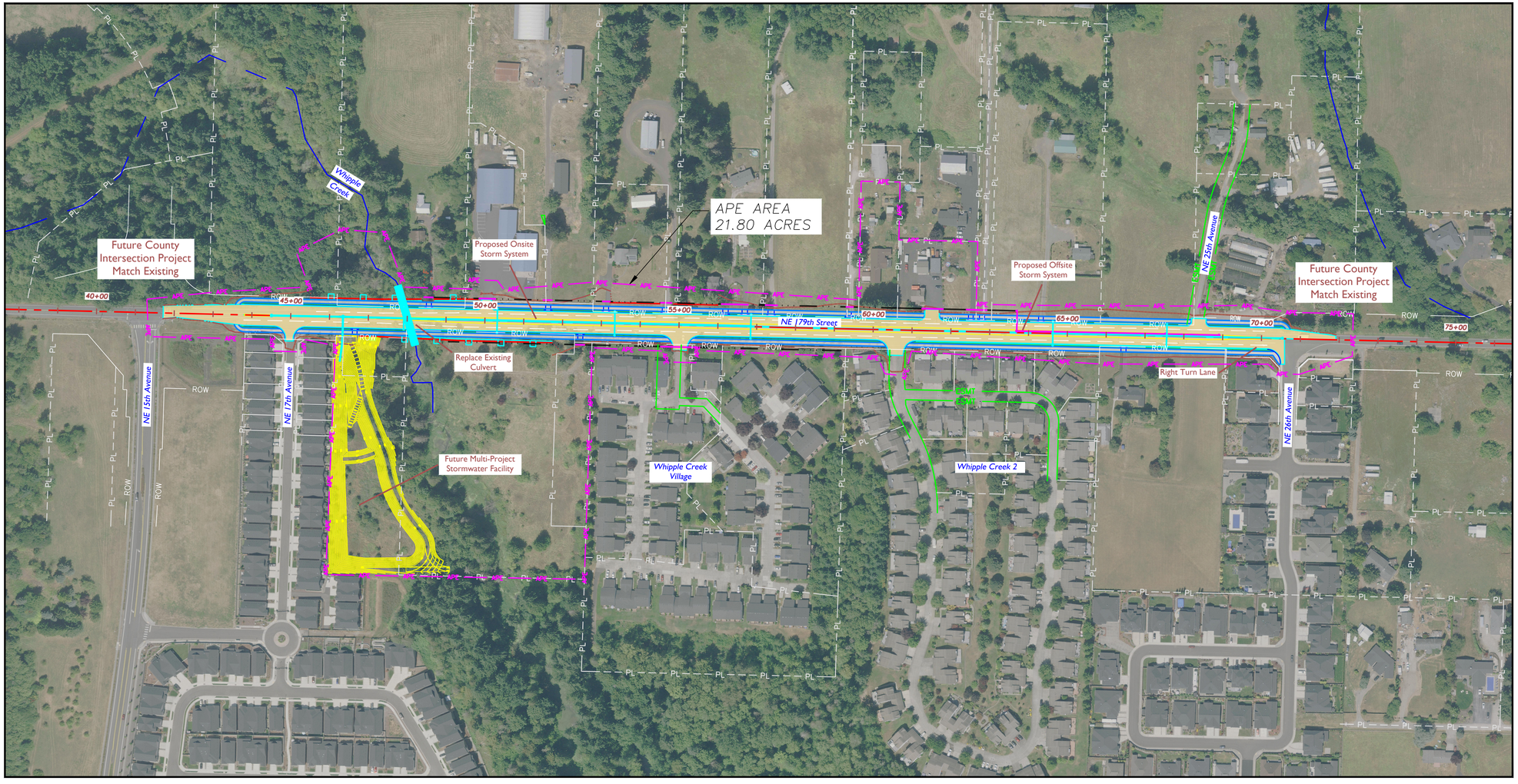
CLARK COUNTY PUBLIC WORKS: **NE 179th Street Improvements**

NE 15th Avenue to NE 26th Avenue — APE Exhibit - Prj #001779

November 30, 2022

CLARK COUNTY WASHINGTON
PUBLIC WORKS
ENGINEERING & CONSTRUCTION

0 150 300 FEET

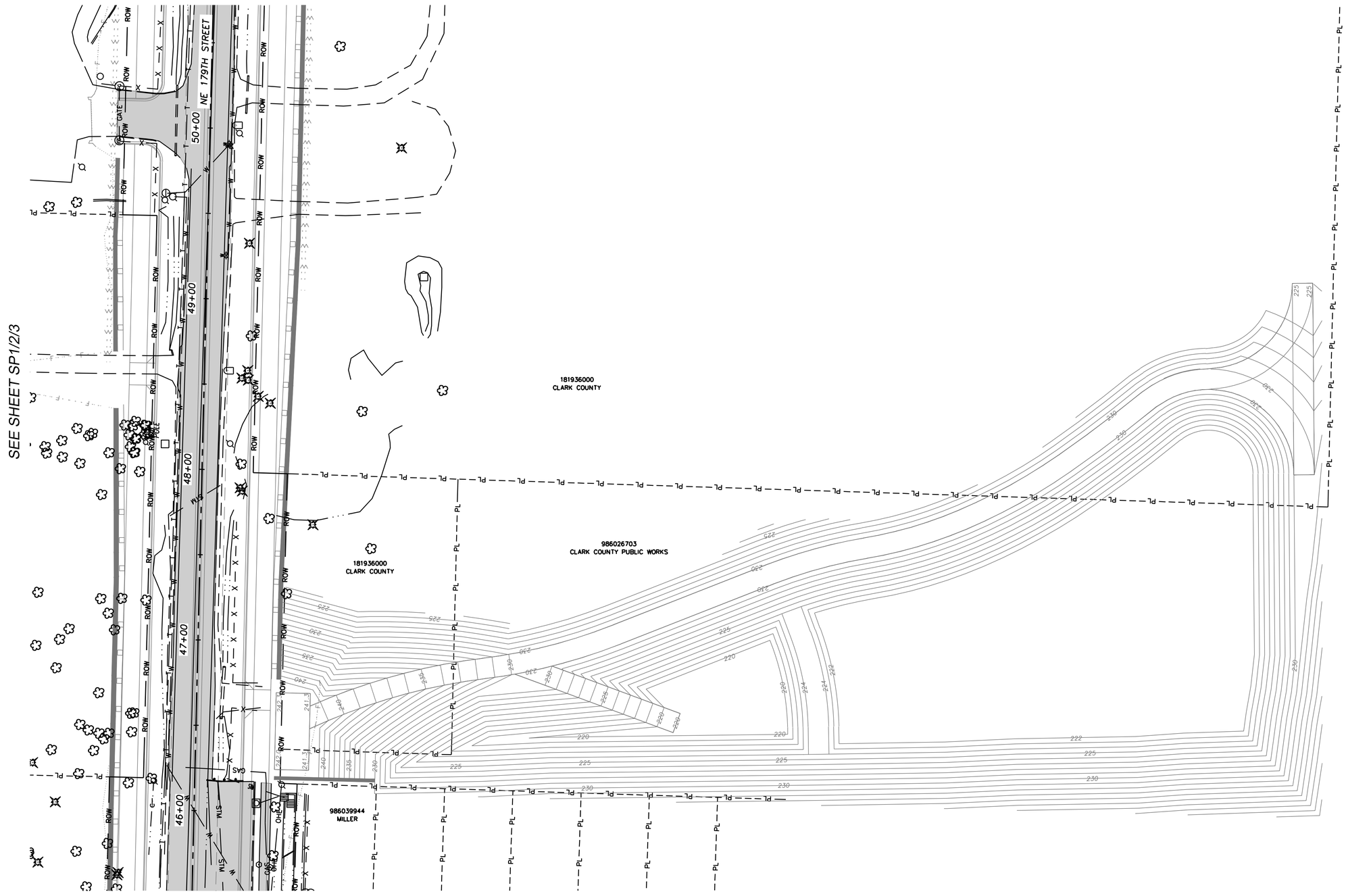


LEGEND

Roadway	Proposed Offsite Storm System
Joint-Use Path/Sidewalk/ Driveways/ADA Ramps	Proposed Onsite Storm System
Landscape Area	Proposed Drainage Ditches
Streams (GIS)	Proposed Retaining Wall
APE Boundary	Proposed Stream Culvert

N:\CRP\PROJECTS\0001779.NE 179th St\NE 15th Ave-NE 26th Ave\ENGR\CIVIL\3D Production\Design\Exhibits and Display\0001779.NE 179th - APE EXHIBIT.dwg - 11/30/2022 4:23:44 AM, kerlin

Last Saved: kerlin



SITE PREPARATION CALLOUTS

CLEARING AND GRUBBING

EXISTING HMA AND CEMENT CONCRETE PAVEMENT REMOVAL AREA

SAWCUT

GENERAL NOTES:

- SEE SIGNING AND STRIPING PLANS FOR SIGN REMOVALS AND RELOCATIONS.

NOTE:
ALL ITEMS TO BE PROTECTED UNLESS OTHERWISE NOTED.

LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE AND MAY BE INCOMPLETE

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555 "It's the Law" NORTHWEST UTILITIES NOTIFICATION CENTER

CLARK COUNTY, WASHINGTON

TRANSPORTATION PROGRAM

PUBLIC WORKS
ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORN STATE OF WASHINGTON 21006426 REGISTERED PROFESSIONAL ENGINEER

50% PRELIMINARY

DATE

NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

SITE PREPARATION
STORMWATER FACILITY

DATE 02/28/23

SP7

19 OF 110

Last Saved:russellr Ver:18.1

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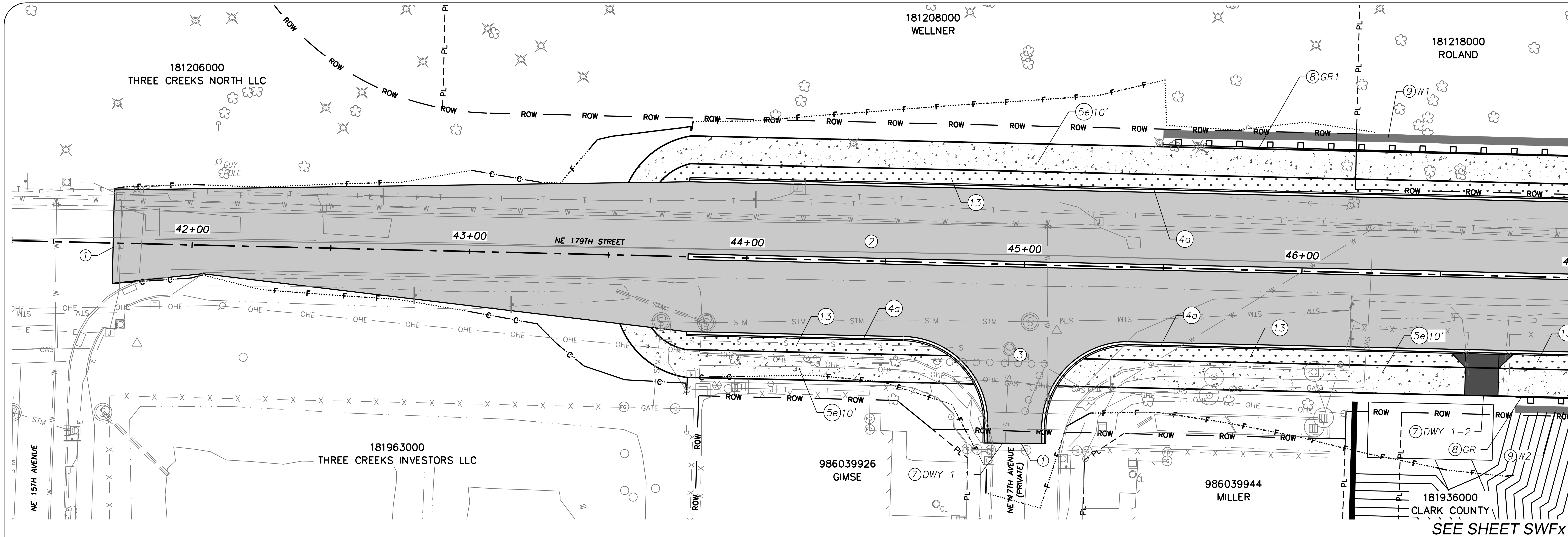
ATTACHMENT E - Pre-50% Draft Clark County Plan and Profile Sheets (2023)



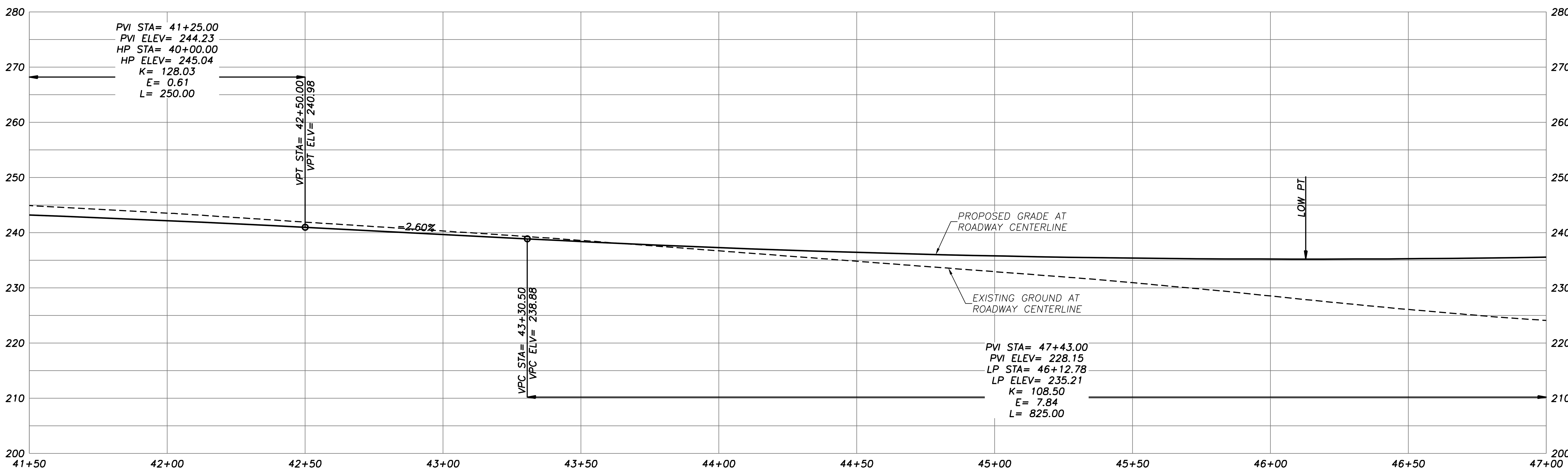
CONSTRUCTION NOTES

1. MATCH EXISTING CURB, SIDEWALK, OR PAVEMENT AT NEAREST JOINT. SAWCUT IF NEEDED FOR CLEAN JOINT
2. CONSTRUCT PAVEMENT. SEE TYPICAL SECTIONS FOR DETAILS
3. CONSTRUCT INTERSECTION IMPROVEMENTS PER INTERSECTION SHEETS

4x. CONSTRUCT CURB PER DETAILS ON SHEET RD(x)
   - a) TRAFFIC CURB & GUTTER
   - b) TRAFFIC CURB
   - c) EXTRUDED
   - d) PEDESTRIAN
   - e) ROUNDABOUT TYPE 1
   - f) ROUNDABOUT TYPE 2
   - g) ROUNDABOUT TYPE 3
   - h) DUAL FACED MOUNTABLE CEM CONC MEDIAN

5x. CONSTRUCT SIDEWALK PER DETAILS ON SHEET RD(x)
   - e) CEMENT CONCRETE
   - f) PERVIOUS CONCRETE
   - g) HMA SIDEWALK/PATH

7. CONSTRUCT DRIVEWAY PER DRIVEWAY PLAN AND PROFILE SHEETS DWY(x). SEE PLAN FOR DRIVEWAY NUMBER
8. INSTALL BEAM GUARDRAIL. SEE GUARDRAIL SHEETS GRD(x)
9. CONSTRUCT RETAINING WALL PER PLANS. SEE WALL SHEETS W(x)
10. INSTALL MAILBOX SUPPORT OF TYPE NOTED PER DETAIL ON SHEET RD(x)
13. LANDSCAPING, PER SHEET LSP(x)



FULL DEPTH CONSTRUCTION/HMA
CEMENT CONCRETE
GRAVEL DRIVEWAY
HMA PATH/DRIVEWAY

LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE AND MAY BE INCOMPLETE

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555 "It's the Law" NORTHWEST UTILITIES NOTIFICATION CENTER

CLARK COUNTY, WASHINGTON

TRANSPORTATION PROGRAM

PUBLIC WORKS ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORN STATE OF WASHINGTON 21006426 REGISTERED PROFESSIONAL ENGINEER

50% PRELIMINARY

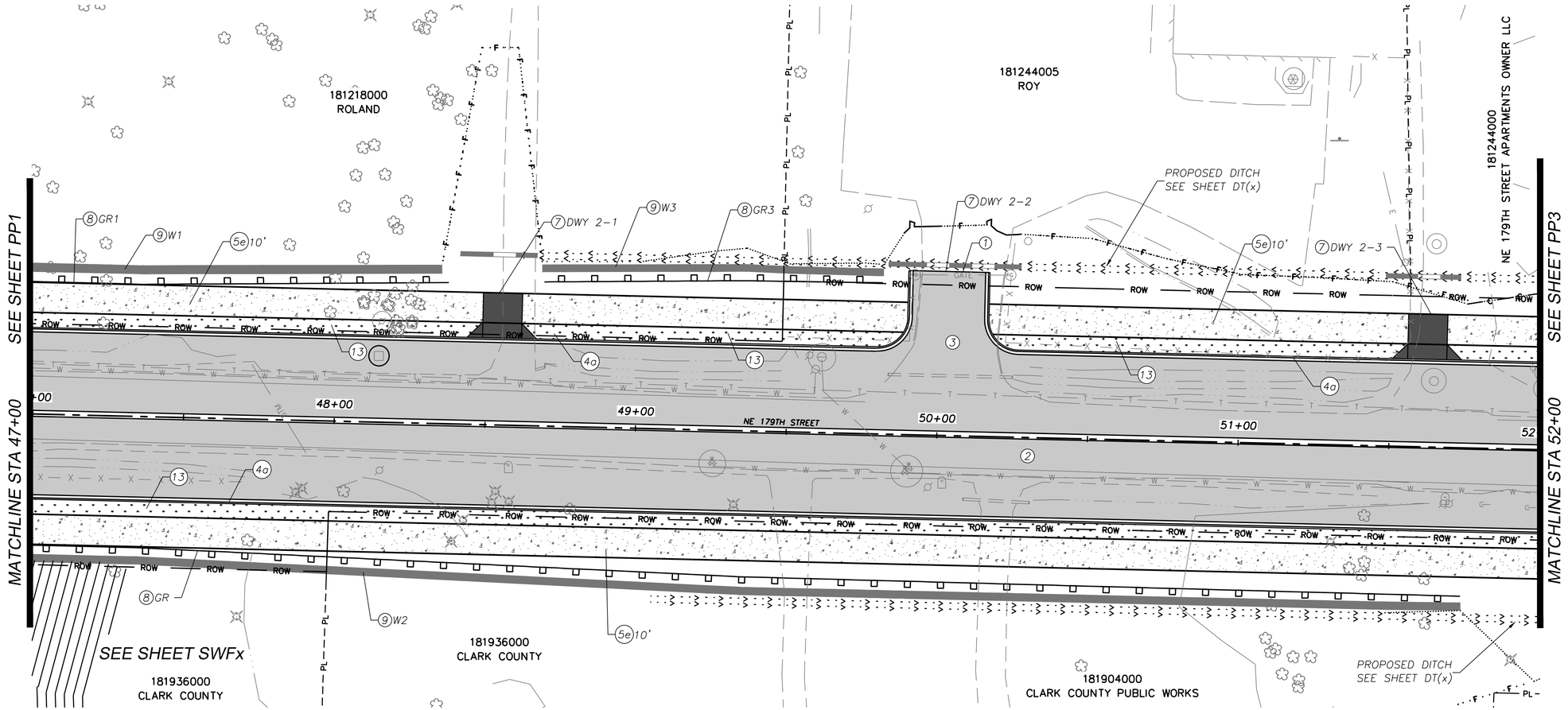
DATE

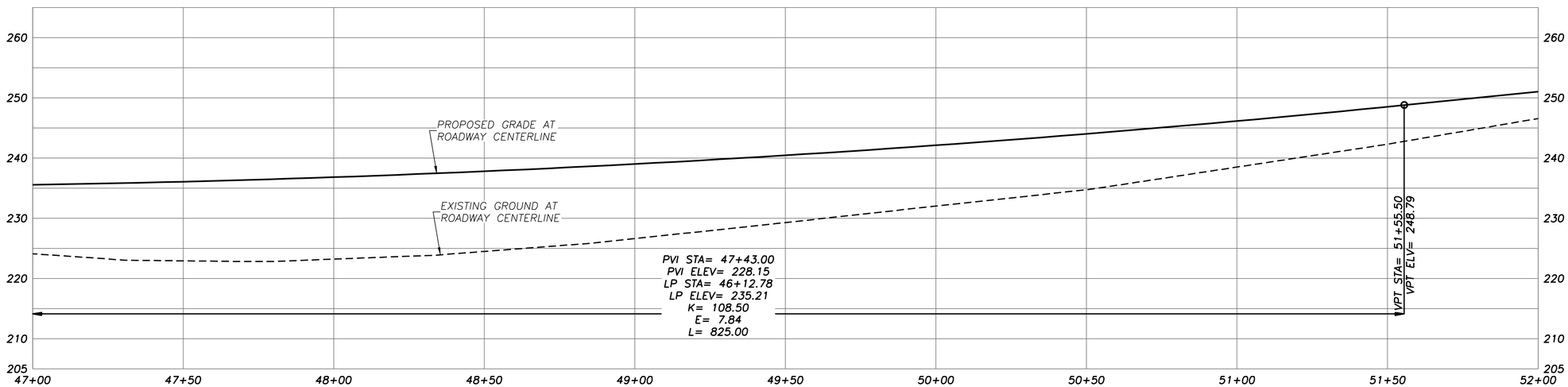
NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

ROADWAY PLAN AND PROFILE
B.O.P. TO STA 47+00

DATE 02/28/23

PP1





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0 20 40 FEET

CONSTRUCTION NOTES

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FULL DEPTH CONSTRUCTION/HMA
CEMENT CONCRETE
GRAVEL DRIVEWAY
HMA PATH/DRIVEWAY

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PUBLIC WORKS
ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORN — STATE OF WASHINGTON — 21006426 REGISTERED PROFESSIONAL ENGINEER

50% PRELIMINARY
DATE

NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

ROADWAY PLAN AND PROFILE
STA 47+00 TO STA 52+00

DATE 02/28/23
PP2
34 OF 110

Last Saved: ruggeltr Ver: 18.1

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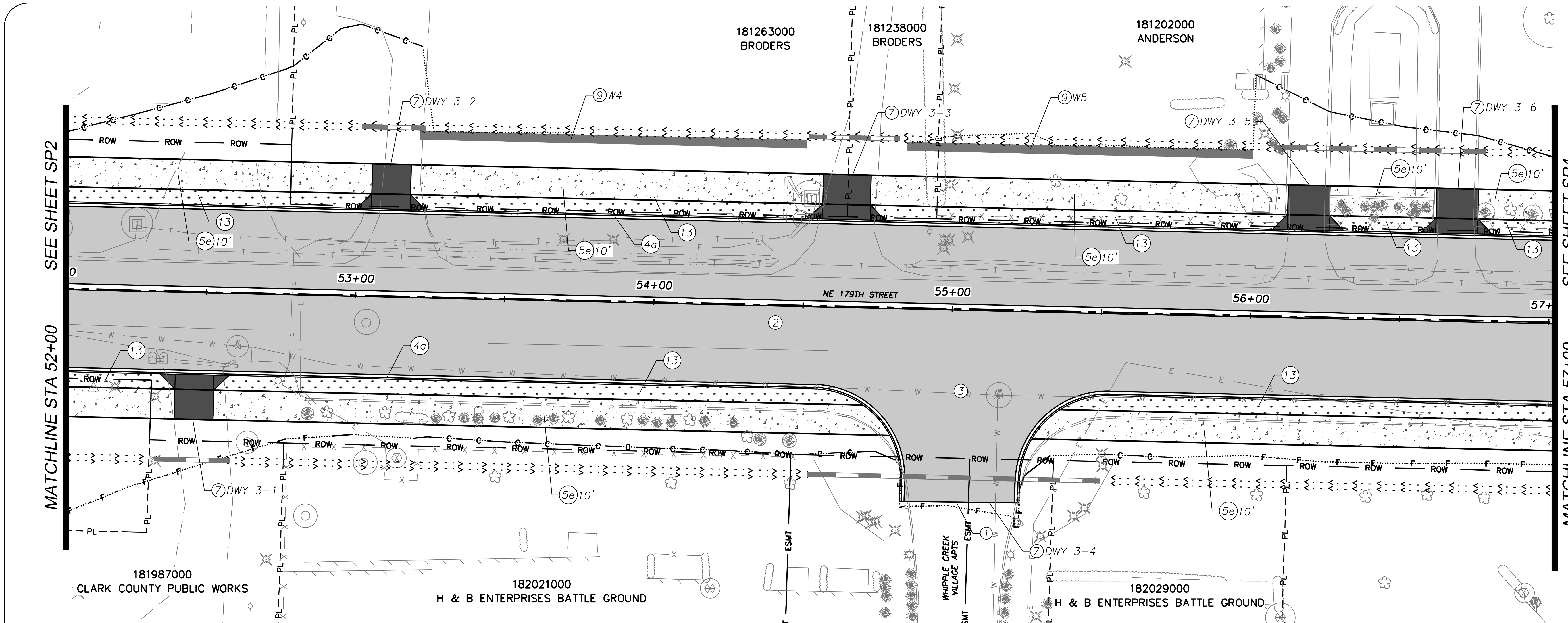
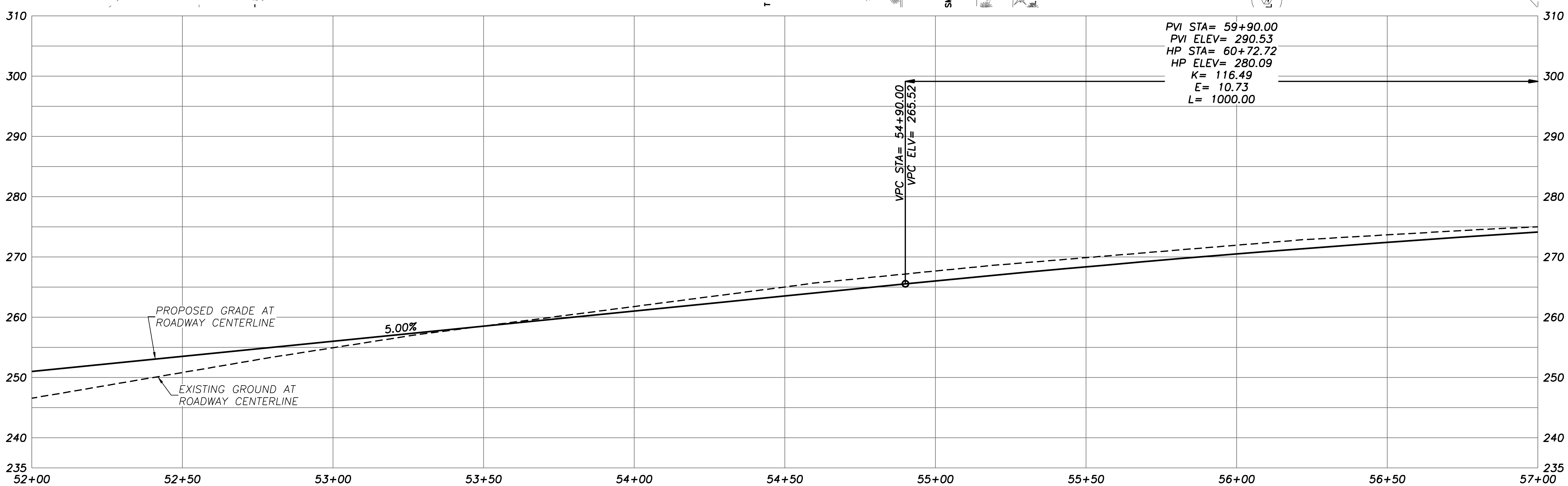
ATTACHMENT E - Pre-50% Draft Clark County Plan and Profile Sheets (2023)





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FULL DEPTH CONSTRUCTION/HMA
CEMENT CONCRETE
GRAVEL DRIVEWAY
HMA PATH/DRIVEWAY

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CLARK COUNTY, WASHINGTON

TRANSPORTATION PROGRAM

PUBLIC WORKS ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORN STATE OF WASHINGTON 21006426 REGISTERED PROFESSIONAL ENGINEER

50% PRELIMINARY

DATE

NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

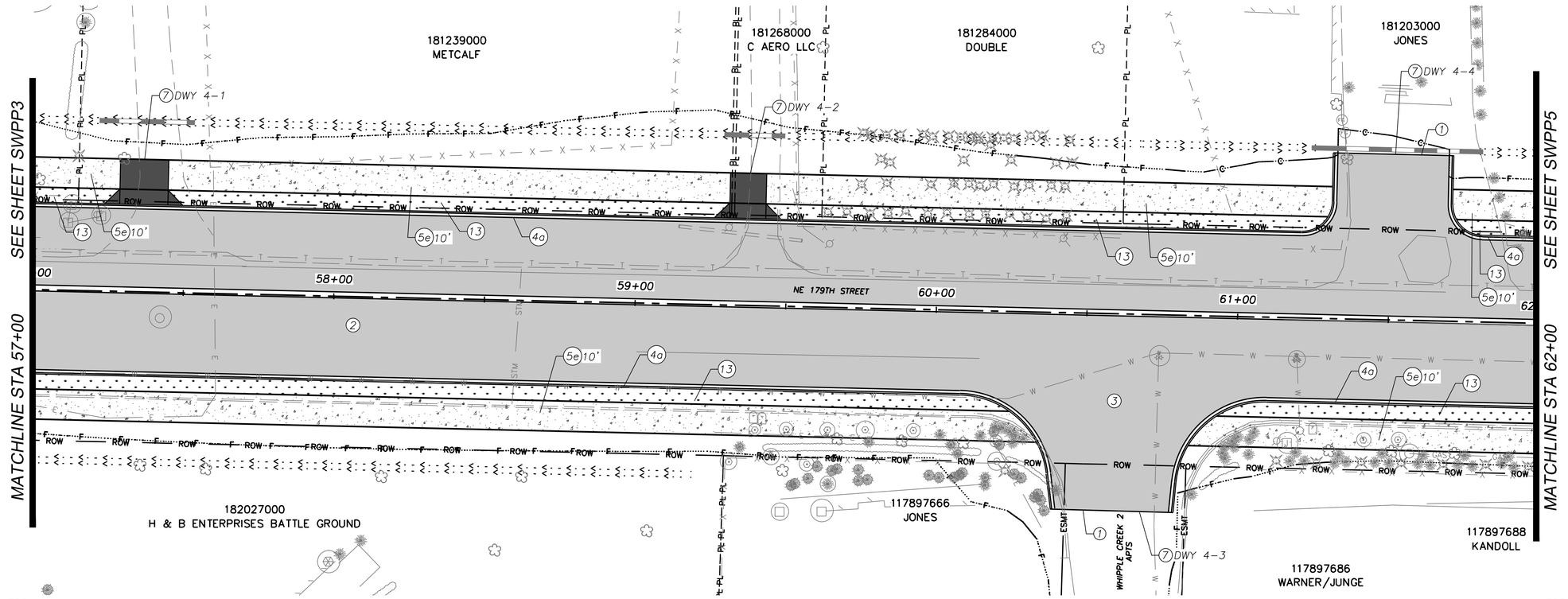
ROADWAY PLAN AND PROFILE
STA 52+00 TO STA 57+00

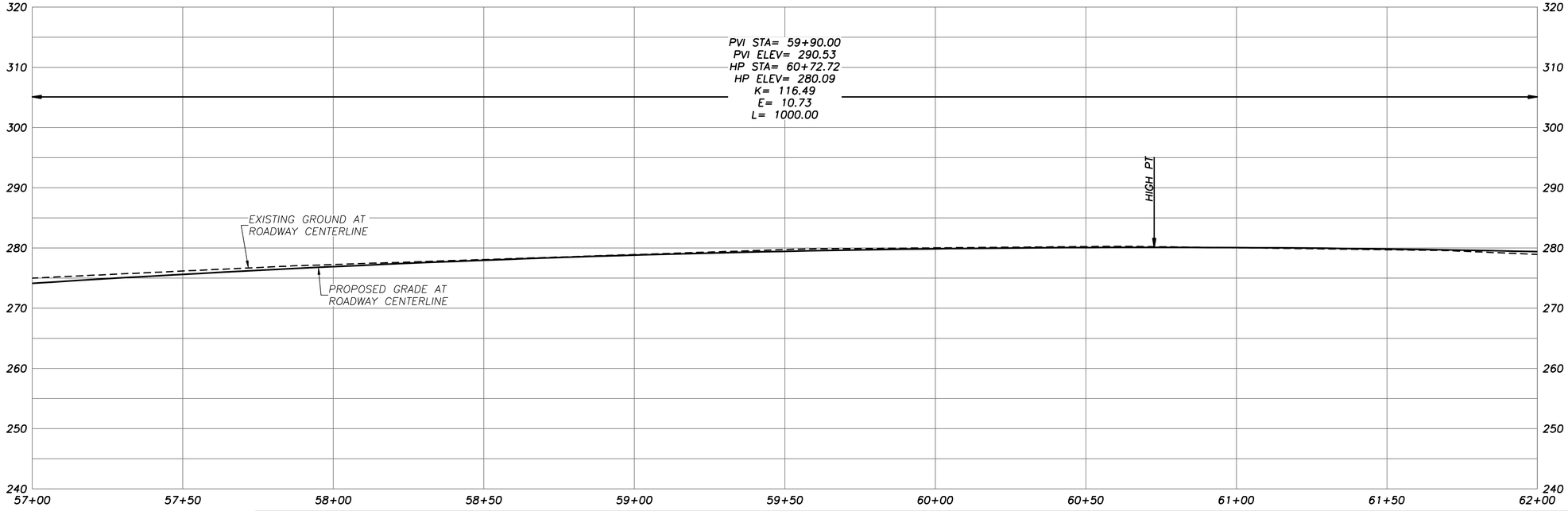
DATE 02/28/23

PP3

35 OF 110

ATTACHMENT E - Pre-50% Draft Clark County Plan and Profile Sheets (2023)





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CONSTRUCTION NOTES

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ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORN STATE OF WASHINGTON 21006426 REGISTERED PROFESSIONAL ENGINEER

50% PRELIMINARY
DATE

NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

ROADWAY PLAN AND PROFILE
STA 57+00 TO STA 62+00

DATE 02/28/23
PP4
36 OF 110

Last Saved:russellr Ver: 18.1

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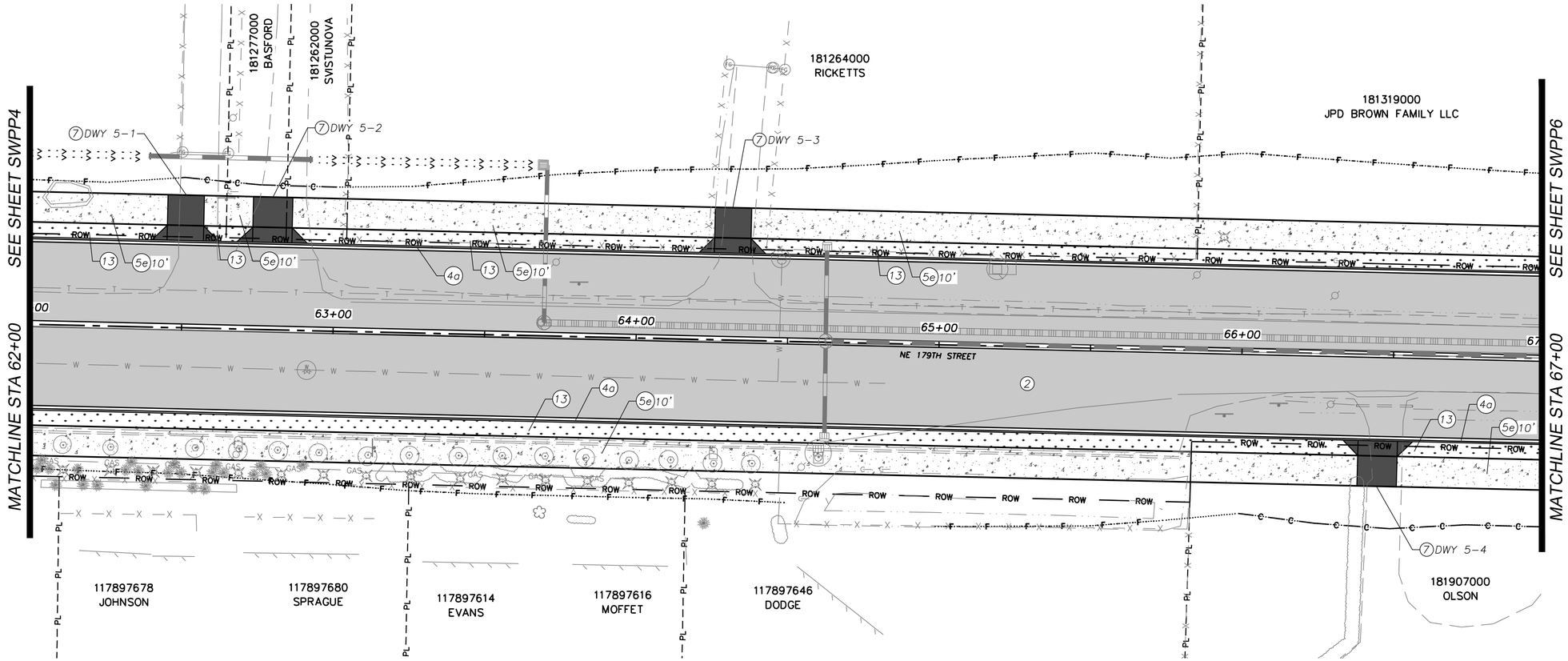
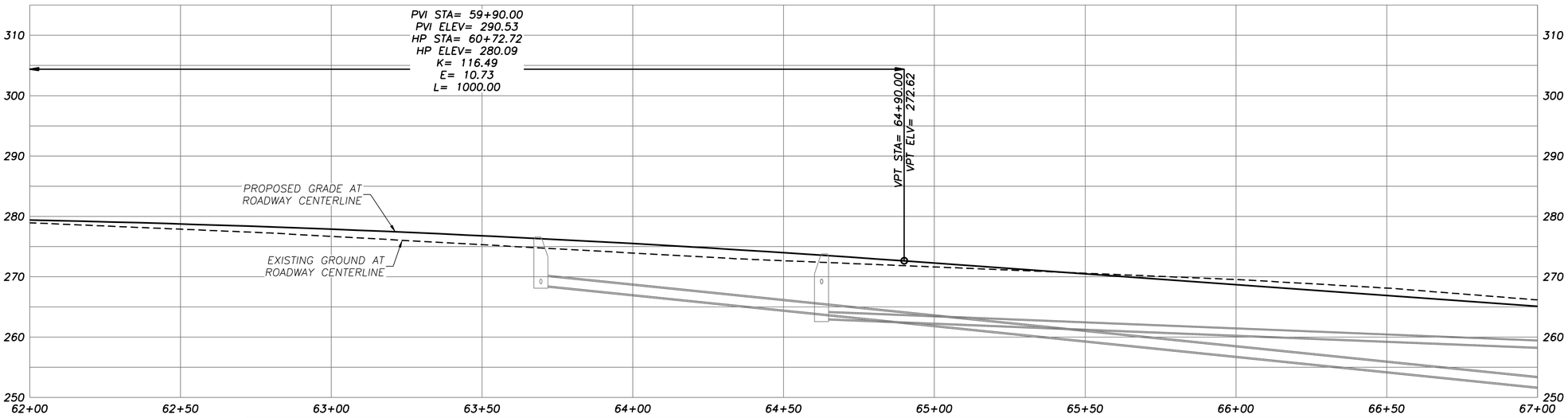
ATTACHMENT E - Pre-50% Draft Clark County Plan and Profile Sheets (2023)





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FULL DEPTH CONSTRUCTION/HMA
4a CEMENT CONCRETE
GRAVEL DRIVEWAY
HMA PATH/DRIVEWAY

LOCATIONS OF EXISTING UTILITIES ARE APPROXIMATE AND MAY BE INCOMPLETE

CALL 48 HOURS BEFORE YOU DIG 1-800-424-5555 "It's the Law" NORTHWEST UTILITIES NOTIFICATION CENTER

CLARK COUNTY, WASHINGTON

TRANSPORTATION PROGRAM

PUBLIC WORKS
ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORNE STATE OF WASHINGTON 21006426 REGISTERED PROFESSIONAL ENGINEER

50% PRELIMINARY
DATE

NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

ROADWAY PLAN AND PROFILE
STA 62+00 TO STA 67+00

DATE 02/28/23
PP5
37 OF 110

Last Saved:ruggeltr Ver:18.1

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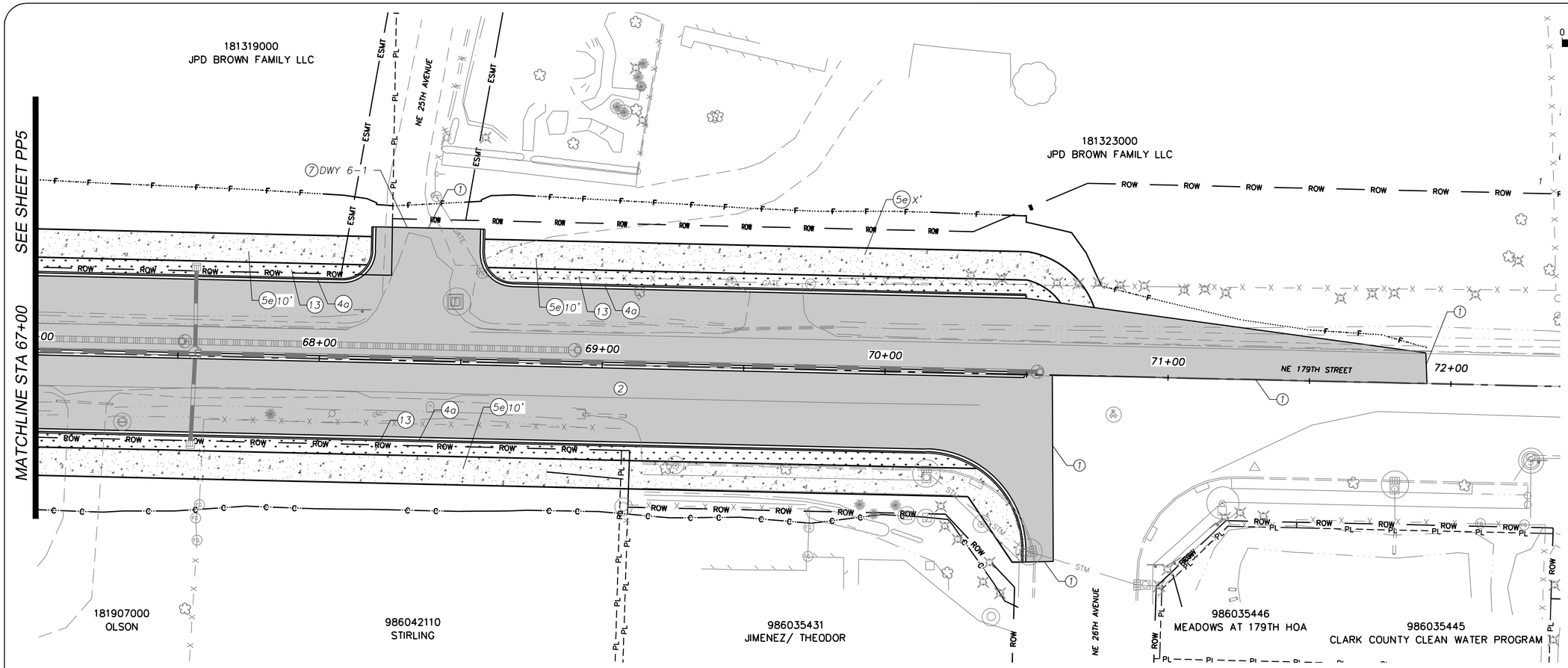
ATTACHMENT E - Pre-50% Draft Clark County Plan and Profile Sheets (2023)



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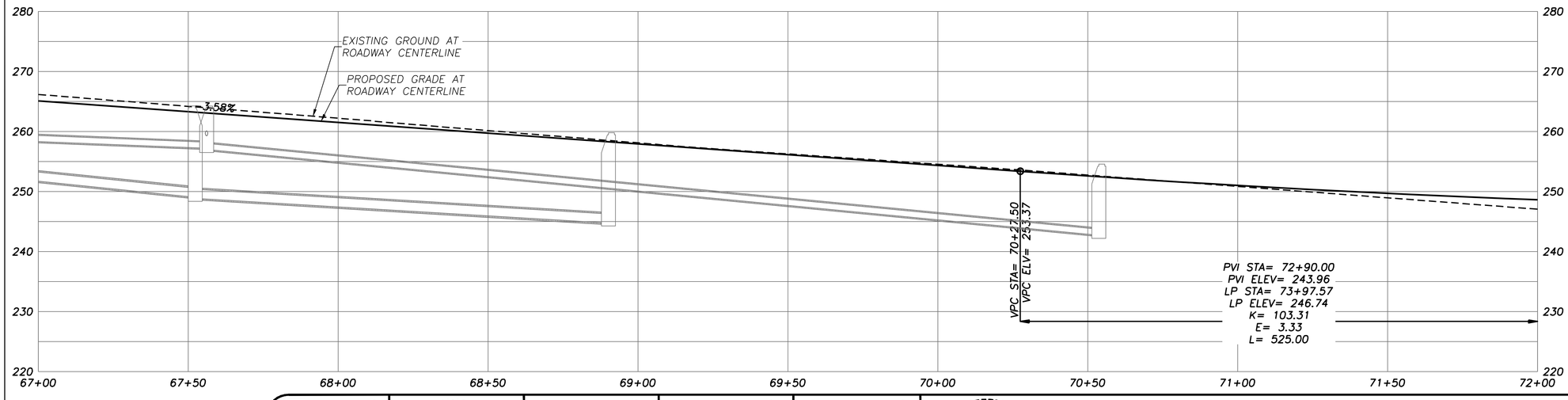
10. INSTALL MAILBOX SUPPORT OF TYPE NOTED PER DETAIL ON SHEET RD(x)
13. LANDSCAPING, PER SHEET LSP(x)



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CLARK COUNTY, WASHINGTON

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PUBLIC WORKS
ENGINEERING & CONSTRUCTION DIVISION

ENGINEERING AND DESIGN SECTION

JESSICA THORN — STATE OF WASHINGTON — 21006426 — REGISTERED PROFESSIONAL ENGINEER

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NE 179TH ST (NE 15TH - NE 26TH) - PRJ# 001779

ROADWAY PLAN AND PROFILE
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Geotechnical Engineering Design Study
NE 179th Street Improvement Project
Clark County, Washington

Prepared for
Clark County Department of Public Works

November 25, 2002
15340

DRAFT

HARTCROWSER
Delivering smarter solutions

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DRAFT

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GEOTECHNICAL ENGINEERING DESIGN STUDY
NE 179th STREET IMPROVEMENT PROJECT
CLARK COUNTY, WASHINGTON

INTRODUCTION

This report presents Hart Crowser's geotechnical exploration and recommendations for the proposed NE 179th Street Improvement Project, in Clark County, Washington.

The significant aspects of this report have been arranged in the following manner:

- Summary;
- Project understanding;
- Subsurface conditions;
- Engineering conclusions; and
- Appendices addressing field explorations.

PURPOSE, SCOPE, AND PROJECT UNDERSTANDING

Purpose of Work

The purpose of our work was to provide geotechnical engineering recommendations for the design and construction of proposed improvements. Our recommendations include the following:

- Site preparation;
- Fill and backfill placement and compaction criteria, and suitability of native soils for use in compacted fill and backfill;
- Construction in areas overlying highly organic silts, peat, and muck;
- Trench excavations and dewatering;
- Limitations of the site soils during wet weather construction;
- Asphalt pavement design sections;
- Subgrade stabilization during wet weather; and
- Utility trench work.

Scope of Hart Crowser's Services

Our scope of services for this project included the following:

- A review of general geologic literature and previous geotechnical reports in the project vicinity;
- Surficial reconnaissance;
- Subsurface explorations;
- Laboratory testing;
- Geotechnical engineering analyses; and
- Preparation of this report.

LIMITATIONS OF OUR WORK

This work was performed for the exclusive use of Clark County Department of Public Works and their clients and consultants, for specific application to this project and site. We performed this work in accordance with generally accepted professional practices in the same or similar localities, related to the nature of the work accomplished, at the time the services were performed. No other warranty, express or implied, is made.

SITE DESCRIPTION AND PROJECT UNDERSTANDING

Project Understanding

Hart Crowser's understanding of the project is based upon discussions with Clark County Department of Public Works as well as review of design plans and information provided to Hart Crowser by the Department of Public Works. The improvement project will consist of the widening and repaving of NE 179th Street starting approximately from the intersection of NE 10th Avenue and terminating at the intersection of NE 179th Street and NE 50th Avenue. The site location has been indicated on Figure 1. The extent of the project has been indicated on Figure 2.

Additional aspects of the project include the construction of stormwater quality (WQ) features within areas yet to be determined. Trenching and installation of new utilities or relocation of existing underground utilities will likely occur as well. Significant earthwork is also anticipated and will include large areas of cutting and filling. In addition, construction of grid-reinforced retaining walls will

occur on most sections of the site. Prefabricated concrete culvert crossing is also being considered for several of the creek crossings.

Site Description

The terrain encompassing the improvement project can be described as relatively rolling. The NE 179th Street alignment crosses a series of north to south trending ridges and low-lying creeks and streams associated with the Mill Creek and Whipple Creek drainage basins. Surface water and very shallow ground water are present within these lower-lying drainage features year around. The drainages are characterized by moderate to steeply sloping banks, heavy vegetation cover consisting of various coniferous and deciduous trees, and significant blackberry undergrowth in areas. Culverted road embankment fills are present in each of the existing drainage crossing.

Site elevations over the majority of the road alignment vary between approximately 210 and 270 feet above Mean Sea Level (MSL). The elevations are based upon review of pertinent project site plans developed by Clark County Department of Public Works and the U.S. Geological Survey (USGS) topographical studies of the project vicinity. Native slopes within the project areas are typically moderately sloping, with localized steeply sloping areas within the drainages.

Road section areas established near native grades are, in many areas, bounded on both shoulders by drainage ditches on the order of 1 to 3 feet deep. The ditches typically have shallow culverts at intersections and driveways.

Based upon field explorations, the existing NE 179th Street Pavement Section consists of an asphalt concrete section over a granular base. No underlying, older concrete pavement section was observed in any of our borings.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Results of Field Exploration

The following represents a summary of the findings in this report. Please refer to the full report for all of the assumptions and details regarding our findings.

- Subsurface conditions can be categorized into several distinct soil units. The first unit consists of various road embankment fills. Fill material observed in subsurface explorations typically consisted of a medium-stiff to stiff silt.

- The second distinct soil unit consists of native mineral soils underlying the vast majority of the project site. This soil unit varies from medium-stiff to stiff silt, sandy silt, and clayey silt.
- Deeper-seated native soils were observed to consist of saturated sands and clay.
- Groundwater conditions underlying the site vary on a seasonal basis. In general, perched water and groundwater can be expected at and above the native ground surface within the drainage areas. On other portions of the site groundwater depths were either not encountered, or were encountered at depths in excess of approximately 10 to 15 feet below the ground surface (bgs). A summary of groundwater depths at the time of drilling is contained in the Subsurface Conditions section of this report. Ground water elevations should be expected to rise several feet during late fall through late spring months.

Site Preparation and Excavations

Structural Fill and Road Embankment Fill. The native soils underlying the project, if properly moisture-conditioned and compacted, are suitable for reuse as structural fill and road embankment fill. Organic soils, such as topsoil strippings, organic silt, should not be reemployed as structural or embankment fills.

Stripping and Grubbing. Stripping depths along most road shoulder areas are anticipated to range from 4 to 6 inches over the majority of the site. Deeper topsoil, organic soils, root balls, and forest duff should be anticipated within wooded areas and along the base and fringes of drainages. These areas may require stripping and grubbing to depths of approximately 1 to 3 feet.

Drainages. Earthwork within drainages will encounter soft, wet soils along the base of such features. Wet weather grading recommendations should be adhered to within these areas regardless of the time of year construction is occurring.

Compaction Criteria. It is recommended that compaction criteria be based upon optimal material density as determined by ASTM D1557 (Modified Proctor) testing. Road embankment fills and trench backfills should be compacted to 92 percent. The road base rock and upper foot of subgrade should be compacted to 95 percent.

Asphalt Concrete Pavement Design. Future traffic design loading was still being assessed at the time this report was prepared. Recommendations regarding asphalt concrete pavement design will be completed once this assessment has been completed.

GEOLOGIC SETTING

Geologic Overview

Near-surface geology within the project area consists of one major near-surface unit, categorized as late Pleistocene-aged lacustrine deposits derived from glacial dam outburst events. This soil unit is characterized by unconsolidated sand and silt deposits, with a maximum thickness in the range of 50 to 100 feet. In the project area, the thickness appears to be in the 20- to 40-foot range.

Deeper-seated geology underlying the site consists of the lower Pliocene-aged Troutdale Formation. The Troutdale formation is characterized by sandstone and conglomerate, with minor amounts of siltstone and claystone. The weathered surface is a very stiff, clayey silt and silty clay with some sand interbeds. The Troutdale appears to have been encountered in borings 1, 3, 8, 11, and 12.

United States Soil Conservation Service Soil Survey of Clark County

Office review of the United States Soil Conservation Service ([USCS] now known as the Natural Resources Conservation Service [NRCS]) soil survey of Clark County (1972) indicates the presence of several major near-surface native soil units mantling the site. In general, the NRCS only classifies soils present in the upper 4 to 6 feet of material mantling a site. The NRCS identifies these soil units respectively as Gee Silt Loam, Hesson Clay Loam, Dollar Loam, and the Cove Series of silty Clay Loam. A summary of the soil properties of these units, as well as the approximate extents over the project area, is described below.

Gee Silt Loam. This soil unit appears to make up the vast majority of near surface native soil along the western half of the project. Unified soil classification of this unit is established as ML or CL; the equivalent AASHTO classification is A6. Shrink-swell potential is considered moderate. Soil fines contents (i.e., percentage of soil particles smaller than a standard No. 200 sieve) vary from 70 to 85 percent, and pH levels fall into the range of 5.1 to 6.

Hesson Clay Loam. This soil unit's presence is limited to the western half of the project. Unified soil classification of this unit is established as CL to CH, and the AASHTO classification is A7. Shrink-swell potential is considered moderate; fines contents (i.e., percentage of soil particles smaller than a standard No. 200 sieve) vary from 85 to 90 percent, and pH levels are classified as falling in the range of 4.5 to 6.0.

Dollar Loam. This soil unit is found predominantly along the eastern half of the project site. It is intermingled with several other soil units. Unified soil classification of this unit is established as ML to CL, and the AASHTO

classification is A4. Shrink-swell potential is considered moderate; fines contents (i.e., percentage of soil particles smaller than a standard No. 200 sieve) vary from 60 to 70 percent, and pH levels are classified as falling in the range of 4.5 to 6.0.

Cove Silty Clay Loam. This soil unit's presence appears to be confined to lower lying portions of the project. It is particularly prevalent within drainages and areas along the fringe of drainages. Unified soil classification of this unit is established as CL to CH, and the AASHTO classification is A7. Shrink-swell potential is considered moderate to high; fines contents (i.e., percentage of soil particles smaller than a standard No. 200 sieve) vary from 70 to 80 percent, and pH levels are classified as falling in the range of 5.6 to 7.3.

Seismicity and Earthquake Sources

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

The Cascadia Subduction Zone. The CSZ is located offshore and extends from Northern California to British Columbia. Within this zone, the oceanic Juan De Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The return interval for large subduction zone earthquakes is believed to be 300 to 500 years. Evidence suggests that the most recent subduction zone event took place approximately 300 years ago. Geomatrix's study (1995) suggests the maximum earthquake associated with the CSZ is moment magnitude (M_w) 8 to 9. A subduction zone earthquake of magnitude 8.5 was assumed for the purposes of this report.

The Intraplate Zone. The intraplate zone encompasses the portion of the subducting Juan De Fuca Plate located at a depth of approximately 30 to 50 km below western Oregon. Very low levels of seismicity have been observed within the intraplate zone in Oregon; however, much higher levels of seismicity within this zone have been recorded in Washington and California. Historical activity associated with the intraplate zone includes the 1949 Olympia (magnitude 7.1), the 1965 Puget Sound (magnitude 6.5), and the 2001 Nisqually (magnitude 6.8) earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

The recent (February 28, 2001) seismic event near the town of Nisqually, Washington (the epicenter of which was between Tacoma and Olympia, approximately 10 miles northeast of Olympia) has been classified as an intraplate-type seismic event. The Nisqually quake resulted in 320 reported injuries and over $2 billion in property damages. The magnitude of the Nisqually Quake was 6.8. The focus of this quake was approximately 30 miles deep. It was felt strongly in Portland and Vancouver, as well as in British Columbia.

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

Site Soil Seismic Coefficient. Any foundation design required for the project in which seismic design parameters are required should be based upon a site soil coefficient of S_D and a Zone Factor (Z) of 0.3.

SUBSURFACE CONDITIONS

Overview

The field explorations for this project were conducted during the Fall of 2002, and consisted of a surficial reconnaissance and the drilling of 14 solid stem augered borings. The maximum depth of any of Hart Crowser's subsurface explorations was approximately 55.5 feet (bgs) in B-12. The approximate locations of subsurface explorations are shown on the accompanying Site Plans.

Logs of all subsurface explorations have been included in Appendix A of this report. The attached logs describe soils and various engineering properties of soils encountered during exploration. Descriptions are based upon *in situ* testing, laboratory testing, and field classification of soil samples.

A summary of subsurface conditions encountered within our borings has been provided below.

Topsoil and Root Mat

Topsoil. It should be anticipated that several inches of topsoil and root matter will mantle the majority of existing road shoulder areas. Typical topsoil depths will average approximately 4 to 6 inches.

Limited segments of the project in which deeper stripping will be required will become apparent during site preparation and site earthwork. These areas will typically manifest themselves within wooded areas and in areas at the base of, and adjacent to, drainages. Stripping in these areas may range anywhere from 1 to 3 feet of soft or wet organic soils. Duff and rootballs will also be present in wooded areas, or areas that are heavily vegetated with brush or blackberries. Grubbing depths in these areas are anticipated to vary from 1 to 3 feet.

Topsoil strippings and other organics should not be reemployed within structural fills or road embankment fills. Topsoil stripping could potentially be reused in thin landscape fills, or in low-lying landscape berms.

Existing Pavement Section

The existing pavement section for NE 179th Street was observed to vary in thickness across the site. The pavement sections observed during site drilling typically consisted of several inches of asphalt concrete over a granular base. Asphalt thickness was observed to range from approximately 5 to 7 inches. One boring location encountered an asphalt concrete section of approximately 9 inches at Boring B-2. Boring B-2 was located near STA. 36+00.

The rock base underlying the pavement is also variable in thickness and ranges anywhere from little or no base rock up to approximately 18 inches of silty crushed rock. The base rock section observed in our borings consisted of silty crushed rock, silty pit-run sized material, or silty sand.

Pavement thickness and base rock encountered in each of our borings is indicated in the following table.

Table: Existing Pavement Sections Observed During Subsurface Exploration

Boring	Approximate Station	Asphalt Concrete Thickness (inches)	Base Rock Thickness (inches)
B-12	26+00	N/a*	N/a*
B-1	29+00	5.5	15
B-2	36+00	9	> 2
B-3	44+50	5.5	9
B-13	54+50	7	Gravel fill
B-4	71+50	5.5	9
B-5	73+00	6.5	> 2
B-6	83+50	5.5	3.5
B-7	87+00	5.5	3.5

B-8	92+00	5.5	9
B-14	98+00	N/a	N/a
B-9	110+50	5.5	12
B-10	117+75	5.5	> 2
B-11	122+75	5	> 2

Note: N/a indicates boring was located along grassy or gravel-covered road shoulder areas.

Road Embankment Fill

Several north to south trending creek and stream drainages bisect the existing NE 179th Street Alignment. The road crossing areas over these drainages are via road embankments fills. The embankment fills appear to have been constructed primarily from material obtained from near by burrow sources. Soil samples obtained from these fills consisted of fine-grained silts or clayey silts typical of this area of Clark County. The borings advanced into road embankment fills encountered medium-stiff to stiff, damp to moist, brown and gray, silt fill. Trace organics were occasionally observed in samples obtained from existing road embankment fills, but for the most part these fills seem to have been constructed in accordance with typical structural fill construction criteria.

Native Soils

The native soils underlying the site consisted of two major near-surface soil units. Near surface soils observed during site subsurface explorations consisted of near-surface medium-stiff to stiff, damp to moist, yellow-brown or brown, medium-stiff to stiff silt, sandy silt, and clayey silt. This soil unit is relatively thick and is expected to be the primary soil unit encountered in road cuts and utility trenches.

If moisture conditioned and compacted, the native soils underlying the project site will function adequately as structural fill and road embankment fill. The native soils underlying the site will also function adequately as road subgrade if properly prepared during construction (see the Pavement Recommendation Section for Subgrade preparation). Because of the moisture sensitivity of the native soils, grading and fill construction should be limited to extended periods of warm dry weather. Processing and drying requirements will typically make this material ill suited for use as trench backfill in areas that will underlay pavement sections or other settlement sensitive structures.

Deeper Seated Soil Units

Two deeper exploratory borings were advanced along the western side of the project alignments. The purpose of these deeper borings was to determine conditions for deep-foundations if required within this area for a possible "fly-over" ramp/bridge. Boring B-1 and Boring B-12 were advanced to depths of 41.5-feet and 56.5-feet respectively. Soils encountered at depths in excess of approximately 20-feet bgs consist of stiff clays and silts, with a loose, wet, gray sand encountered in B-1 only. The sand unit transitions into very stiff clay at depths below approximately 40 feet. Moderately loaded piles could be established within the very stiff clay units underlying the site.

Groundwater Conditions

The depth of groundwater at the time of our exploration varied across the proposed road improvement area. Groundwater depths observed at the time of our drilling explorations is presented in the following table.

Table: Groundwater Levels At the Time of Drilling

Boring	Approximate Station	Groundwater ATD* (feet)
B-12	26+00	20
B-1	29+00	15.5
B-2	36+00	11
B-3	44+50	14
B-13	54+50	Not encountered to 5.5-ft**
B-4	71+50	16
B-5	73+00	Not encountered to 21.5-ft**
B-6	83+50	Not encountered to 11.5-ft**
B-7	87+00	Not encountered to 21.5-ft**
B-8	92+00	15
B-14	98+00	Not encountered to 25-ft**
B-9	110+50	Not encountered to 21.5-ft**
B-10	117+75	Not encountered to 11.5-ft**
B-11	122+75	13

*Note1: ATD indicates groundwater at the time of drilling. Depth is below the existing surface grade at the time of Hart Crowser's site exploration.
Note2: Not encountered to 21.5-ft indicates the maximum depth of the boring was approximately 21.5-ft bgs and no groundwater was encountered up to that depth at the time of drilling.

Groundwater depths are expected to rise several feet during late fall through late spring months. This is particularly the case within areas adjacent to the various drainages that bisect the NE 179th Street alignment.

CONCLUSIONS AND RECOMMENDATIONS

Site Preparation

We have provided recommendations for wet weather and dry weather construction, as well as other geotechnical concerns and issues relative to the project site. Because of the moisture sensitive near-surface soils and the presence of shallow groundwater over much of the site, Hart Crowser strongly recommends site grading and utility trenching be conducted during dry weather conditions. The optimum time for site grading and trench work generally falls between late June and late September.

Road-Shoulder Topsoil. Road shoulder areas are typically mantled in 4 to 6 inches of topsoil. Preliminary site preparation should consist of stripping this topsoil layer from all road subgrade areas and new structural fills and embankment fill areas.

Limited areas where deeper stripping is required will become evident during site work. These areas may require stripping depths of between 1 to 3 feet below surface grades in order to remove surficial roots, surficial organic rich silts, or soft subgrade soils.

Drainage Ditches. It is relatively common to encounter soft, wet soils at the bases of existing ditches. The bottom of ditch areas may require stabilization prior to constructing structural fills or road embankment fills over these areas. Following surficial stripping of any topsoil in ditch areas, any soft subgrade areas should be overexcavated to firm native mineral soil. Overexcavated areas should be backfilled with suitable compacted structural fill material. Typically, overexcavations should not exceed 1 to 2 feet bgs.

Dry Weather Construction. It is recommended that compaction criteria for structural fills, embankment fills, and trench backfills be based upon ASTM D1557. Embankment fills, structural fills, and backfills should be compacted to 92 percent of the material's maximum dry density. Landscape fills and nonstructural berms should be compacted to approximately 85 percent of the material's maximum dry density. Compaction of grid-reinforced fills should adhere to proprietary specifications. This often entails slightly reduced compaction requirements adjacent to the backside of block walls.

Even during dry weather, some areas of the road subgrade may become soft or may "pump" (deflect under wheel load), particularly in cuts, poorly drained areas, abandoned drainage ditches, swales, old fills, and areas subjected to frequent heavy construction traffic loads. Soft or wet areas present at finished road subgrade elevations should first be scarified, tilled, dried, and recompacted. These areas should subsequently be proof-rolled again. If the area still deflects under wheel load, it should subsequently be prepared in accordance with the recommendations provided in the Wet Weather Construction Section of this report. Overexcavation of soft road subgrade areas can generally be limited to 1 to 2 feet. Filter fabric may also be employed to road subgrade areas where overexcavation of soft soils is required.

Overexcavated soft areas should be backfilled with clean granular stabilization rock. Stabilization rock should consist of clean bank-run gravel, diced rock, or pit-run quarry rock. Nominal material size should be 2 to 4 inches (minus).

Wet Weather and Wet or Soft Subgrade Construction Methods. During wet weather, or when adequate moisture control is not possible, it may be necessary to install a granular working blanket to support construction equipment and provide a firm base on which to place subsequent fill and pavement. Commonly, the working blanket consists of a bank-run gravel or pit-run quarry rock. Nominal material size should not exceed 4 inches (minus). Import material fines content should not exceed maximum allowable Washington State Department of Transportation (WSDOT) standards for fines content (i.e., maximum allowable by weight material passing a standard No. 200 sieve).

As an alternative to a granular working blanket, it may be possible to substitute a certain percentage of the overall working blanket thickness with a cement treated soil base. Based upon our past experience with cement treated working blankets, it is likely that cement content will be in the range of 5 to 7 percent by weight.

After installation, the working blanket should be compacted by a minimum of four complete passes with a moderately heavy (15,000 pounds) static steel drum or grid roller. We recommend Hart Crowser be retained to observe granular working blanket installation and compaction.

The working blanket must provide a firm base for subsequent fill installation and compaction. It has been our experience that a minimum of 1 to 2 feet of working blanket is normally required, depending on the gradation and angularity of the working blanket material. This assumes the material is placed on a relatively undisturbed subgrade in accordance with the preceding recommendations and is not subjected to frequent heavy construction traffic.

Portions of the site used as haul routes for heavy construction equipment will require a thicker working blanket in order to protect the fine-grained subgrade.

A heavy-grade, nonwoven, nondegradable filter fabric installed on the fine-grained subgrade will be required to prevent silt and clay from contaminating and pumping the granular working blanket. If desired, we can provide sample specifications for filter fabrics. Working pads and construction haul roads constructed over the Cove silty clay loam area will require additional consideration. These areas are likely to require much thicker stabilization layers, as well as tensar-grid or geo-web reinforcement.

Construction practices can greatly affect the amount of working blanket necessary. In addition, the use of a cement-treated soil subgrade can significantly reduce the amount of granular working blanket required. By using tracked equipment and granular haul roads, the working blanket area can be minimized. If dump trucks and rubber-tired equipment are allowed random access across the site, a thicker working blanket may be required. Normally the design, installation, and maintenance of a granular working blanket are the responsibilities of the earthwork contractor.

Proof-Rolling of Road Subgrades. Regardless of which method of subgrade preparation is used (i.e., wet weather or dry weather), we recommend the prepared subgrade be proof-rolled with a fully-loaded dump truck or other suitable equipment prior to fill placement or base course installation. Any area that pumps, weaves, or appears soft and muddy, should be scarified, dried, and recompacted or overexcavated, and backfilled with compacted granular fill. If a significant length of time passes between fill placement and commencement of construction operations, or if significant traffic has been routed over these areas, we recommend the subgrade be similarly proof-rolled again before any foundation or pavement installation is allowed.

Water Quality Ponds

It is understood that several storm water detention ponds will be constructed as part of the NE 179th Street Improvement project. The actual sites for these water quality ponds had not been determined at the time this draft report was prepared. Once these areas have been finalized, and access permission obtained, Hart Crowser will be conducting supplemental subsurface investigations within pond areas. The purpose of these supplemental subsurface explorations would be to address pond liner requirements (if necessary), as well as detail suitable pond wall side slopes. Other geotechnical consideration associated with pond design and construction would also be addressed.

Road Subgrade

Subgrade conditions over the majority of the road alignment appear to consist of moderately-stiff native mineral soils or soft to medium-stiff embankment fill soils. Based upon results from our subsurface explorations, the native mineral soils and existing embankment fills will function adequately as road subgrade if prepared in accordance with the recommendations outlined in this report. Some sections of the project will encounter special construction challenges associated with marginal subgrade conditions. There will likely be other limited areas of the site that will require subgrade stabilization during either new embankment fill construction or road subgrade reconstruction.

Marginal Subgrade Stabilization. It should also be anticipated that limited areas of marginal subgrade will manifest themselves during construction. These limited areas of marginal subgrade, when encountered, should be assessed on a case-by-case basis to determine the best approach for stabilization. There are several common approaches to stabilization of road subgrade. These approaches typically can include the following:

- Subgrade scarification, aeration/drying followed by recompaction;
- Stabilization via overexcavation and replacement of soft areas with clean crushed rock or pit-run material. This option is sometimes employed in combination with placement of a geo-grid or geo-fabric over marginal subgrade areas prior to placement of stabilization rock; and
- Stabilization via in-place cement treatment. Typically, subgrade stabilization via cement treatment entails the use of a 5 to 7 percent cement content addition by dry unit weight. The cement additive is mixed into subgrade soils "in-place" with rippers, tillers, and scarifiers. Following mixing, the treated soils are subsequently recompacted. Practical depth of in-place treatment is usually 12 to 14 inches below surface grade.

In any of the above-described approaches, subgrade stabilization can typically be limited to depths of approximately 1 to 2 feet below design subgrade elevations.

Embankment Fills and Structural Fills

Embankment and structural fills should be installed on a subgrade prepared in accordance with the above recommendations. Fills should be installed in horizontal lifts not exceeding 8 inches in thickness (loose - prior to compaction), and should be compacted to at least 92 percent of the material's maximum dry density as determined by ASTM D1557 (modified proctor) testing. The compaction criteria may be reduced to 85 percent in nonstructural

landscape or nonstructural berms. The road base below the asphalt section and the upper 12 inches of road subgrade should be compacted to 95 percent as determined by ASTM D1557.

Materials that cannot be moisture-density tested due to oversized rock fragments should be compacted by a minimum of four passes with a moderately heavy (15,000 lbs.) drum roller. This material should subsequently be observed for its performance under heavy wheel loads. Any area that pumps or deflects excessively should be prepared in accordance with our previous recommendations.

In order to achieve acceptable levels of compaction, it is generally desirable to maintain moisture contents of fine-grained fill soils within the range of 3 to 4 percent of the optimum moisture content.

Each compacted layer of structural fill or road embankment fill should be observed for excessive deflection or reaction under moving loaded equipment to verify no soft or pumping areas remain in any layer. Areas noted to deflect excessively should be prepared in accordance with the dry and wet weather grading recommendations provided above.

Structural fills or embankment fills placed over ground with slopes in excess of 5H:1V should be keyed and benched into existing slopes. Seeps encountered during grading on sloping ground should be intercepted via area drains. Outfalls for such drains should be routed to the toe of such slopes and should not be allowed to drain freely over slopes. Area drains are typically field-designed on a case by case basis. Usually seeps will be intercepted via 6 inch perforated drain pipes surrounded by clean crushed rock or drain rock fill.

Utility conduits should be bedded in sand or 5/8-inch (minus) gravel within one conduit diameter. Bedding should surround the pipe in all directions. Trench backfill should be lightly compacted within two pipe diameters or 18 inches, whichever is greater, above breakable conduits. The remaining backfill should be compacted to 92 percent of the material's maximum dry density as determined by ASTM D1557.

A summary of recommended compaction specifications is provided in the table below.

Fill Compaction Recommended Specifications

Material	Percent of Maximum Dry Density ASTM D 1557 (percent)
Fine Grained Fill	92
Landscaping Fill	85
Clean Granular Fill	95
Pavement Subgrade	95

Suitable Fill

Structural Fills During Summer Grading. During dry weather, road embankment fills and other structural fills may consist of virtually any relatively well-graded soil free of debris, organic matter, and high percentages of clay or clay lumps, that can be compacted to the preceding specifications. However, if excess moisture causes the fill to pump or weave, those areas should be dried and recompacted or removed and backfilled with compacted granular fill. To achieve adequate compaction during wet weather, or if proper moisture content cannot be achieved by drying, we recommend fills consisting of well-graded, clean granular soils (sand or sand and gravel) that do not contain more than 5 to 6 percent material by weight passing the No. 200 sieve. In addition, it is usually desirable to limit this material to a maximum of 4 inches in diameter for ease of compaction and future utility installation.

Wet Weather Grading and Subgrade Stabilization Fills. Because moisture levels are difficult to control in fine-grained soils and soil drying via aeration is not realistically an option, structural fill constructed during the wet season should consist of clean, durable crushed rock, or clean granular fill. Typically, wet weather grading conditions should be assumed between the months of mid-October through early to late June.

Wet Weather Grading with Cement-Treated Soils. An alternative to the use of granular fill is cement treatment of native soils to be employed in structural fill. This is accomplished using specialized spreaders and mixers and is sometimes more cost-effective than imported granular fill. Soil cement treatment is typically a contractor related means-and-methods item. This type of soil treatment is typically conducted by spreading Portland cement over the surface of the soils to be treated. The Portland cement is subsequently tilled or disced into soils via specialized mixing equipment. Ideal mixing depths are typically between 12 and 18 inches bgs, dependent upon the contractors' equipment and their construction approach. Percentage of cement additive to soils being treated in this manner often varies depending upon soil moisture content and soil clay

content. It has been Hart Crowser's past experience with the native soils in the project vicinity that 5 to 7 percent cement additive by total weight will be required to achieve acceptable compaction levels and soil stiffness within fills, subgrades, or haul routes. Employing local earthwork contractors with experience in soil cement treatment will typically minimize construction delays and budget overages associated with wet weather grading.

Pavement Base Rock. Crushed rock utilized in these areas should consist of clean, 5/8- to 1-1/2-inch (minus) durable crushed rock. The material should be clean and thus contain less than 5 percent fines by weight passing a standard No. 200 sieve.

Trench Backfill. Utility conduits should be bedded in sand or 5/8-inch (minus) crushed rock within one conduit diameter surrounding the pipe in all directions. Trench backfill should be lightly compacted within two pipe diameters or 18 inches, whichever is greater, above breakable conduits. Trench backfill underlying pavements or other settlement-sensitive structures or features should consist of durable, clean, crushed rock with nominal size between 5/8 inch (minus) and 1-1/2 inches (minus). This material should be clean and contain less than 5 to 6 percent fines by weight passing a standard No. 200 sieve.

Working Pads for Marginal Subgrade Areas and Wet Weather Grading. The working pad for wet weather construction should consist of durable, clean, crushed rock, bank-run, or pit-run material. Nominal size should be between 1-1/2 inches (minus) and 4 inches (minus). The material should contain less than 5 to 6 percent fines by weight passing a standard No. 200 sieve.

Areal Settlements

Areal Settlements. Areal settlements for fills constructed to maximum heights of 10 to 12 feet or less, are estimated to be less than approximately 1 inch. Areal fills of approximately 12 to 20 feet in thickness will likely settle 1 to 2 inches. This assumes fill construction over firm native mineral soil subgrades. If fills are constructed in accordance with Hart Crowser's recommendations regarding fill compaction, subgrade stabilization, and optimal moisture levels for fill placement, the majority of areal fill settlement is expected to occur during fill construction.

Cuts & Fills

Significant cutting and filling is anticipated for the project. It is recommended that structural fill and embankment fill be graded to finished slopes of no steeper than 2H:1V. Permanent cut slopes into native soils should also have finished

grades no steeper than 2H:1V. Cut and fill slopes with vertical heights in excess of approximately 15 feet should be accessed for long term global stability.

Structural fill and embankment fill constructed over moderately sloping ground should be keyed and benched into firm structural fill or native mineral soils. Any fills constructed over ground that is steeper than approximately 5H:1V should be keyed and benched into the existing ground. A schematic of recommending keying and benching has been provided on Figure 4.

If ground seeps are encountered during stripping or keying and benching, groundwater should be intercepted by perforated pipes wrapped in drain rock and filter fabric. The drain's function is to maintain drained conditions within fill slopes and reduced long-term stability issues with the fill slope. Drains should be designed to drain by gravity toward storm water lines or tight-lined to the base/toe of fill slopes. Outfalls should be armored with rip-rap or gabions, or other approved erosion resistant material.

It is possible that the toe area of larger fills may be started over wet subgrade areas at the base of drainages. Typically the initial lift or two may require use of granular import to bridge softer subgrade soils, and establish a firm base over which the remainder of the fill can be constructed. Suitable fill material required for this purpose would include a clean pit-run or large nominal-sized crushed rock (two inch minus or four inch minus angular rock).

Erosion Control

Hart Crowser recommends finished cut and fill slopes be protected immediately following grading with vegetation, gravel, or other approved erosion control methods. Water should not be allowed to flow over slope faces or drop from outfalls, but should be collected and routed to stormwater disposal systems. Riprap, gabion baskets, or similar erosion control methods may be necessary at stormwater outfalls or to reduce water velocity in ditches. Silt fences should be established and maintained throughout the construction period. Silt fence barriers should be established down slope from all construction areas to protect natural drainage channels from erosion and/or siltation. To decrease erosion potential, care should be taken to maintain native vegetation and organic soil cover in as much of the site as possible.

Excavations and Utilities

Native soils may stand near vertical slopes for short periods of time; however, they may collapse suddenly and without warning. Precautions in utility trench and other excavations will be required due to the potential for caving/sloughing

within native soils underlying the site. Any excavations deeper than 4 feet should be sloped or shored in accordance with Occupational Health and Safety Administration (OSHA) regulations. Normally, shoring systems are contractor designed and installed items.

Dewatering and Trench Wall Stability. Dewatering within trenches and excavations will be required on some segments of the project site. Earthwork and utility contractors should anticipate some level of dewatering during site work particularly within trenches and excavations in the proximity of the various creeks and streams that bisect the site.

Moisture Sensitive Utilities. Utilities sensitive to moisture should be placed in watertight conduits. Utility conduits should be bedded in sand, or a suitable sand and gravel mix, within one conduit diameter surrounding the pipe in all directions. Trench backfill should be lightly compacted within two diameters or 18 inches, whichever is greater, above breakable conduits. The remaining backfill should be compacted to 92 percent of the material's maximum dry density as determined by ASTM D1557.

Near Excavation Settlement. Excavations and cuts can often result in settlement or loss of support of the surrounding ground surface. These settlements may be sufficient to cause damage or distress to buildings, retaining walls, utilities, services, or other structures located near the excavation. Shoring or underpinning of structures and/or existing underground utilities sensitive to settlement may be required when trenching is advanced adjacent to these lines. Typically, temporary construction shoring is both contractor designed and implemented.

GEO-GRID RETAINING WALLS

Geo-grid reinforced retaining wall foundations should be designed for an allowable bearing capacity of 2,500 pounds per square foot (psf). This allowable bearing capacity assumes wall foundation pads or crushed rock leveling pads are established over firm native subgrade or structural fill. A passive pressure in resistance to lateral loads of 300-pcf equivalent fluid weight may be employed for geo-grid retaining walls embedded below finished surface grades. An ultimate base friction value equal to 40 percent of the vertical load may also be used at the base of foundations as sliding resistance.

Grid reinforced retaining wall backfill can consist of any material that adheres to grid manufacturing specifications. Ideally, backfill used for geo-grid reinforced retaining walls should consist of clean, durable, free-draining

granular material. Use of clean granular backfill within the geo-grid reinforced zone provides two advantages;

- High shear strength, and thus increased global wall stability; and
- Good drainage characteristics and thus reduced potential for developing hydraulic pressure over time along the backside of the wall.

Other backfill types will function within geo-grid reinforced walls subject to soil strength parameters outlined below. Whatever the final choice for the geo-grid reinforced backfill zone, it is recommended that a drainage layer consisting of clean crushed rock be employed in the backfill zone immediately behind the back of the retaining wall. The drainage layer should extend a minimum of 12 to 18 inches laterally into the wall backfill zone. This drainage layer should consist of clean, well-graded, crushed rock or drain rock material with less than 5 to 6 percent material by weight passing the No. 200 sieve. Use of other material could increase lateral pressures acting on the grid-reinforced wall. Overcompaction of the reinforced backfill adjacent to the wall can also greatly increase lateral soil pressures acting on the wall.

Typically, the grid and wall block manufacturer will specify a recommended setback zone behind the wall in which a low compaction level should be adhered to. In many cases, the level of compaction in this zone will be between 90 and 92 percent of the maximum density determined in accordance with ASTM D1557. Proprietary specifications will often call out that smaller compaction equipment such as light weight self propelled compactors or hand operated vibratory skidders or jumping jacks will also be employed in this zone immediately adjacent to the back of the retaining wall blocks.

Wall Drains. It is recommended that a 6-inch diameter perforated drainpipe be established at the heel of the geo-grid retaining wall foundations or along the top of the leveling pad or footing. The perforated pipe should be encapsulated in clean, free draining, crushed rock. A filter fabric or silt sock should be used to prevent internal soil erosion and potential clogging of the drains.

Backfill Soil Strength Design Recommendations. Recommended soil strength parameters for use in geo-grid reinforced retaining wall design are summarized in the following table. Soil cohesion should be assumed as zero.

Geo-Grid Backfill Soil Strength Design Recommendations

Backfill Type	Design Friction Angle (phi)	Moist Soil Unit Weight (gamma)
Crushed Rock	35 degrees	140 pcf
Clean Sand	30 degrees	115 pcf
Native Soil**	26 degrees	125 pcf

****Note:** Native soil conditions over the site typically consist of lower strength clay silts. Use of this type of backfill should be restricted to placement during warm, dry summer months. This soil unit will require processing via turning and drying to reduce natural moisture contents to levels where placement and compaction can be conducted. Soil drying can usually only be conducted during extended periods of warm, dry weather.

Traffic Surcharging Loads. If traffic loads are expected within a horizontal distance from the top of the geo-grid wall equal to the wall height, a uniform lateral earth pressure acting horizontally on geo-grid reinforced walls equal to 60 psf should be added to earth loads acting on the wall. If back-slopes behind geo-grid reinforced walls are not horizontal/level, additional soil surcharge acting on the geo-grid retaining wall should be incorporated into global wall stability assessments.

Grid reinforcement and Future Utilities. Grid reinforcement can be relatively fragile with respect to future excavation work into the grid reinforced zone. For this reason, any wall design involving grid-reinforced retaining features needs to consider alignment of future underground utilities. Trenching through in-place grid reinforcement will destroy the integrity of a retaining system and may destabilize the retaining wall. It is therefore critical to consider the impact of employing grid reinforced retaining features with respect to future utility alignments.

Prefabricated Concrete Culvert Foundations

It is understood that prefabricated concrete culvert construction is being considered for some or all of the creek and stream crossing areas. The native soil conditions at foundation grade will likely be wet and may also be soft.

Although the actual construction approach will be contractor driven, it has been our experience in the past that dewatering 2 to 3 feet below the footing excavation areas, both prior to work commencement and during earthwork and foundation construction, will be required. It may be advantageous to consider prefabricated footings in this situation. Due to the condition of subgrade soils in culvert footing areas (i.e., soft and saturated), we recommend footing

construction consist of stabilizing the subgrade with a 3-foot overexcavation below base-of-footing grade. Hart Crowser recommends that a representative of our geotechnical engineering staff be retained during footing excavation and construction to determine where optimal bearing strata is encountered.

The overexcavated footing areas should be returned to design foundation subgrade elevations with imported clean compacted crushed rock. Maximum fines content within crushed rock should not exceed 5 percent by weight. The material should have a nominal size of 5/8 inch to 2 inches (minus) and should be compacted to 92 percent of the material's maximum dry density as determined by AASHTO T-180. Lateral dimensions of the overexcavation should extend to approximately one half the width of the culvert footing on all sides of the footing. Any other proprietary design and installation methods specific to the prefabricated concrete culverts should be adhered to during design and construction.

Allowable Bearing Pressure for Culvert Foundations. Based upon the results of preliminary office analysis and assumptions as to probable soil conditions in this area, an allowable soil bearing pressure of 2,500 psf can be utilized in foundation design for prefabricated concrete culvert footings. This allowable bearing capacity assumes the above recommendation regarding overexcavation of soft subgrade soils is conducted. It is assumed that foundation loads will fall within the range of 3 to 5 kips per lineal foot (factored dead plus factored live loads) dependent upon the final bridge span. If culvert loading conditions vary from these assumed loads by more than 10 percent, Hart Crowser should be advised to assess the validity of the above allowable bearing capacity. Total settlements of foundation elements associated with the above recommendations should be less than one inch. Differential settlement between separate footing elements should be less than 50 percent of the total settlement estimation.

Transient Loads. The above-described allowable soil bearing pressures may be increased by one-third for short-term transient loads (wind and seismic loading conditions).

Lateral Load Resistance for Culvert Footings. Lateral loads may be resisted by passive soil pressure along foundation edges. An equivalent fluid weight of 300 pcf may be employed for this purpose. A base friction of 40 percent of an applied vertical load may be employed for resistance via base friction. This base friction value should be considered an ultimate friction load and, therefore, contains no factor of safety.

Lateral Earth Pressure on Culvert Walls. Lateral soil pressure acting on restrained culvert walls should be designed based upon an equivalent soil fluid

weight of 40 pounds per cubic foot. This fluid weight assumes culvert wall drains are employed, and retaining wall backfill is level and consists of free draining rock. We recommended a uniform lateral surcharge pressure of 80 psf be applied to the culvert wall to model loading effects of vehicular traffic over the culverts.

Culvert Wall Drains. Drains should be employed behind all culvert wall areas, at the top or base of footing elevation, and should consist of a 4- or 6-inch perforated pipe. The perforated pipe should be encased in drain rock to a distance of approximately 1 foot around the pipe. The drain rock should be wrapped within a filter fabric to reduce the potential for siltation or else a fabric wrapped pipe should be employed.

Seismic Foundation Design Parameters. Seismic foundation design considerations, if required, should be based upon a site soil coefficient of S_D and a Zone Factor (Z) of 0.3.

PAVEMENT DESIGN RECOMMENDATIONS

Pavement design recommendation will be completed following determination of projected traffic loading conditions for NE 179th Street.

RECOMMENDATIONS FOR ADDITIONAL GEOTECHNICAL SERVICES

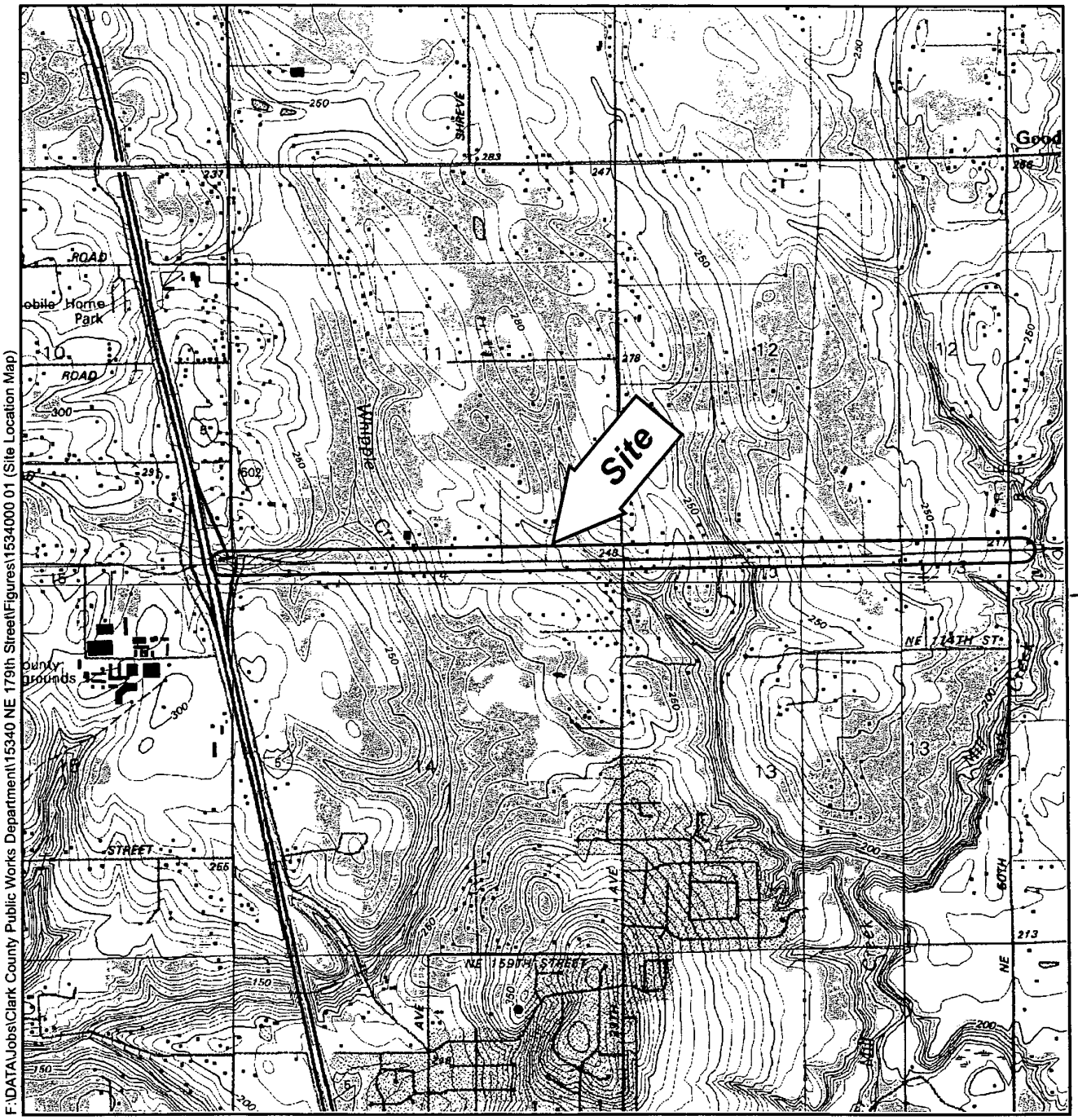
Prior to construction, we recommend Hart Crowser review the final design plans and specifications. This review will allow us to evaluate whether any change in concept may affect the validity of our recommendations, and whether our recommendations have been correctly interpreted. In order to correlate preliminary soil data with the actual soil conditions encountered during construction, and to assess construction conformance to our report, we recommend Hart Crowser be retained for construction observation of the following:

- Site preparation activities including fill placement and compaction;
- Subgrade beneath pavements; and
- Other geotechnical considerations that may arise during the course of construction.

CLOSING

This report presents Hart Crowser's geotechnical engineering evaluation and recommendations for the proposed NE 179th Street Improvement Project in Clark County, Washington. We trust this report meets your needs. If you have any questions, or if we can be of further assistance, please call. We look forward to working with you in the future.

Site Location Map
NE 179th Street
Clark County, Washington



F:\DATA\Jobs\Clark County Public Works Department\15340 NE 179th Street\Figures\1534000 01 (Site Location Map)

Note: Base map prepared from the USGS 7.5-minute quadrangles of Orchards, Vancouver, Battle Ground, and Ridgefield, WA, dated 1990.

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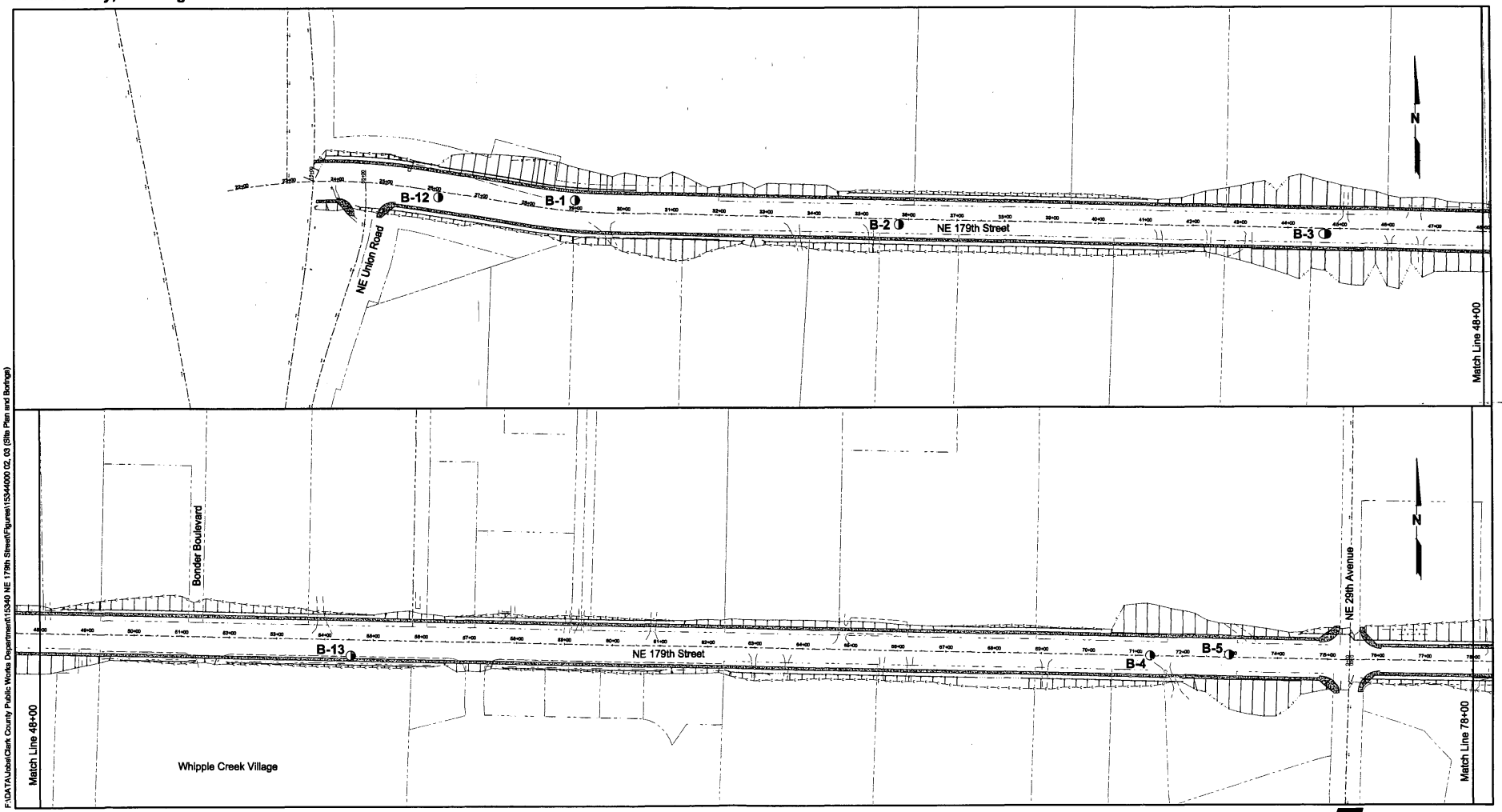
Figure 1

Site Plan with Boring Locations
NE 179th Street
Clark County, Washington



F:\DATA\Jobs\Clark County Public Works Department\15340 NE 179th Street\Figures\15344000 02, 03 (Site Plan and Borings)

Note: Base map prepared from and AutoCAD file by Clark County Department of Public Works.

Legend:

B-1 ◑ Boring Location and Number

0 200 400
Approximate Scale in Feet

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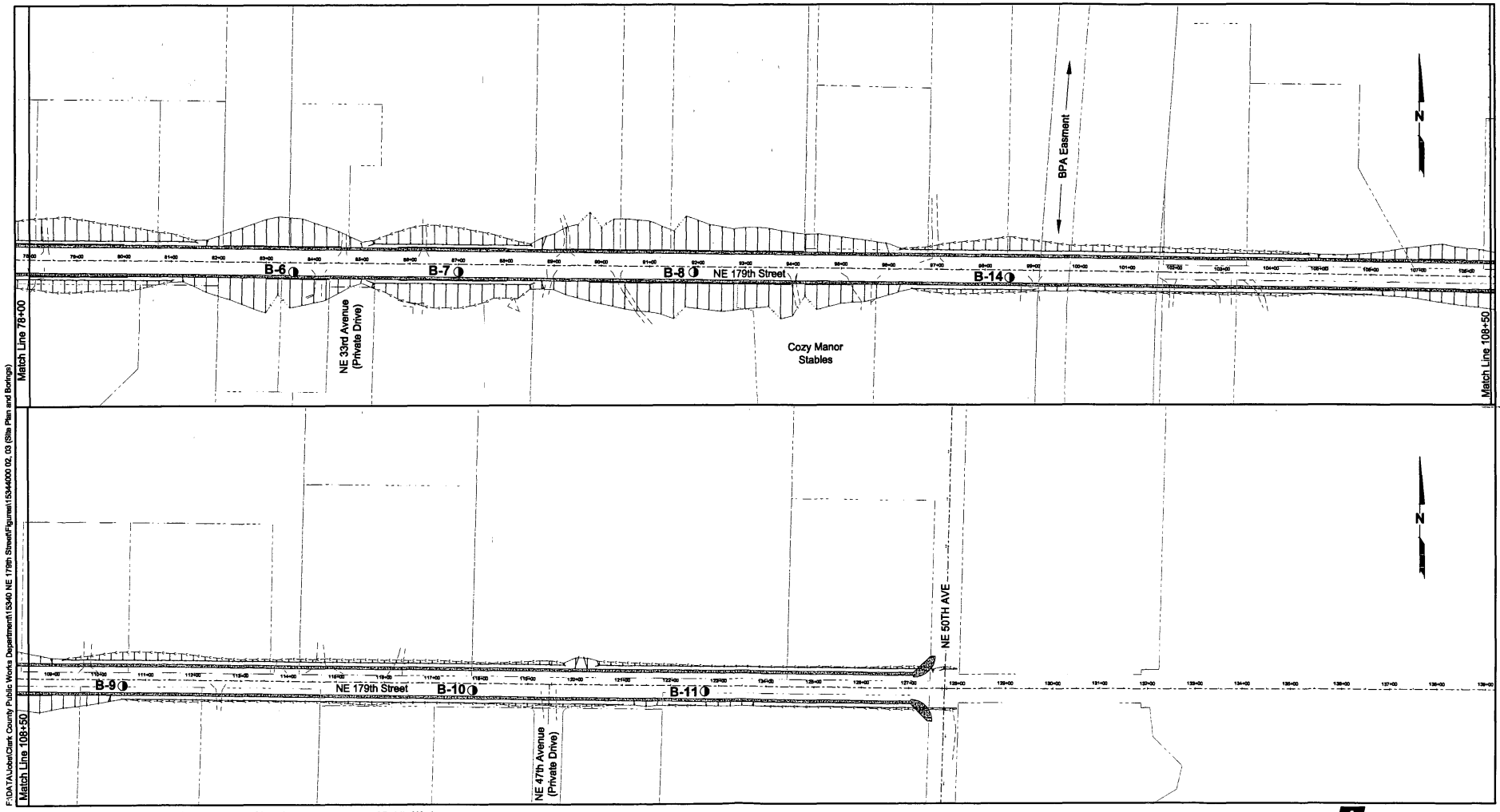
Figure 2

Site Plan with Boring Locations
NE 179th Street
Clark County, Washington



Note: Base map prepared from and AutoCAD file by Clark County Department of Public Works.

Legend:

B-1 ◑ Boring Location and Number

0 200 400

Approximate Scale in Feet

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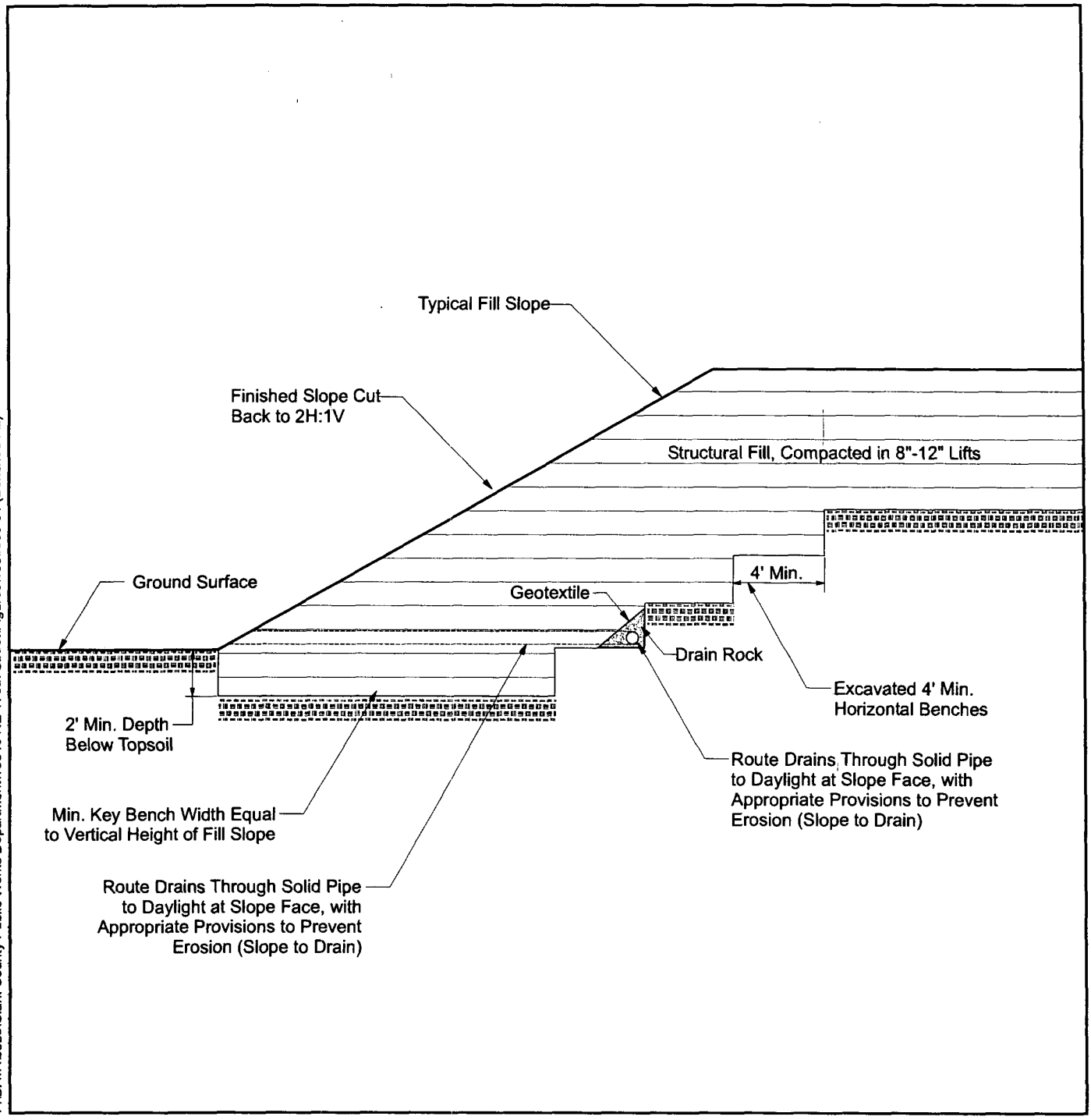
Figure 3

Typical Fill Benching Detail
NE 179th Street
Clark County, Washington



F:\DATA\Jobs\Clark County Public Works Department\15340 NE 179th Street\Figures\1534000 04 (Benched Fill)

NOT TO SCALE

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Figure 4

APPENDIX A
EXPLORATION LOGS

Key to Exploration Logs

Sample Descriptions

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, and grain size, and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT with additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and push probe explorations is estimated based on visual observation and is presented parenthetically on test pit and push probe exploration logs.

SAND and GRAVEL Density	Standard Penetration Resistance in Blows/Foot
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	>50

SILT or CLAY Density	Standard Penetration Resistance in Blows/Foot	Approximate Shear Strength in TSF
Very soft	0 - 2	<0.125
Soft	2 - 4	0.125 - 0.25
Medium stiff	4 - 8	0.25 - 0.5
Stiff	8 - 15	0.5 - 1.0
Very Stiff	15 - 30	1.0 - 2.0
Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture.
Damp	Some perceptible moisture, probably below optimum.
Moist	Probably near optimum moisture content.
Wet	Much perceptible moisture, probably above optimum.

Minor Constituents

	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Symbols

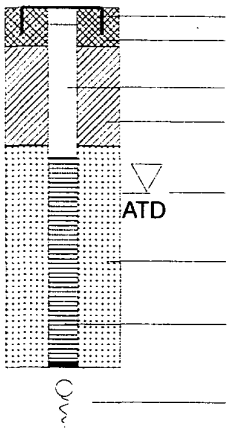
BORING SYMBOLS

- Split Spoon
- Tube (Shelby, Push Probe)
- Cuttings
- Core Run
- * No Sample Recovery

TEST PIT SOIL SAMPLES

- Grab (Jar)
- Bag
- Shelby Tube

Groundwater Observations and Monitoring Well Construction



Test Symbols

GS	Grain Size Classification
K	Permeability
AL	Atterberg Limits

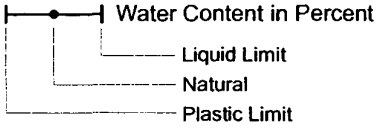


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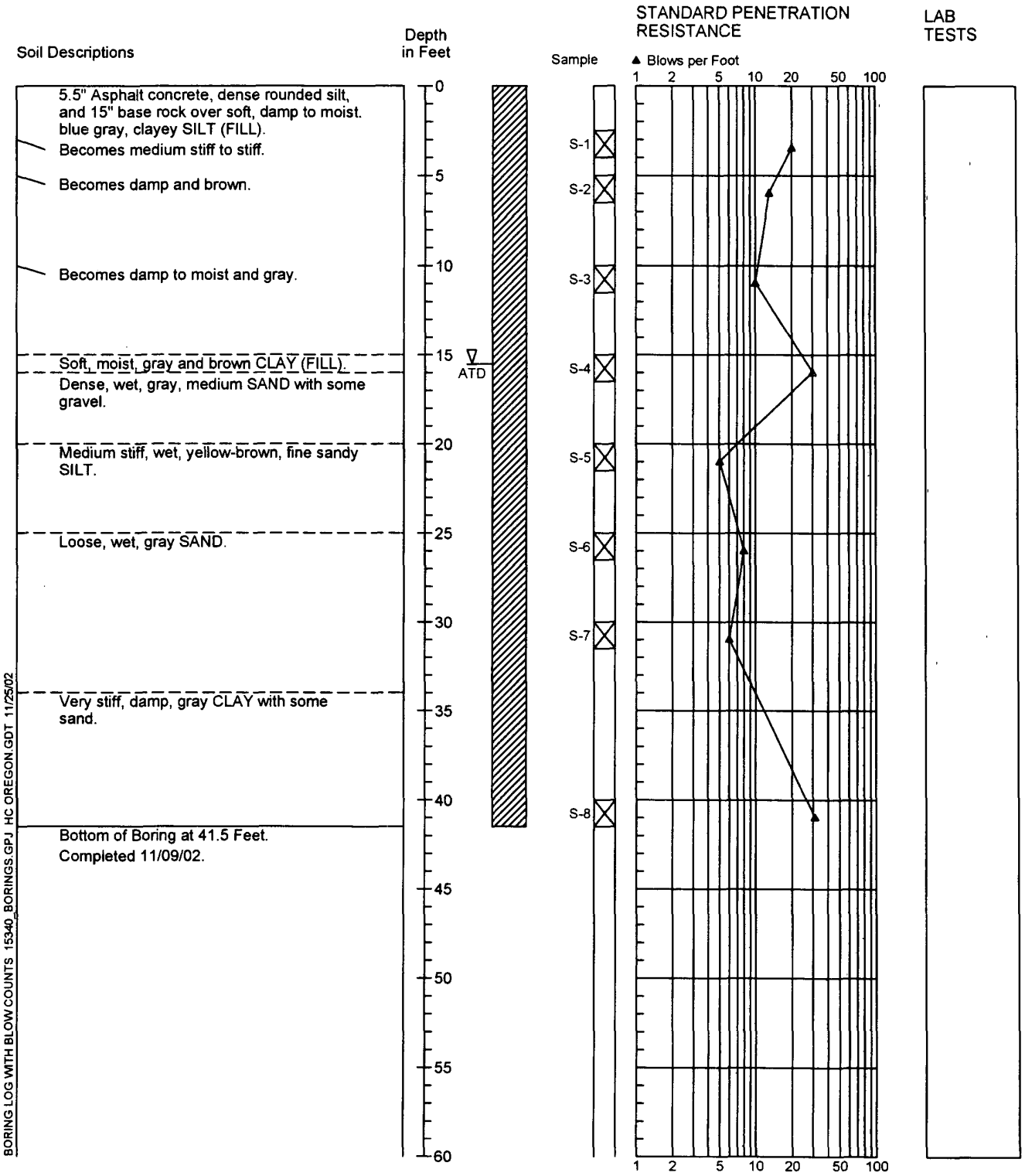
Figure A-1

Boring Log B-1



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-2

Boring Log B-2

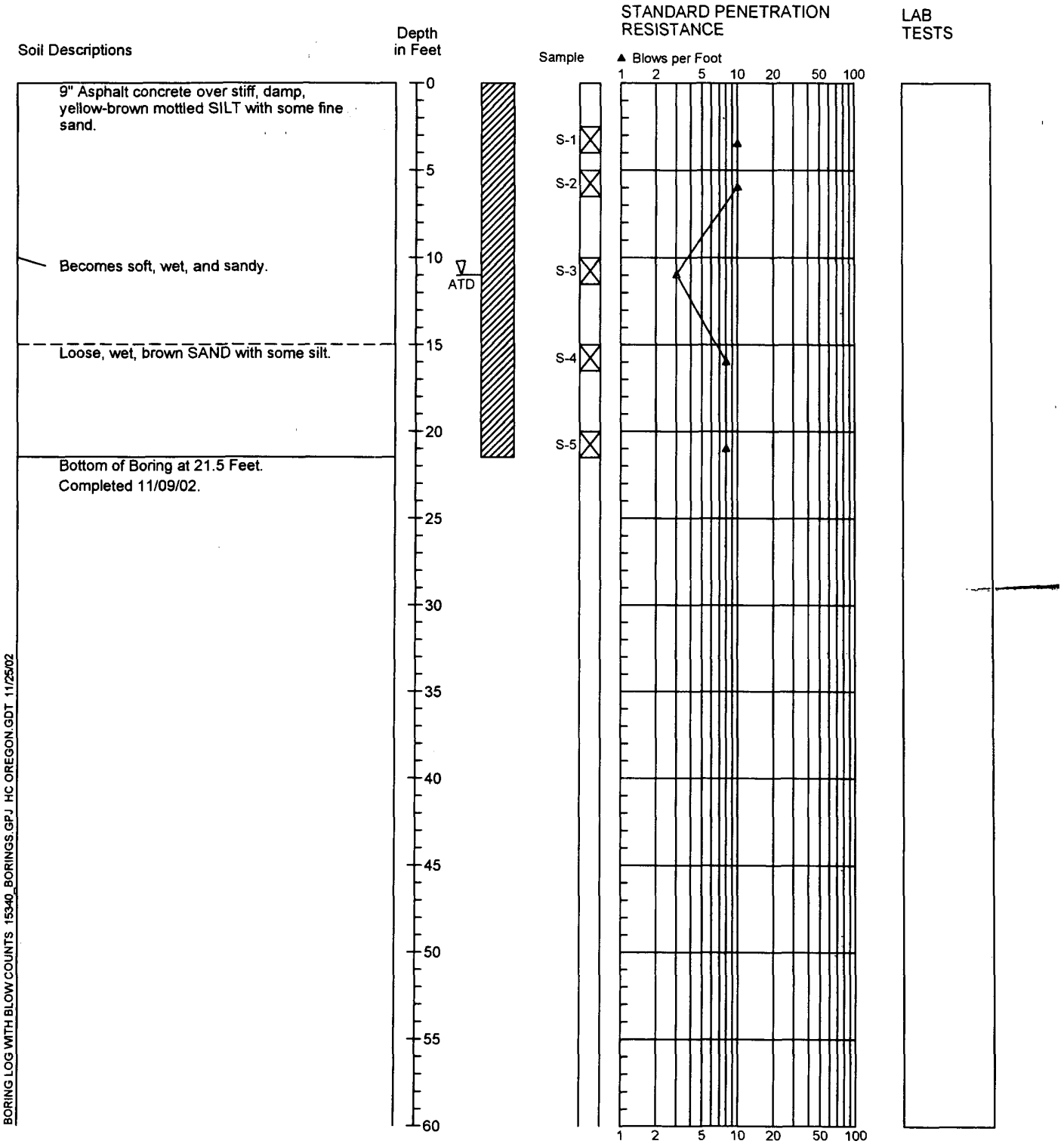

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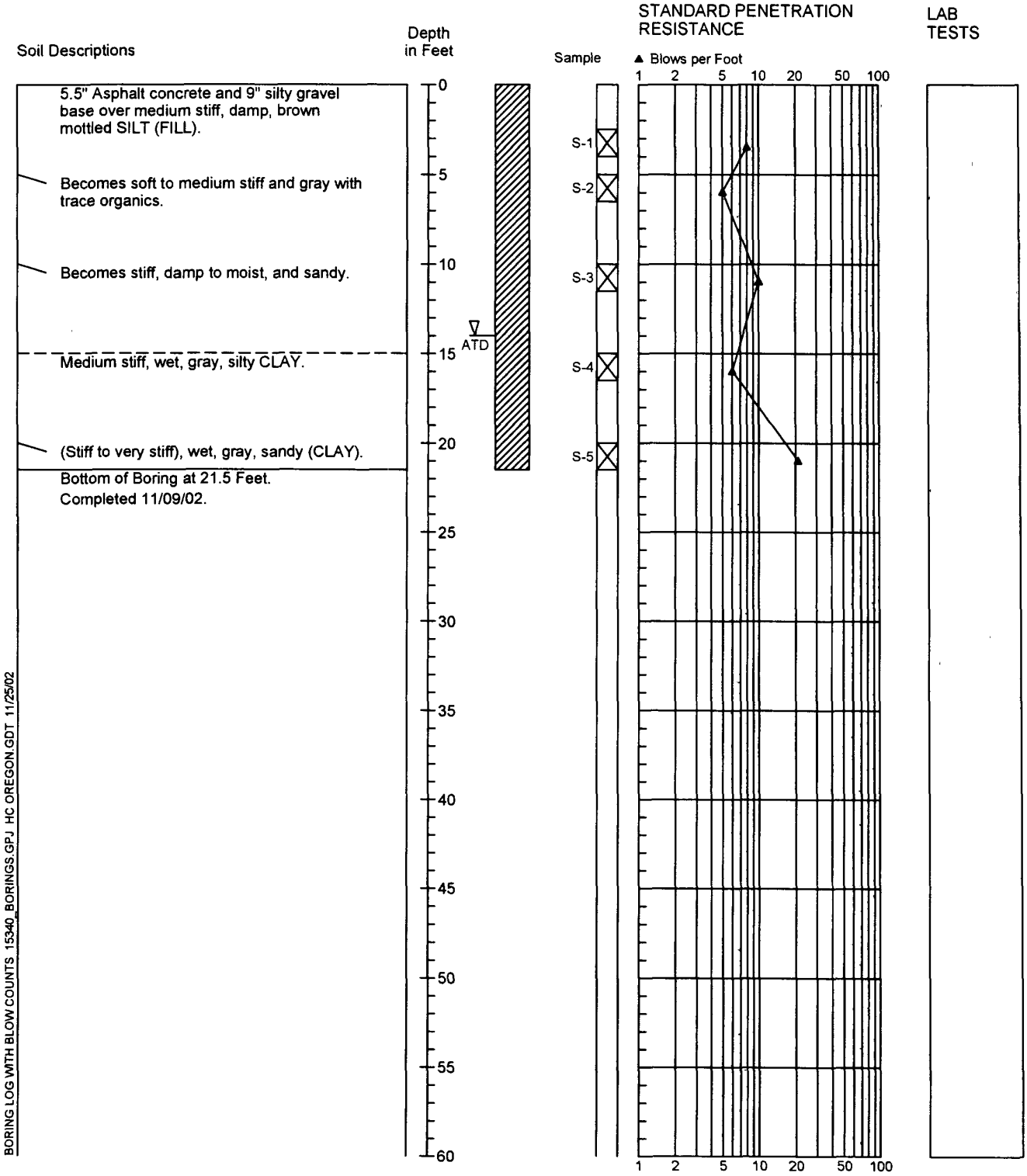
Figure A-3

Boring Log B-3



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3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-4

Boring Log B-4

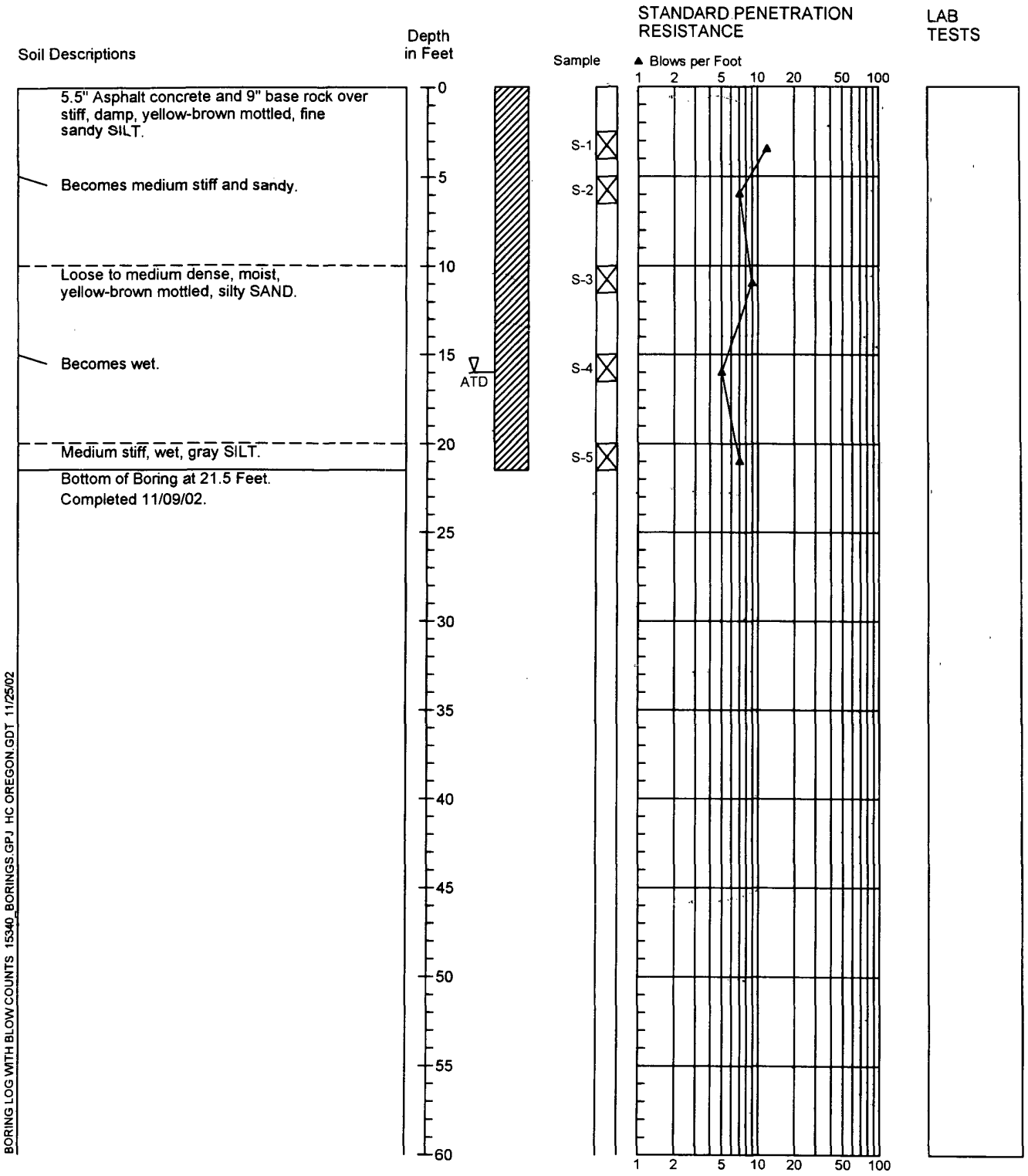

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Figure A-5

Boring Log B-5

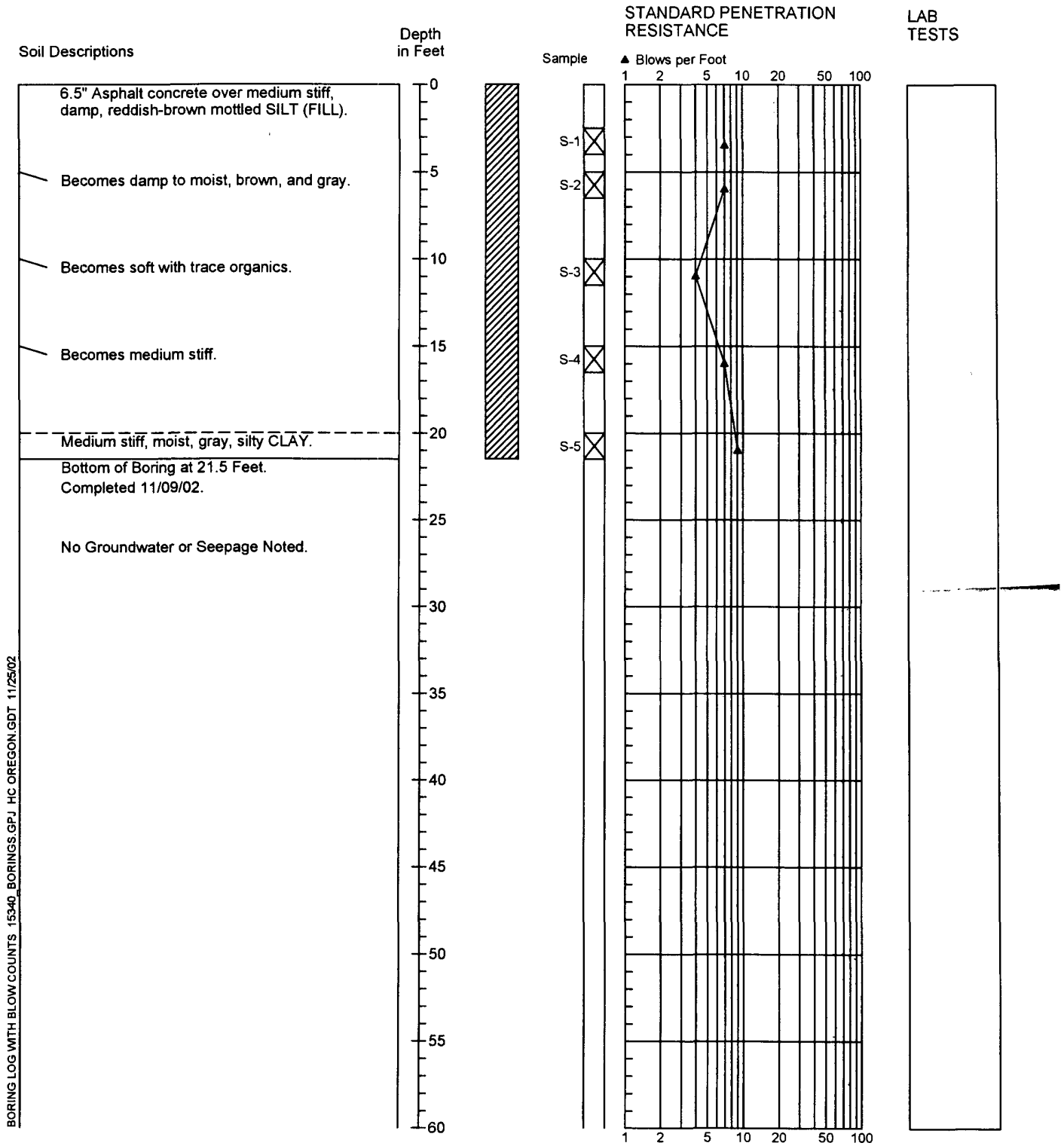

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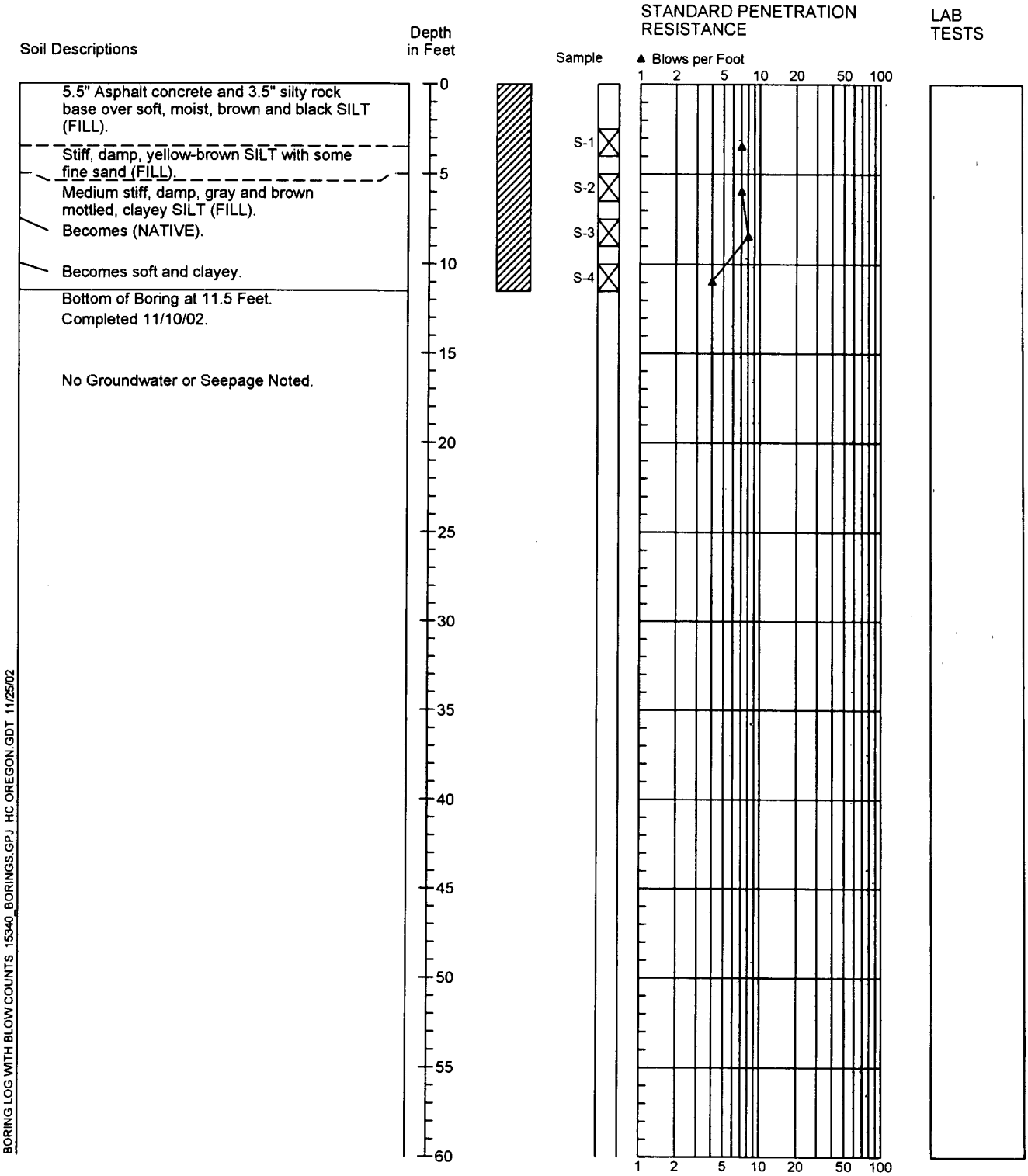
Figure A-6

Boring Log B-6



BORING LOG WITH BLOW COUNTS 15340_BORINGS.GPJ HC OREGON.GDT 11/25/02

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-7

Boring Log B-7

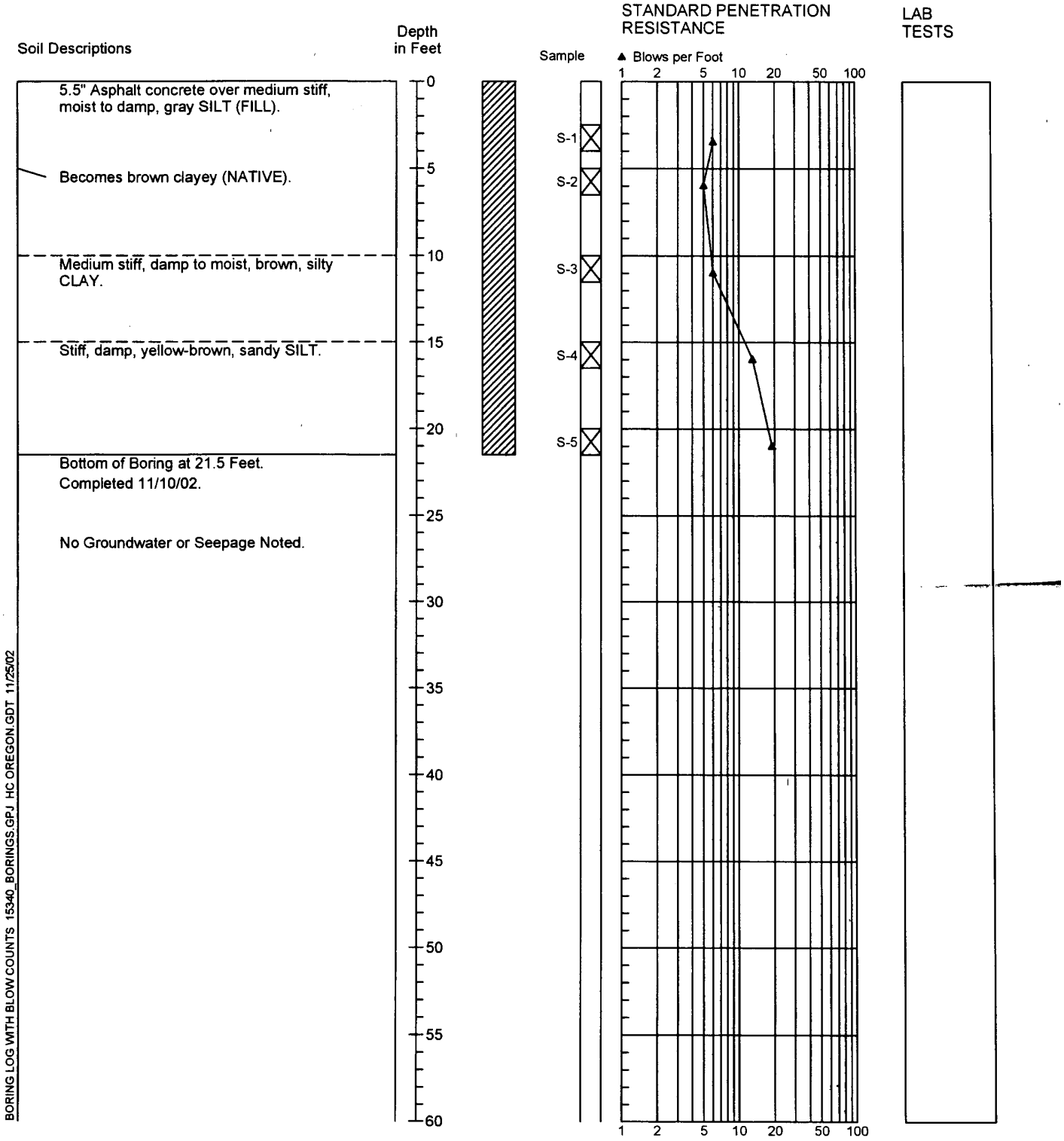

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Figure A-8

Boring Log B-8

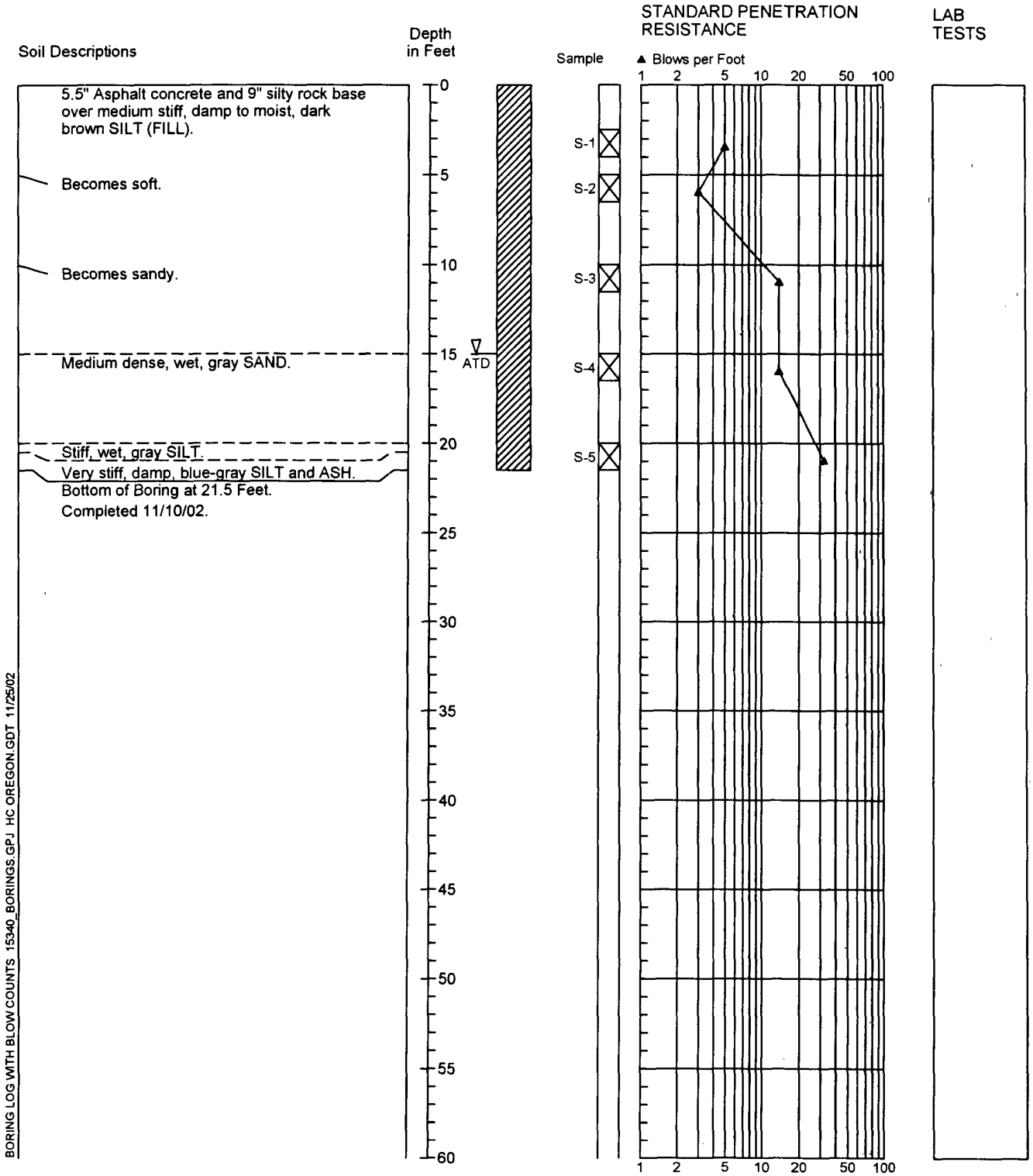

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Figure A-9

Boring Log B-9

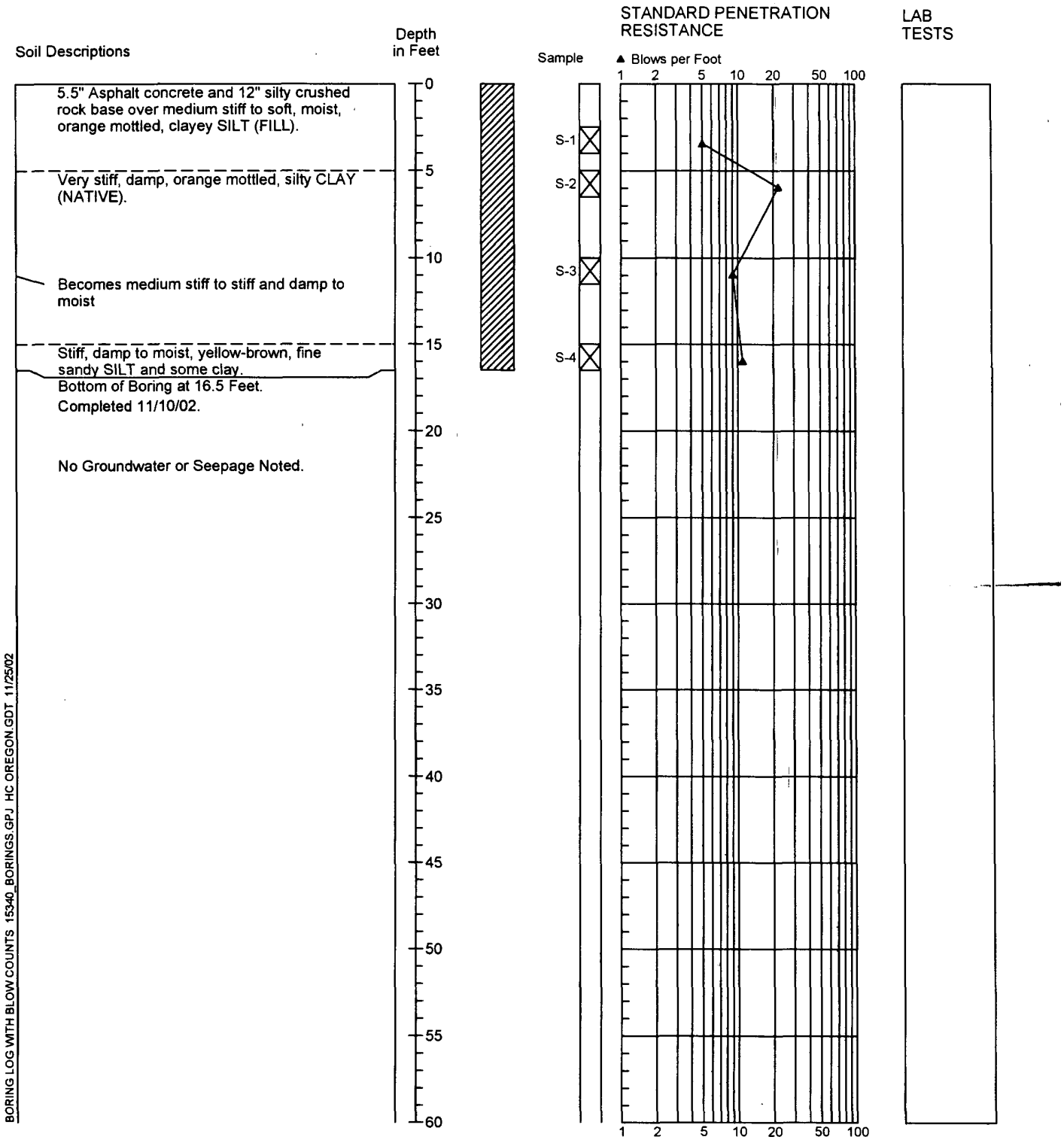

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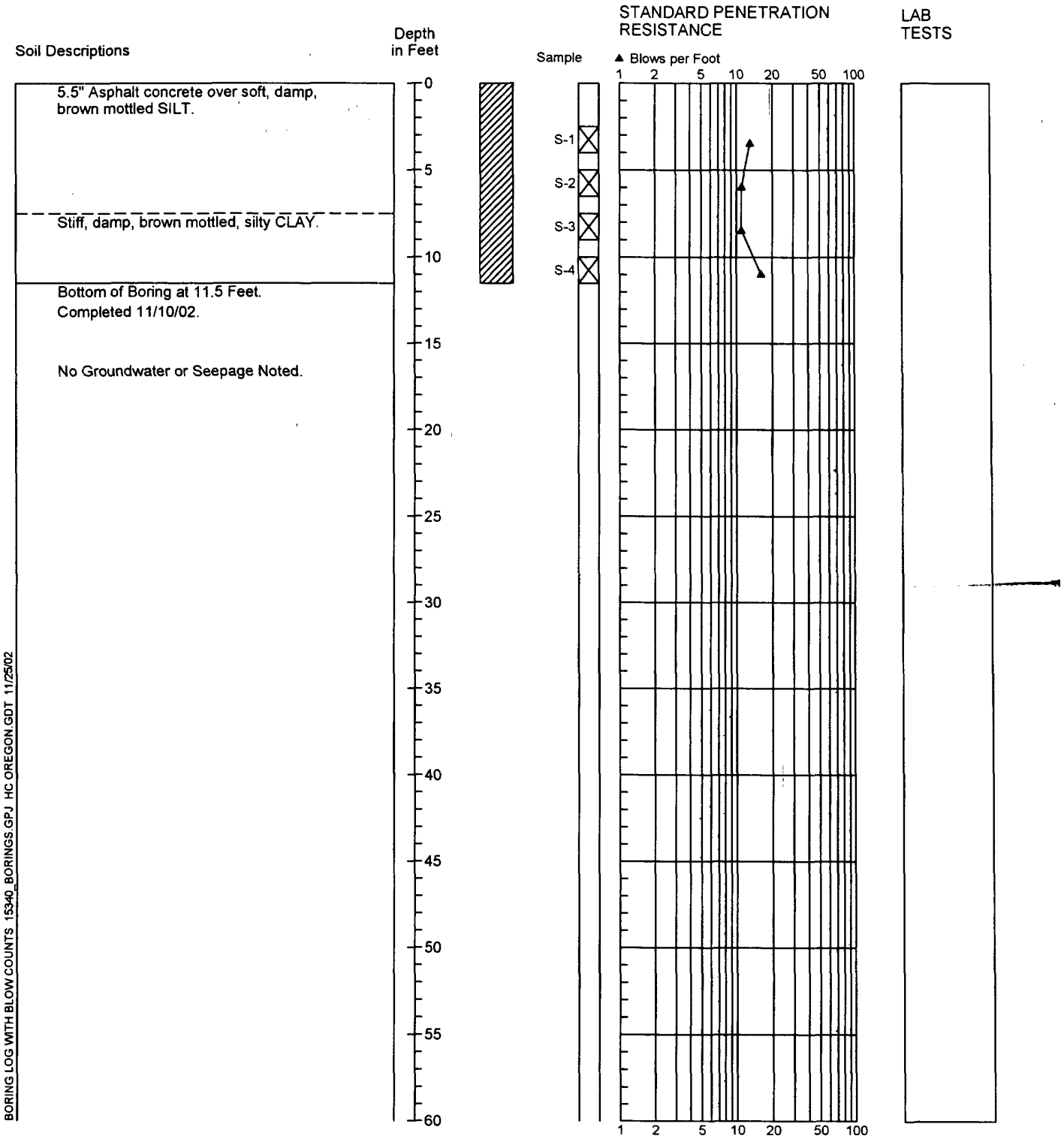
Figure A-10

Boring Log B-10



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2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
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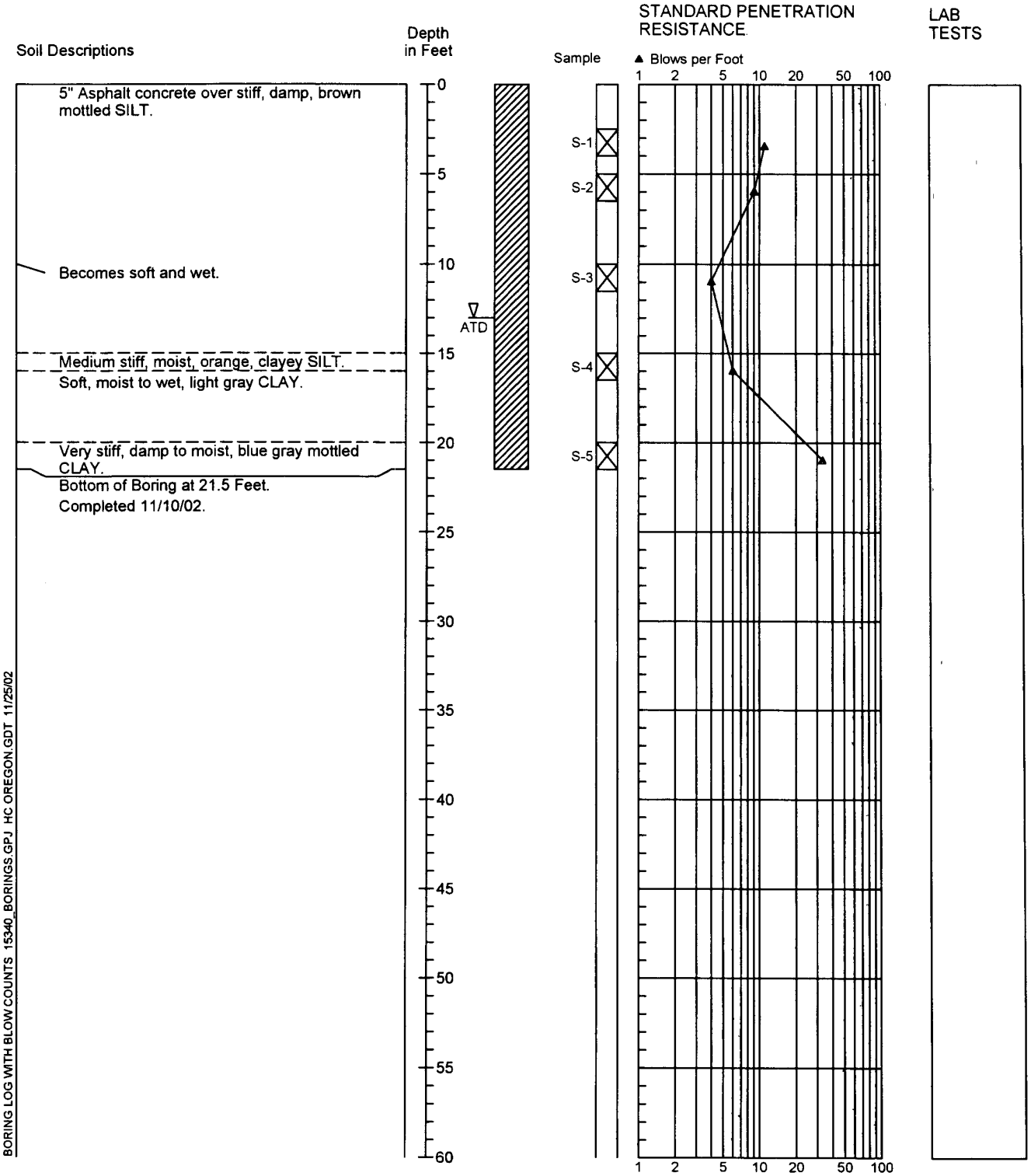
Figure A-11

Boring Log B-11



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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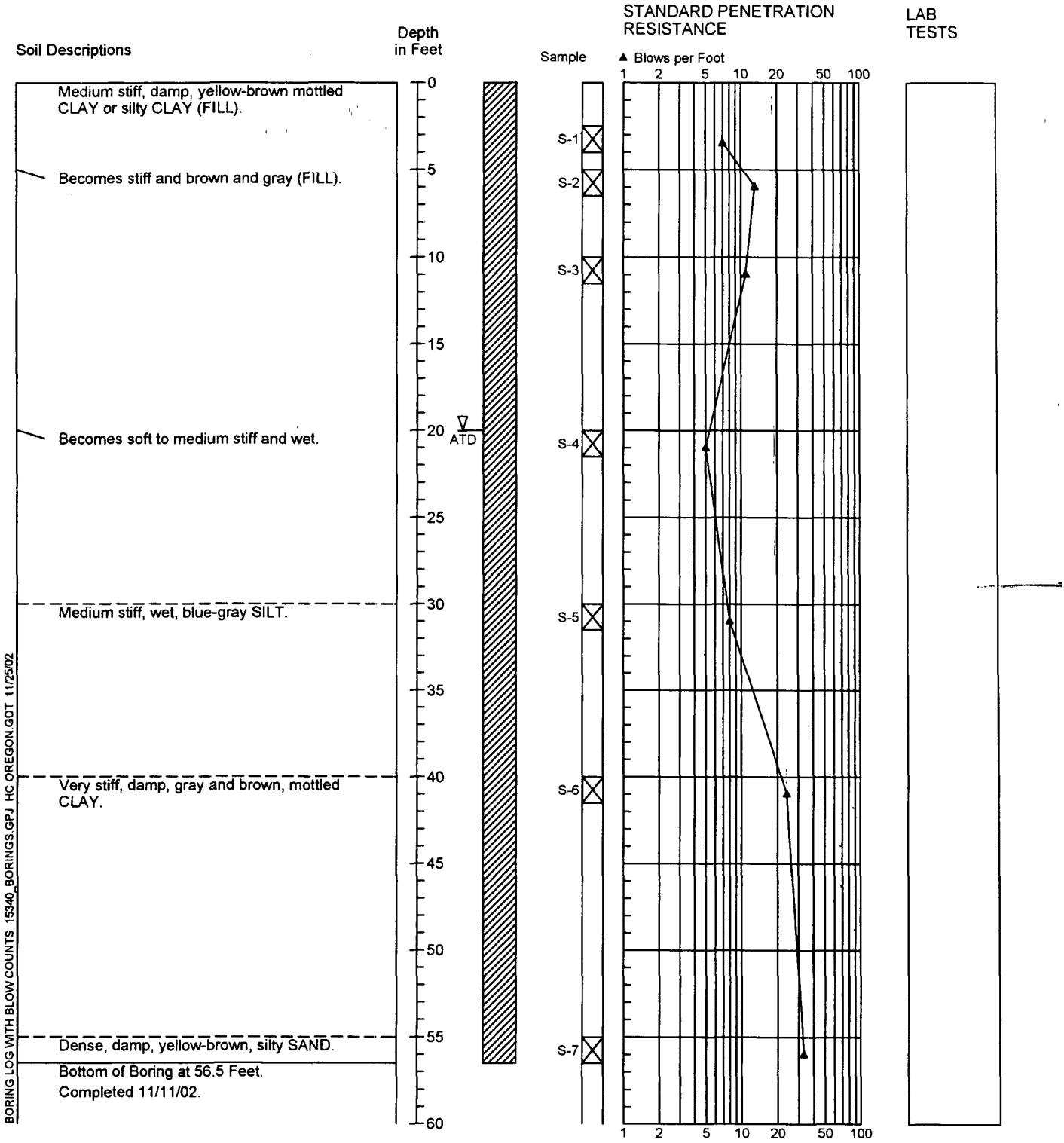
Figure A-12

Boring Log B-12



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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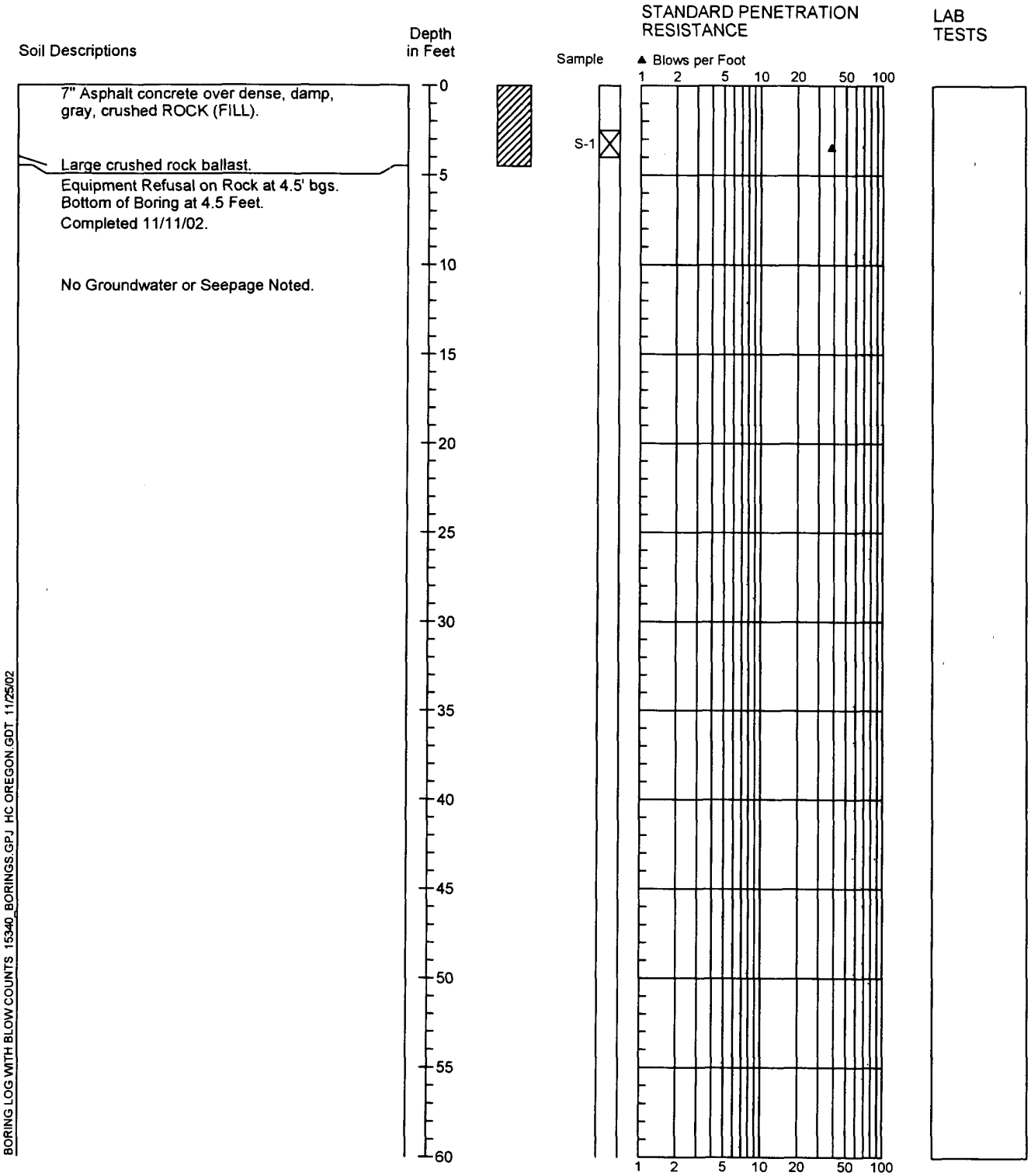
Figure A-13

Boring Log B-13



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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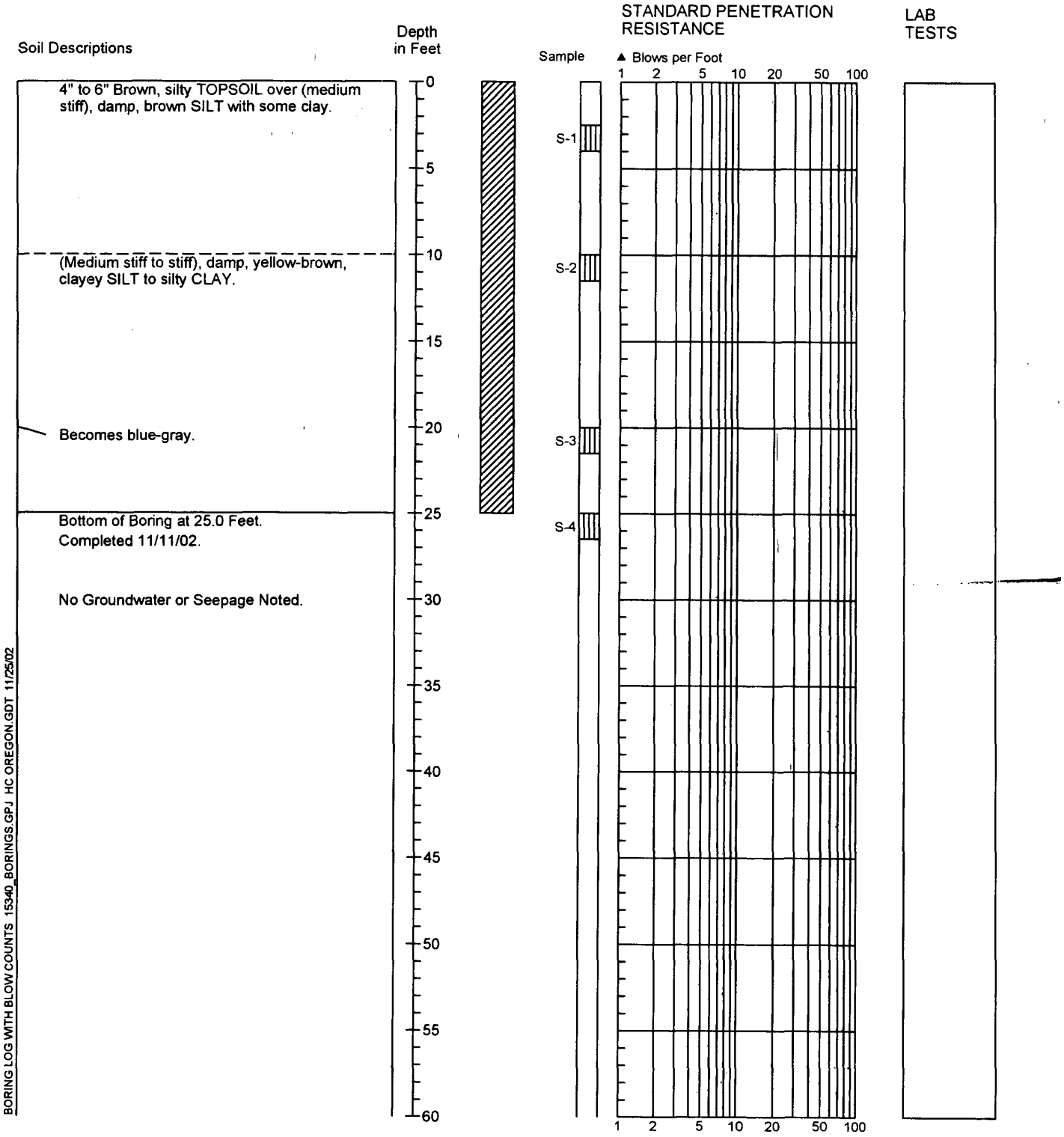
Figure A-14

Boring Log B-14



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-15

Geologic Hazards Assessment
NE 179th Street Improvements, NE 10th Ave. to NE 50th Ave.

PREPARED FOR: Clark County, Washington

PREPARED BY: Heike Guettel/PDX
Ed Shorey/PDX

COPIES: Suki Cupp/PDX

DATE: September 22, 2003

Introduction

Clark County proposes to widen a portion of NE 179th Street to include turning lanes, bike lanes, and sidewalks. Improvements are proposed for the section between 10th Avenue and 50th Avenue. The site location is shown on Figure 1.

The existing roadway consists of two travel lanes without any shoulders. Several drainage pathways, as well as a creek, cross 179th Street. The total length of the proposed improvements section is 2 miles.

This memorandum has been prepared according to the Local Agency Consultant Agreement, Task Order No. 4, between Clark County, Washington, and CH2M HILL, dated November 15, 2002.

Purpose and Scope

This memorandum has been prepared to present the results of our geologic literature review and surface reconnaissance.

The scope of work includes the following:

- Performing a surface reconnaissance
- Reviewing available geotechnical, geologic, and seismic hazard information
- Preparing this geological assessment memorandum

Limitations

This memorandum has been prepared for the exclusive use of Clark County and CH2M HILL, for specific application to the NE 179th Street widening project in Clark County, Washington. It has been prepared in accordance with generally accepted geotechnical engineering and engineering geology practice. No other warranty, express or implied, is made.

Figure 1

Background

Literature Review

Before conducting the surface reconnaissance, CH2M HILL engineers and geologists reviewed existing geologic literature. The following geologic maps were reviewed to better understand the geology and seismicity at the project site:

- Geologic Map of Washington – Southwest Quadrant (Walsh et al., 1987)
- Geologic Map of the Vancouver Quadrangle, Washington and Oregon (Phillips, 1987)
- Relative Earthquake Hazard Map for the Vancouver, Washington Urban Region (Mabey et al., 1994)
- United States Geological Survey Web page (USGS, 2002)
- Seismic Design Mapping, State of Oregon (Geomatrix, 1995)
- Geographic information system (GIS) soils map, slope data, and earthquake hazard map provided by USGS/Clark County, 2003

Site Location and Description

The site is located in Clark County, Washington, approximately 8 miles north of Vancouver. The project extends approximately 2 miles along NE 179th Street, from NE 10th Avenue to NE 50th Avenue. It is located in Township 3 North, Range 1 East, Sections 11 and 12. Interstate 5 (I-5) is at the western terminus of the improvement area.

The existing roadway alignment follows rolling hill terrain crossing several drainage pathways. The hills slope gently following NE 179th Street. Vegetation along NE 179th Street consists of farmland, trees, and shrubs surrounding drainage paths and creeks.

Surface Reconnaissance

A CH2M HILL engineering geologist and geotechnical engineer visited the site on August 28, 2003. The field reconnaissance concentrated on areas with potential geologic hazard zones, such as unstable slopes, wet or poor soils, and shallow bedrock. Few areas of concern were observed. Areas of interest featured drainage pathways and one creek with ponded or slowly moving water. No signs of unstable slopes or rock outcrops were observed. The following is a summary of observations made. The various areas are shown on Figure 2.

Area No. 1

A shallow drainage area cuts across NE 179th near the intersection with 10th Ave. The height of the ground from the stream bottom to the roadway is approximately 15 to 20 feet, and the embankment slope is approximately 45 degrees. The drainage area and its slopes are overgrown with blackberries. The slopes are shallower on the north side of the roadway. A natural gas pipeline crosses NE 179th and the north drainage area.

Area No. 2

Whipple Creek crosses the road in a culvert that is not visible because of dense vegetation. Both the south and north sides of the road have standing water with algae growth about 5 feet below the roadway. No steep slopes were observed.

Figure 2

Area No. 3

A stream crosses the road at this location. On the south side, there is a 15-foot elevation difference from the bottom of the drainageway to the roadway. Embankment slopes are approximately 45 degrees. The culvert is overgrown with vegetation and could not be observed. A steep embankment slope was also observed extending down into the drainage on the west side. The embankment leads up to someone's driveway. On the north side, moderately steep slopes lead down to the drainage area.

Area No. 4

A shallow drainage area fed by a field with some wetland grasses was observed at the north side of the roadway. The culvert that goes underneath the road consisted of a corrugated metal pipe, approximately 14 inches in diameter. The south side of the drainage area is heavily vegetated, predominantly with blackberries. The elevation difference between the roadway and the drainage is approximately 5 feet.

Area No. 5

A stream crosses the roadway at this location. This stream looks larger than other areas. The elevation difference between the roadway and the stream is approximately 15 to 20 feet. A culvert was observed on the south side with a diameter of approximately 3 to 4 feet and an invert of 5 feet above the stream bottom. The side slopes of the embankment are steep and covered with heavy vegetation.

Subsurface Investigation

No subsurface investigation was conducted as part of this scope of work.

Geologic Setting

Site Geology

The geology in the site vicinity is mapped as Upper Pleistocene Outburst Deposits of Glacial Lake Missoula consisting of Flood sand and silt (Walsh et al., 1987). These flood deposits can consist of silt, sand, and clay, commonly grading into flood gravel. The sand and silt contain slackwater deposits and cross-bedded, fine-grained surge deposits, as well as some interbedded gravels.

Soils Inventory

The Soil Survey of Clark County, Washington (Natural Resource Conservation Service [NRCS], 1972) was reviewed to identify and inventory the types of soils that exist within the proposed project limits. In general, the soil surveys published by the NRCS limit the description of soils from the ground surface to a depth of 60 inches. Soils that have alike profiles make up a soil series. Each soil series can be divided into phases based on differences in texture of layers, slope, stoniness, or some other characteristic that affects use of the soils by man. The soil series and soil phases mapped within the proposed project extent are listed and described in Table 1. Figure 3 shows the soils mapped in the project area.

TABLE 1
Summary of Mapped Soils Within the Project Limits

Soil Series	Description	Soil Phase Name	Map Unit Symbol	USDA Texture	Unified Soil Classification	AASHTO Classification
Cove	The Cove series consists of deep, very poorly drained soils formed in water-laid deposits in old lakes and ponds. This soil occurs in concave drainageways and in large, flat old lakebeds. Moderate to slow permeability and very slow runoff. Erosion is not a hazard.	Cove Silty Clay Loam, 0 to 3 percent slopes	CvA	Clay, gravelly silty clay loam.	CH to CL	A-7
Dollar	The Dollar series consists of deep, moderately well-drained soils formed in old Columbia River alluvium. This soil can be identified by its slightly raised relief and scattered stands of Douglas Fir. Permeability is very slow, runoff is slow to ponded, and erosion is slight.	Dollar Loam, 0 to 5 percent slopes	DoB	Loam	ML to ML/CL	A-4
Gee	The Gee series consists of deep, moderately well-drained soils formed in old alluvium deposited by the Columbia River. This soil occurs on terraces in the western part of the county. Permeability is moderate to slow, runoff is slow to ponded, and erosion is slight.	Gee Silt Loam, 0 to 8 percent slopes	GeB	Silt loam	ML/CL to CL	A-6
	Same as above except surface runoff is medium, and erosion is moderate.	Gee Silt Loam, 8 to 20 percent slopes	GeD			
	Same as above except surface runoff is medium to rapid, and erosion is moderate to severe.	Gee Silt Loam 20 to 30 percent slopes	GeE			
Hillsboro	The Hillsboro series consists of deep, well-drained soils formed in deposits of Columbia River alluvium. This soil occurs on terraces and gently undulating relief. Permeability is moderate and runoff is very slow. Erosion is not a hazard.	Hillsboro Silt Loam, 0 to 3 percent slopes	HIA	Loam, sandy loam, and sand	ML to SM	A-4, A-1

TABLE 1
Summary of Mapped Soils Within the Project Limits

Soil Series	Description	Soil Phase Name	Map Unit Symbol	USDA Texture	Unified Soil Classification	AASHTO Classification
	Same as above except surface runoff is medium to rapid, and erosion is moderate to severe.	Hillsboro Silt Loam, 20 to 30 percent slopes	HoE			
Odne	The Odne series consists of deep, poorly drained soils formed in drainageways and depressions on terraces. Permeability is moderate and very slow, runoff is very slow to slow, and erosion is slight.	Odne Silt Loam, 0 to 5 percent slopes	OdB	Silt loam, silty clay loam, clay loam, and loam.	CL	A-4 or A-6

Seismicity

The seismicity of Washington and Oregon is continually being updated. For this project, the primary reference used to establish the seismicity and design ground motions at the project site was information provided on the USGS Web page (USGS, 2002), the relative earthquake hazard map of the Vancouver, Washington, urban area (Mabey et al., 1994), and the Seismic Design Mapping, State of Oregon project (Geomatrix Consultants, 1995). The Geomatrix study quantified the level of seismic hazard throughout Oregon in terms of the location, size, and frequency of occurrence of earthquakes in and near Oregon.

Seismic mapping of Washington and Oregon indicates that about eight earthquakes occurred within approximately 10 kilometers of the site between 1841 and 1986 (Jacobson, 1986). Locations and magnitudes of earthquakes occurring before 1935 were estimated on the basis of intensity reports from observers at the time. Earthquakes occurring between 1936 and 1969 may have been recorded instrumentally, but instrument coverage was not sufficient to accurately locate the events. Of the eight earthquakes, two had estimated Richter scale magnitudes of 4 or greater, one had an estimated magnitude of between 3 and 4, one had an estimated magnitude of between 2 and 3, and four had estimated magnitudes of between 1 and 2. The mapping by Jacobson (1986) also indicates that approximately 50 earthquakes have occurred within approximately 35 kilometers of the site. The largest historical earthquake near the site was an 1877 event centered in Portland, Oregon, with an estimated magnitude of 5.7.

Sources of Seismic Activity

The principal tectonic feature of the Pacific Northwest is the active Cascadia subduction zone, where the Juan de Fuca plate subducts beneath the North American plate along the Cascadia margin. This subduction zone begins off the coast of Oregon and Washington and dips downward toward the east beneath the Cascade Mountains. Two primary seismic source mechanisms are associated with this subducting plate: an interface source mechanism and an intraslab source mechanism. In addition to these two source

Figure 3

mechanisms, shallow crustal sources also can generate earthquakes within the North American plate. The following sections describe these sources.

Cascadia Subduction Zone Sources

The Cascadia subduction zone (CSZ) sources include the Juan de Fuca-North American plate *interface* earthquakes. Interface earthquakes occur when two converging plates, such as the Juan de Fuca and the north American plates, become stuck together until the plates suddenly slip along the interface as the strain is released. Interface earthquakes are generally large, low-angle thrust events at depths of 30 miles or less and are associated with the largest earthquakes observed worldwide. On the basis of geologic evidence gathered from coastal areas in Washington and Oregon during the past 10 years, very large earthquakes of estimated moment magnitude (M_w) 8 to 9 have originated at irregular intervals offshore from Oregon and Washington. The most recent such event is believed to have occurred about 300 years ago.

Deep *intraplate* earthquakes occur at 40 to 55 kilometers deep and to approximate magnitudes of 7.5. Intraplate earthquakes occur within the remains of oceanic rocks that have been subducted beneath western Oregon and Washington along the CSZ. Intraplate earthquakes are typically high-angle, normal-faulting earthquakes related to stress and physical changes in the subducting slab as it is pulled deeper into the aesthenosphere.

Crustal Sources

Crustal sources are shallow earthquakes occurring in the North American plate. The expected magnitude associated with crustal earthquakes in the vicinity of the project area is approximately 6.5. Crustal earthquakes may be associated with either known or undetected faults. The Scotts Mills earthquake is an example of a crustal earthquake. This earthquake was a magnitude 5.6 earthquake that occurred on March 25, 1993, near Scotts Mills, Oregon (approximately 65 kilometers south of the project site). This was the largest earthquake to occur in the Vancouver-Portland area since the 1962 magnitude 5.5 Portland earthquake, which actually occurred beneath downtown Vancouver. Crustal earthquakes are further categorized as occurring on *discrete fault sources* where repeated earthquakes have occurred in the geologic past, or within *areal source zones* where earthquakes have been observed and will likely occur again, but have not been associated with any specific geologic features. The crustal faults near the project site were identified in the Geomatrix study (Geomatrix Consultants, 1995). As part of the Geomatrix study, known faults and fault zones were investigated and assigned a probability of activity ranging from zero (not active) to 1 (active).

The potentially active fault zones that were identified by Geomatrix and others within a 25-mile radius of the site are as follows:

- Portland Hills Fault Zone: A series of northwest-trending faults along the eastern margin of the Portland Hills, located approximately 16 miles south of the site and mapped at approximately 39 miles long. Assigned a probability of activity of 0.7.
- Frontal Fault Zone (includes Lackamas Lake Fault): Northwest-trending fault located approximately 15 miles south of the site and mapped at approximately 27 miles long. Assigned a probability of activity of 0.5.

- East Bank Fault: Northwest-trending fault located approximately 14 miles south of the site and mapped at approximately 34 miles long. Assigned a probability of activity of 0.8.
- Oatfield Fault: Northwest-trending fault located approximately 14 miles south of the site and mapped at approximately 25 miles long. Assigned a probability of activity of 0.8.
- Sandy River Fault: Northwest-trending fault located approximately 22 miles southeast of the site and mapped at approximately 7 miles long. Assigned a probability of activity of 0.1.
- Grand Butte and Damascus-Tickle Fault Zone: Located approximately 22 miles southeast of the site and mapped at approximately 11 miles long. Features in this fault zone were assigned a probability of activity of 0.5.
- Helvetia Fault: North-northwest-trending fault located approximately 19 miles southwest of the project site and mapped at approximately 6 miles long. Assigned a probability of activity of 0.2.
- Lackamas Creek Fault: Northwest-trending fault located approximately 10 miles east to southeast of the site and mapped at approximately 15 miles long. Assigned a probability of activity of 0.5.

Geologic Hazards

The discussion of geologic hazards is based on our surface reconnaissance and on geologic and soils information referenced in the following sections. Additional review of geologic publications, geologic field reconnaissance, and geotechnical explorations will be required to identify specific geologic hazards related to the project site.

The relative earthquake hazard map of the Vancouver, Washington, urban area (Mabey et al., 1994) shows the study site in relative hazard zone B, with the greatest relative hazard being zone A and the least relative hazard in zone D. The rating includes three specific earthquake hazards: soil liquefaction, amplification of ground shaking, and earthquake-induced landsliding.

Landslides

The project is located within gently to moderately sloped terrain. The majority of the slopes are 5 to 10 percent, approximately 30 percent of the slopes are 0 to 5 percent, and less than 10 percent of the slopes are 15 to 25 percent. Manmade embankment slopes in the vicinity of the drainageways and creeks are up to 45 degrees. Figure 4 shows the slopes at the project site. No landslides were observed during our surface reconnaissance, and no landslide areas are identified in the geologic and soil mapping reviewed as part of this assessment.

Liquefaction

The process of liquefaction occurs when ground shaking associated with an earthquake causes soil to lose shear strength and behave like a liquid. The susceptibility of a soil deposit to liquefaction is a function of the degree of saturation, soil grain size, relative density, confining pressure, earthquake ground motion characteristics, and geologic history.

Figure 4

Soils that are most susceptible to liquefaction are loose sand, loose silty sand and soft sandy silt, and low-plasticity silt. Non-saturated soils are typically not susceptible to liquefaction.

The soils mapped at the project site are flood deposits consisting of sand, silt, and clay, possibly underlain by gravel. Fine-grained flood deposits can have low densities; therefore, the non-plastic sands and silts would be susceptible to liquefaction if below the groundwater table.

Lateral Spread

Lateral spread (also called displacement) is lateral movement of the ground on a zone of liquefied soil. Lateral spread can occur on gentle slopes or along an open face (such as along Whipple Creek) when liquefaction occurs in a relatively widespread and continuous layer. Because the majority of the creeks and drainage areas are fairly small, the site should have a low potential of lateral spread.

Ground Shaking

The ground shaking at the site was estimated based on USGS seismic maps (USGS, 2002). The mapping shows a peak ground acceleration (PGA) on bedrock of 0.18g (g is the acceleration due to gravity) at the site for an earthquake with an approximate 500-year return period (exceedance probability of 10 percent in 50 years).

According to recommendations given by the National Earthquake Hazardous Reduction Program (NEHRP) (FEMA, 2000), a soil amplification of 1.4 should be used. This amplification factor corresponds to an NEHRP site soil classification of S_D. This results in a PGA at the ground surface of 0.25g.

The proposed road improvements can be designed to sustain no permanent structural damage under these ground-shaking conditions.

Ground Displacement

The probability of fault displacement within the project limits is considered to be very low because no known faults traverse the site or are mapped within a 5-mile radius around the site (Geomatrix, 1995). The closest active fault is 10 miles to the southeast of the site (Lackamas Creek).

Peat

Peat and organic soils could be encountered in the drainageways and in and near the creeks. Soil mapping is not detailed enough to detect localized areas of poor soils. A subsurface investigation program should be conducted in areas where fills or permanent structures are proposed to be constructed.

Rock Excavation

Geologic and soil mapping did not reveal the presence of bedrock. Therefore, no rock excavation is anticipated.

Tsunami Inundation

Tsunami inundation is not a seismic hazard at this inland site.

Groundwater Conditions

Groundwater is expected to fluctuate, depending on the time of the year. High groundwater levels can be expected in the drainage and wetlands areas during the winter and spring months (Figure 2). Potential for flooding is moderate to high during extended periods of rain. Areas of intermittent surface water features, such as creeks and streams, could provide a source for water infiltrating into excavations during construction.

Conclusion and Recommendations

On the basis of the geologic and soils mapping reviewed as part of this geologic assessment, no fatal flaws have been identified. A geotechnical exploration program should be performed to further evaluate geologic hazards at specific locations where structures or fill placement is proposed, and to develop geotechnical design recommendations for roadway construction.

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Alternate 1 *Conspan or Steel Plate Arch*

This alternate involves the use of a precast concrete "Conspan" type structure or a large steel plate arch. These are both systems that can be used for this application, and are relatively economical solutions for crossings with short spans. Both types of structures allow the use of soil over the top to bring up the grade to the proper level. The design span here was chosen as 30 feet, to help minimize the impact of actual in water or in wetland work, however, if the spans can be reduced the subsequent costs would be lowered.

Approximate construction cost: $550,000 to $940,000

The wide variance in the expected construction cost range is dependent upon the soil conditions at the location of the actual structure. If there is competent soil only 3 to 4 feet below the existing ground surface, the amount of shoring, excavation, dewatering, etc., costs are expected to be in the lower range indicated. If there are soft soils down to 10 feet below the existing surface, the amount of work required to establish firm bearing for the structure would be substantial, and is reflected in the upper range of the costs listed.

Wetlands impacts:

Although the final wetlands delineation has not been performed, but based on our observations on site, this option appears to require not only work in the wetlands but work in the water. Sheetpiling will be driven through the water, then excavation and dewatering will occur to allow the excavation down to firm bearing. Another alternative would be to temporarily reroute the stream in a culvert that extends a distance past the end of the proposed structure. The amount of wetland impact that will be temporarily disturbed will depend on the depth to competent underlying soil strata.

Phased construction:

This alternate has some complexities concerning the phased construction, meaning that two way traffic has to be maintained at all times; therefore construction must be in phases. The difficulty lies in having to excavate and dewater deep next to traffic lanes and involves the use of steel sheetpiling or other means of temporary shoring. The use of the conspan or plate arch structures at a skewed crossing also geometrically constrains the phasing scheme as the precast elements are constructed orthogonally, and not skewed.

Footnote: *Final assessment for the alternatives can be made after the wetland delineation is complete and additional soil borings are taken.*

Alternate 2 *Bridge Structure*

This alternate involves the use of concrete precast bridge deck sections setting on poured-in-place concrete abutment walls. The abutment walls would be founded on a concrete grade beam over steel piling. A preliminary span of 80 feet was chosen to completely avoid the wetlands.

Approximate construction cost: $680,000 to $910,000

The variance in the cost listed is based on the guidelines listed in the WSDOT bridge design manual, for costs associated with short span bridges founded on piling and over a water crossing. The square foot costs assumed are also in the ballpark of local historical costs in this area.

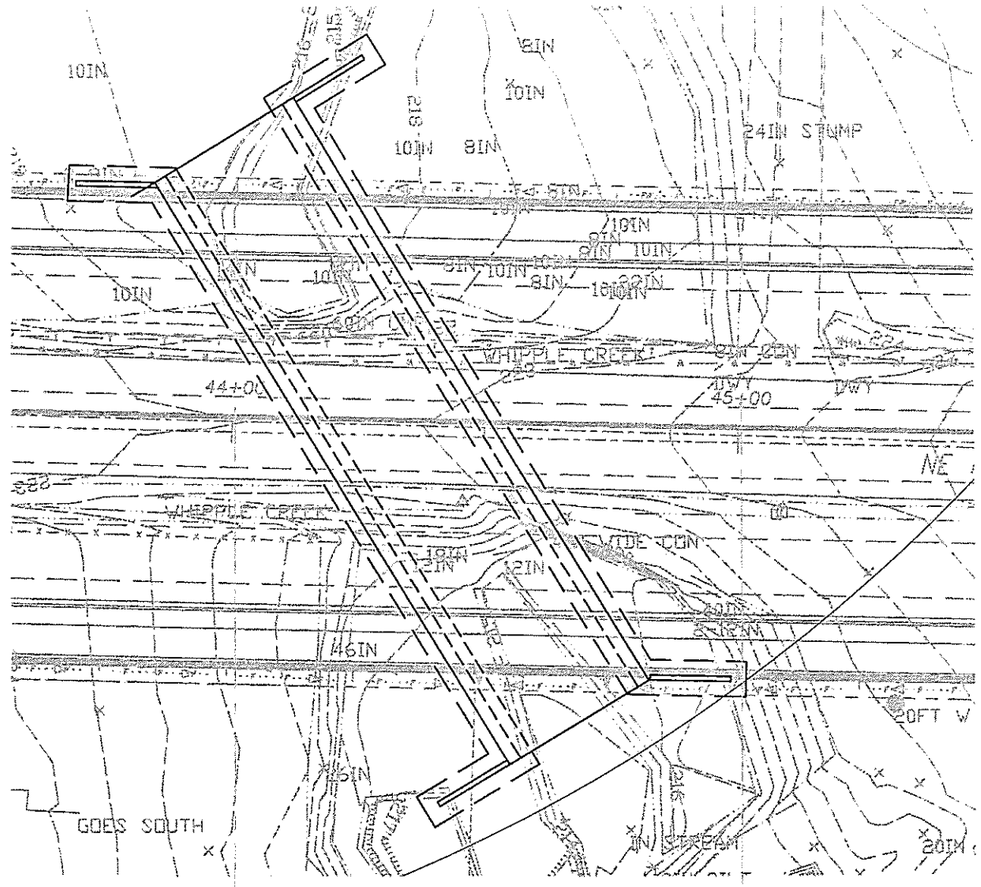
Wetlands impacts:

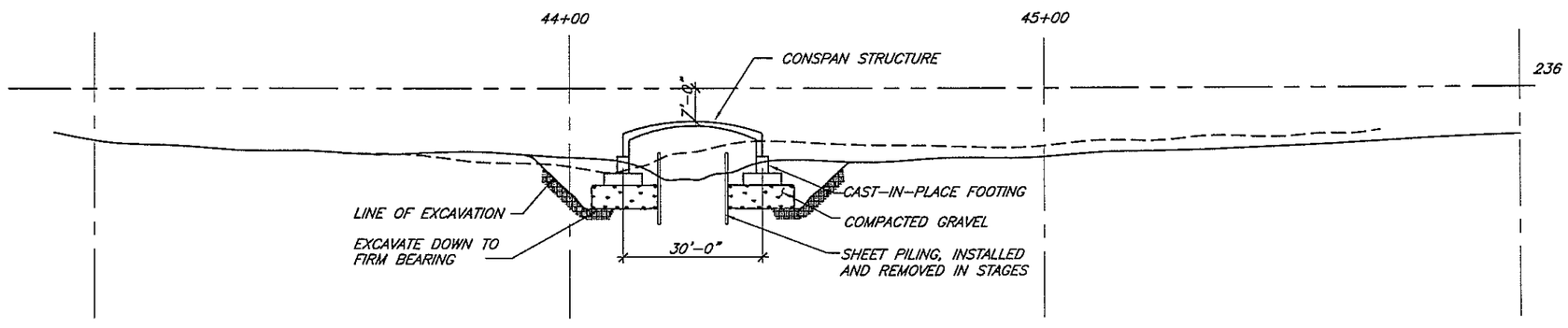
Although the final wetlands delineation has not been performed, the layout was an estimate of which span would have no impact on the wetlands. It would involve placing precast bridge sections over the wetlands and the stream itself; however, this is a common occurrence and can be performed with minimal impact. The pile driving and abutment construction would occur well back from the waters edge and be at a relatively shallow depth.

Phased construction:

This alternate allows relatively easy phased construction of the bridge to maintain two way traffic at all times on the roadway. The precast bridge sections are typically four feet wide and are constructed with skewed ends, so the outer two sides of the bridge could be constructed outside of the current road alignment, then traffic rerouted to them, and the inner section of bridge completed.

Footnote: *The level of water on the north side is currently backed up due to a beaver dam. In late November of this year, we observed the County crews removing the dam due to the concern of high water during a period of high rainfall, but a few weeks later the beavers had built up the dam again. The dam raises the water level 2 to 3 feet. Without the dam, the concern of working in the water proper as indicated for alternate 1 may not be an issue on the north side.*





N.E. 179th STREET IMPROVEMENT WHIPPLE CREEK CROSSING

KGA
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SUITE 240
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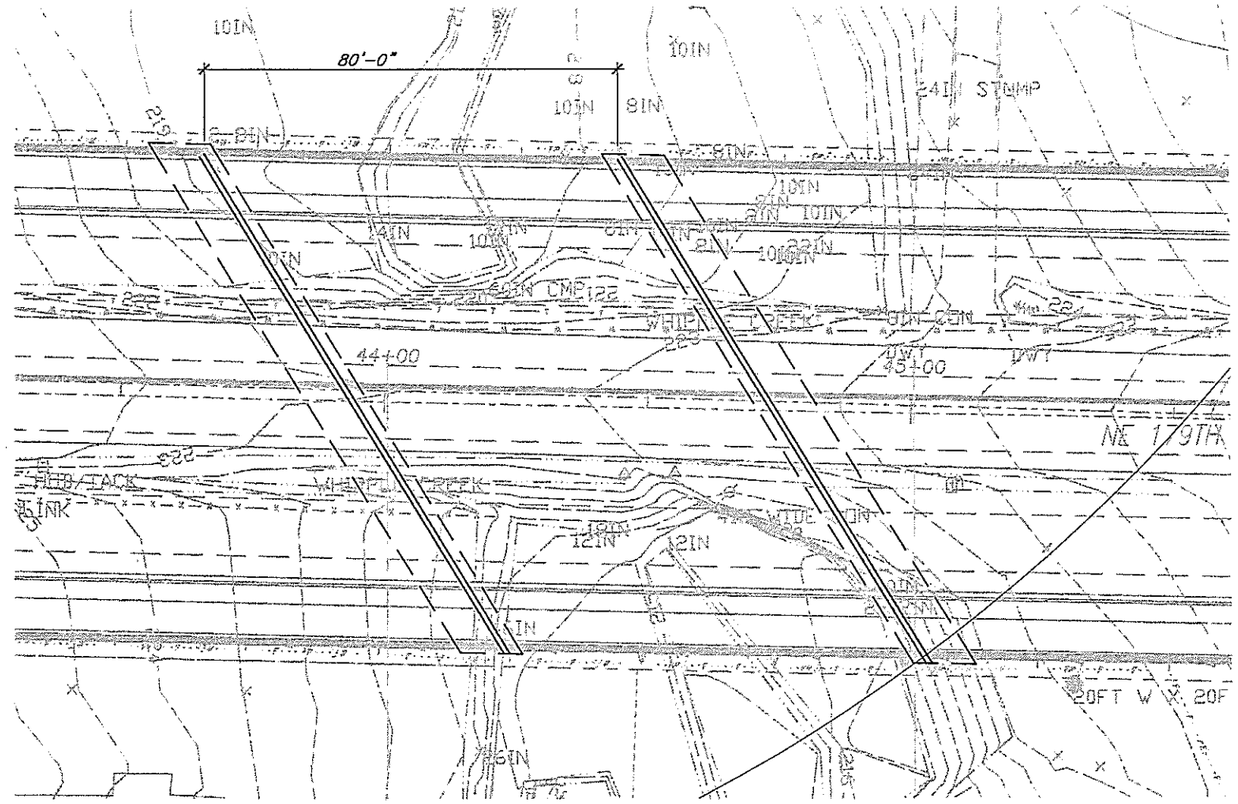
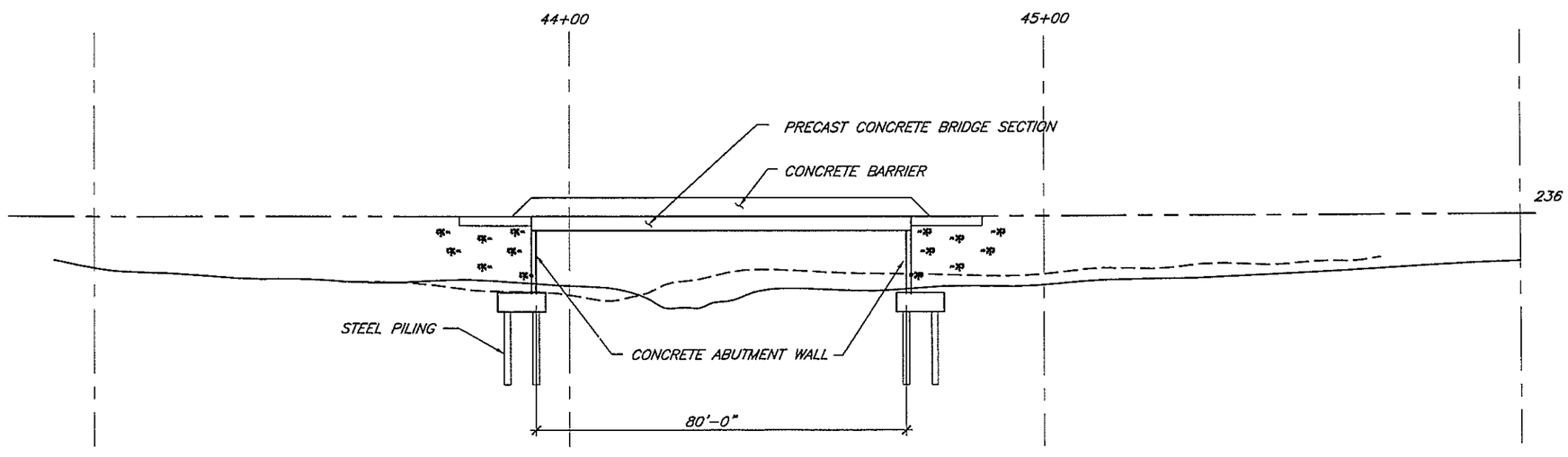
98660-3117
360-693-1621
503-289-2661

ALT 1

CONSPAN OR STEEL PLATE ARCH STRUCTURE





N.E. 179th
STREET IMPROVEMENT
WHIPPLE CREEK CROSSING

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ALT 2

BRIDGE STRUCTURE