

Draft Environmental Assessment

National Environmental Policy Act Review:  
Tumwater East Distribution Center and  
Tumwater West Conservation Site Habitat  
Conservation Plan for the threatened Olympia  
subspecies of the Mazama Pocket Gopher  
(*Thomomys mazama pugetensis*) in Thurston  
County, Washington

August 2020

Prepared for:

Puget Western, Inc.  
PO Box 1529  
Bothell, WA 98041

Prepared by:

SCJ Alliance  
8730 Tallon Lane NE, Suite 200  
Lacey, WA 98516  
360.352.1465  
[www.scjalliance.com](http://www.scjalliance.com)

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## 1 EXECUTIVE SUMMARY

Puget Western Inc. (PWI), including wholly owned subsidiaries (1) Tumwater West Conservation Site LLC, (2) Tumwater East I-5 Distribution Center LLC, and (3) Tumwater East I-5 Commercial LLC, (the Applicant), is proposing to develop the 79-acre Tumwater East property as a warehouse distribution and commercial center while providing mitigation which fully offsets impacts to the Olympia subspecies of Mazama pocket gopher (*Thomomys mazama pugetensis*, hereafter Olympia pocket gopher) at the 67.5-acre Tumwater West property. The entire Tumwater West property will be dedicated in perpetuity to the conservation of the Olympia pocket gopher.

Both properties are known to be occupied by the Olympia pocket gopher, a species listed as threatened under the Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 et seq.) (ESA). It will not be possible to completely avoid all adverse effects to this species and its habitat while the new Tumwater East sites are developed. For that reason, the Applicant has prepared a habitat conservation plan (HCP) in partial fulfillment of requirements for an incidental take permit (ITP) from U.S. Fish and Wildlife Service (USFWS).

The proposed action being evaluated in this Environmental Assessment (EA) is for USFWS to issue a 20-year ITP authorizing take of the Olympia pocket gopher that may occur during HCP implementation related to construction of the commercial development at Tumwater East and the habitat management activities at of the Tumwater West Conservation Site.

The HCP describes impacts to the species likely to result from permit issuance for the proposed development, and describes measures that will be implemented to minimize and mitigate any resulting unavoidable take of the listed species. Habitat functions on the Project Site and Conservation Site were compared and mitigation offsets were determined using an approach reflecting “functional-acres” of habitat at both sites by integrating patterns of observed occupancy with metrics of relative habitat quality.

Results of this work indicate that development at Tumwater East is expected to negatively impact 60 functional-acres of Olympia pocket gopher habitat, while conservation at Tumwater West is expected to provide at least 171 functional-acres of habitat at the time of permit issuance, an excess of 111 functional-acres of habitat. The Applicant proposes to use 60 functional-acres of Tumwater West’s conservation credits as mitigation for unavoidable impacts for the full development of Tumwater East. The remaining 111 functional-acres of Tumwater West’s conservation credits would be managed as advanced mitigation for the Olympia pocket gopher. This EA analyzes the effects on the human environment of permit issuance for the proposed HCP.

## 2 INTRODUCTION

### 2.1 Project Description

Puget Western Inc. (PWI), including wholly owned subsidiaries of Puget Western Inc., (1) Tumwater West Conservation Site LLC, (2) Tumwater East I-5 Distribution Center LLC, and (3) Tumwater East I-5 Commercial LLC, (the Applicant), is proposing to develop the 79-acre Tumwater East property (Project Site) as a warehouse distribution and commercial center while providing mitigation which fully offsets impacts to the Olympia subspecies of Mazama pocket gopher (*Thomomys mazama pugetensis*, hereafter Olympia pocket gopher) at the 67.5-acre Tumwater West property (Conservation Site) (Figure 1).

The 83.7-acre Tumwater East construction site (including immediately adjacent roadside areas) includes potential habitat for the Olympia subspecies of Mazama pocket gopher (*Thomomys mazama pugetensis*, hereafter Olympia pocket gopher), based on mapped soil types. Under current conditions, there are 22.2 acres of occupied habitat and 6.4 acres of suitable (grassland) but currently unoccupied habitat. The rest of the site is covered by trees or shrubs or currently has unsuitable soils for burrowing, and thus is not currently suitable habitat. The Applicant proposes to mitigate for loss of habitat at Tumwater East by preserving and improving 67.5 acres of Olympia pocket gopher habitat at the Tumwater West property, which is also mapped as a preferred pocket gopher soil type. Discussion below provides more detail about mitigation calculations and habitat comparisons.

Both properties are known to be occupied by the Olympia pocket gopher, a species listed as threatened under the Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 et seq.) (ESA). The Applicant acknowledges that it will not be possible to completely avoid all adverse effects to this species and its habitat while the new warehouse distribution center and other commercial buildings are constructed.

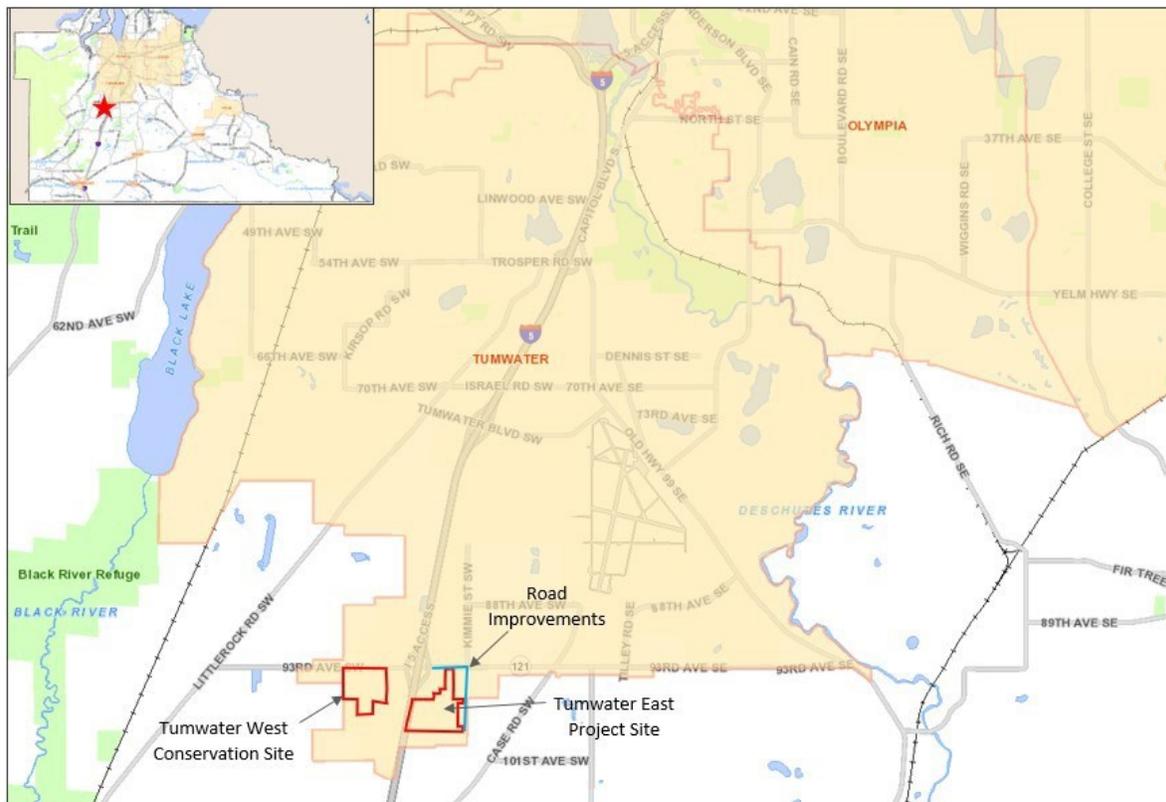
Section 10 of the ESA allows non-Federal Applicants, under certain terms and conditions, to incidentally take listed species that would otherwise be prohibited under Section 9 of the ESA. When a non-Federal landowner or other non-Federal entity wishes to proceed with an activity that is legal in all other respects, but that may result in the incidental taking of a listed species, an incidental take permit (ITP), as defined under Section 10 of the ESA, is recommended. Under Section 10 of the ESA, a habitat conservation plan (HCP) that meets statutory and regulatory requirements is required to accompany an application for an ITP.

The Applicant prepared this habitat conservation plan (HCP) in partial fulfillment of requirements for an incidental take permit (ITP) from U.S. Fish and Wildlife Service (USFWS) in accordance with Section 10(a)(1)(B) of the ESA. An ITP authorizes take that is incidental to otherwise lawful activities and therefore provides ESA compliance.

The Applicant's HCP describes impacts to the species likely to result from proceeding with the proposed construction and development as well as measures that will be implemented to minimize and mitigate any resulting unavoidable take of the listed species. The proposed project development site is called Tumwater East (Project Site), and the proposed conservation site is called Tumwater West (Conservation Site). The Applicant is proposing to fully develop the Tumwater East site and to establish a conservation program and conservation easement on Tumwater West. The Applicant will utilize a portion of Tumwater West's conservation benefits (defined in terms of functional-acres of habitat in this HCP), as mitigation for unavoidable impacts

for the full development of Tumwater East. The remainder of Tumwater West’s conservation benefits will be available for other project applicants.

The 79-acre Tumwater East I-5 Distribution Center and Tumwater East I-5 Commercial projects (Tumwater East – Project Site) will be constructed on four parcels (Parcel Numbers 12721130000, 12721140100, 12721110400, and 12721110200) located east of I-5 and south of 93<sup>rd</sup> Avenue SW in the City of Tumwater, Washington (See Figure 1, “Vicinity Map”). The project will also require the Applicant to undertake infrastructure and associated roadside improvements affecting about 4.7 acres of land along 93<sup>rd</sup> Ave SW and Kimmie St SW to provide for appropriate transportation routes and safety improvements on the existing roads in light of the new commercial development. References to the “Project Site” in this document are inclusive of the construction areas and associated road improvement areas.



**Figure 1. Project Site and Conservation Site Vicinity Map**

The development and road safety improvements at the Project Site would affect potential habitat, including onsite areas and immediately adjacent roadside areas. Within the Project Site construction area, there are 22.2 acres of onsite habitat occupied by the Olympia pocket gopher, 6.4 acres of suitable habitat without confirmed occupancy, 6.4 acres of shrubby, unsuitable habitat, and 48.7 acres of forested areas, disturbed soils, and paved areas that are not currently habitat for Olympia pocket gopher. Table 1 summarizes the area of habitat at the Project and Conservation Sites.

**Table 1. Habitat Functions at Project Site and Conservation Site**

Habitat Type	Project Site construction area (acres)*	Conservation Site (acres)
Occupied Habitat	22.2	67.5
Suitable but unoccupied Habitat	6.4	-
Shrub Cover (unsuitable, unlikely to become occupied)	6.4	
Forest Cover, Disturbed Soils, Paved Areas (unsuitable, unlikely to become occupied)	48.7	0
<b>Total</b>	83.7	67.5

**Table 2. Tumwater East and Traffic Improvement Area – Habitat Conditions**

Soil Suitability	Land Cover	Acres
Unsuitable	Paved / Compacted	4.0
Not likely to be suitable due to soil compaction and disturbance	Disturbed Soils	4.2
Not likely to be suitable due to dense tree and shrub roots	Tree-dominated	40.5
Less likely to be suitable due to dense shrub roots	Shrub-Dominated	6.4
Suitable	Degraded Prairie	28.6
Total		83.7

The 67.5-acre Tumwater West (Conservation Site) property is located west of I-5 and south of 93<sup>rd</sup> Avenue SW in the City of Tumwater, Washington on five parcels (Parcel Numbers 12721220000, 12721210300, 12721210100, 12721240300, and 12721230300), bounded on the north by 93<sup>rd</sup> Avenue SW; on the west by Blomberg Street SW and a Washington Department of Natural Resources (WDNR) tree nursery; on the south by undeveloped land; and on the east by Lathrop Industrial Drive SW (See Figure 1, Vicinity Map). A permanent Conservation Site will be established on these parcels by establishing a conservation easement that extinguishes development rights and requires a land manager to implement a management plan to restore pocket gopher habitat and protect gophers from habitat loss. The Tumwater West Conservation site contains small patches of forest. Developed areas and impervious surfaces are limited to two vacant homes, a barn structure and associated gravel drives. Before ITP issuance, all trees, buildings, and associated gravel pads and drives will be removed, and soils will be restored in these areas as needed with loamy sand from the Olympia pocket gopher range to provide soil texture suitable for burrowing by gophers.

The entire 67.5-acre Tumwater West site will be dedicated in perpetuity to the conservation of the Olympia pocket gopher. PWI commits to fully fund and implement the conservation actions described in the HCP in perpetuity. PWI will fund the first five years of land management based on a Land Manager's scope of work and cost estimate for this work. The remaining endowment amount as estimated by the long-term Land Manager or as estimated in Appendix D of the HCP will be funded 30-days post-close of Tumwater East and prior to commencement of covered activities at Tumwater East, or 30-days prior to allocation of excess functional-acres by PWI to other parties. Under any event, PWI commits to fund the estimated long-term endowment by the end of Year 5.

The HCP describes the Applicant's commitment to provide for conservation of the species by providing mitigation to fully offset unavoidable take resulting from the proposed warehouse distribution center development project. The Applicant's "Tumwater East Distribution Center and

Tumwater West Conservation Site Habitat Conservation Plan for the threatened Olympia subspecies of the Mazama pocket gopher (*Thomomys mazama pugetensis*) in Tumwater, Washington” and its associated appendices and exhibits (Krippner 2019) are hereby incorporated into this document by reference and information from the HCP is summarized, where appropriate, below.

Habitat functions on the Project Site and Conservation Site were compared and mitigation offsets were determined using a mitigation calculator (detailed in the HCP) to estimate “functional-acres” of habitat impacted by the full development of Tumwater East (Project Site) and provided by Tumwater West (Conservation Site). The formula for this calculation is provided in Appendix A of the HCP.

A “functional-acre” is a habitat index score which ranges from 0 to 3 for each acre of land on a site based on the quality of the assessed habitat. Therefore, the functional-acres (FA) of habitat on a site can be more than, or less than, the measured acreage of the assessed area. For example: A one-acre site with high quality native prairie vegetation, preferred soil types, current occupation by Olympia pocket gopher, and with similar adjacent acres would be assigned an index score of 3.0 FA. Conversely, a score as low as 0.1 FA might be assigned to a one-acre site with suitable soils, but with a forested plant community and no adjacent suitable habitat. Juvenile Olympia pocket gophers may disperse into adjacent areas from occupied portions of the site during construction or during juvenile dispersal, so each affected cover type on suitable soils was entered into the calculator.

The calculator assumes that greater diversity in a native prairie plant community supports greater habitat resilience after disturbance, and therefore, best supports Olympia pocket gopher productivity. The underlying assumption is that native prairie is more resistant to and resilient from disturbance, thereby providing the most stable and productive habitat condition for Olympia pocket gopher.

Using the calculator, habitat acreage at the Project Site and Conservation Site was weighted by habitat quality. Both the Project Site and Conservation Site are located on soils suitable for Mazama pocket gopher and therefore provide current or potential habitat. Categories of habitat quality were determined mostly by current vegetation cover and current occupancy. Lower values were assigned to areas with woody cover, which is unsuitable for Olympia pocket gopher. Higher values were assigned to prairie vegetation areas with a diversity of native forbs (which provide forage resources for gophers and other prairie species) and to areas with recent observations of Olympia pocket gopher occupancy. The calculator also considered the landscape connectivity of the Conservation Site, and long-term opportunity for the site to block together with other areas occupied by Olympia pocket gopher, which are termed “Reserve Priority Areas” (USFWS, 2017).

This method was used to analyze habitat values on the Covered Lands across a grid system with grid cells approximately 656 feet x 656 feet (200 meters x 200 meters). The grid cell size was selected because it encompasses the common dispersal limits of Olympia pocket gopher (79 FR 19774), and provides for a manageable data collection/analysis framework. The HCP provides more detailed information about site conditions, habitat analysis methods, and calculator inputs/outputs (Chapter 3, Chapter 4, and Appendix A).

Results of this analysis indicate that development at Tumwater East is expected to impact 60 functional-acres (FA) of occupied and potential Olympia pocket gopher habitat (Table 2). Conservation at Tumwater West is anticipated to result in permanent maintenance of 171 FA of

habitat at the time of permit issuance (Table 3). Tables 2 and 3 provide summary information showing how different types of habitat were valued and assessed in the HCP as “functional-acres” on the Project Site and Conservation Site (collectively Covered Lands).

**Table 3. Project Site construction area (Tumwater East) Functional-Acres Calculations**

<b>Factors Used in Determining Functional-Acres in the Habitat Calculator</b>	<b>Acres</b>	<b>Multiplier</b>	<b>Functional-Acres</b>
Paved areas	4.0	0	0
Tree Dominated and/or Disturbed Soils	44.7	0.1	4.47
Shrub-Dominated	6.4	0.5	3.2
Degraded Prairie	28.6*	0.70	20
Currently Occupied Area	22.2	1.0	22.2
<b>Subtotal (Functional-Acres)</b>	<b>NA</b>	<b>NA</b>	<b>49.87</b>
Connectivity & Conservation Multiplier (Functional-acres x 1.2)	NA	1.2	59.84
<b>Adjusted from Acres to Functional-Acres</b>	Total Acres: 83.7		Funct.-Acres: 59.84 (rounds to 60)
* Including both occupied (22.2 acres) and unoccupied (6.4 acres) habitat			

**Table 4. Conservation Site (Tumwater West) Functional-Acres Calculations**

<b>Factors Used in Determining Functional-Acres in the Habitat Calculator</b>	<b>Acres</b>	<b>Multiplier</b>	<b>Functional-Acres</b>
Degraded Prairie	67.5	0.7	46.3
Current Occupancy	67.5	1.0	67.5
<b>Subtotal (Functional-Acres)</b>	<b>NA</b>	<b>NA</b>	<b>113.8</b>
Connectivity & Conservation Multiplier (Functional-acres x 1.5)	NA	1.5	170.7 (or 171)
<b>Adjusted from Acres to Functional-Acres</b>			Funct.-Acres: 170.7 (rounds to 171)
Mitigation to offset the proposed Project	N/A		60 Funct.-Acres
Proposed Mitigation Balance	NA		171-60=111 FA

Should the ITP be issued for proposed activities at the Project Site, 60 FA would be apportioned from the 171 FA available at the Tumwater West Conservation Site to offset the impacts anticipated at Tumwater East. Based on current conditions, a balance of 111 FA may be available for future mitigation needs.

Future management of the Conservation Site for native prairie attributes will be designed to increase habitat value for Olympia pocket gopher over time. In addition to the 111 FA that may be available after mitigating for Project Site impacts, this long-term management regime could produce up to an additional 32 FA over time (a maximum total of 143 FA) if the entire site eventually improves to meet criteria for “high-quality native prairie” (see Glossary and Appendix A to the HCP for details).

In the future, the Applicants or third-parties may apply for a permit(s) that utilizes the remaining functional-acres of habitat at the Conservation Site (Tumwater West) for other projects within the Olympia pocket gopher range. In this event, Conservation Site monitoring will be used to confirm changing habitat conditions over time, and Tumwater West, LLC., will maintain habitat-accounting records to document the maintenance or increase of mitigation values and their allocation over time. Impacts on lands other than Covered Lands for this project are not addressed by the proposed HCP. In the event a subsequent permit application is received which relies on the remaining functional-acres of habitat, the Service would consider the environmental baseline, status of the species, then existing best available science for determining suitability of mitigation, and other information in assessing the mitigation value of the remaining mitigation lands at the time the application is made.

## **2.2 Regulatory Framework**

To be eligible for coverage under an ITP, a project or action must be otherwise lawful, and must remain in compliance with all relevant Federal, State, and local laws, regulations, and ordinances.

## **2.3 National Environmental Policy Act**

The National Environmental Policy Act of 1969 (NEPA) as amended (42 USC § 4331 et seq.), requires that Federal agencies analyze and publicly disclose the social, economic, and environmental effects associated with major Federal actions (42 USC § 4332). A major Federal action includes those actions “with effects that may be major, and which are potentially subject to Federal control and responsibility” (40 CFR § 1508.18). The issuance of an ITP under Section 10(a)(1)(B) of the ESA is considered a major Federal action (40 CFR § 1508.18(b)).

While NEPA does not mandate any particular result, it requires the Federal agency to follow particular procedures in its decision-making process. The purpose of these procedures is to ensure that the agency has the best possible information to make an “intelligent, optimally beneficial decision”, and to ensure that the public is fully apprised of any environmental risks that may be associated with the proposed action.

The Applicants understand that USFWS is required to complete a NEPA analysis of the effects of issuing the requested permit on the “human environment”, including the incidental take authorized by permit issuance and the effects associated with implementation of an HCP. The results of this analysis will be documented in either an Environmental Action Statement supporting a determination that an action can be categorically excluded from further analysis, an Environmental Assessment supporting a Finding of No Significant Effect, or an Environmental Impact Statement resulting in a Record of Decision.

Based on evaluation of similar recent projects and discussions with the USFWS, the Applicant has assumed that an environmental assessment (EA) is the appropriate level of NEPA review. An EA consists of a concise public document that includes:

- a brief discussion of the need for the proposed Federal action;
- evidence and succinct analysis determining whether to prepare an environmental impact statement or a finding of no significant impact;
- brief discussions of required alternatives;
- brief discussions of the environmental impacts of the proposed action and alternatives; and
- a listing of agencies and persons consulted (40 CFR § 1508.9).

## 2.4 Endangered Species Act

Section 9 of the ESA prohibits “take” of species that are listed as endangered (Except where take is exempted under Section 4(d) of the ESA or approved pursuant to Section 7 or 10), and Section 4 provides USFWS with the discretion to extend all or some of those protections deemed necessary and advisable to provide for the conservation of threatened species. Take includes harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capturing, or collecting a listed species, or attempting to engage in any such conduct (16 USC §1538(19)). Harm is further defined in ESA implementing regulations as an act which actually kills or injures fish or wildlife, including significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 C.F.R. § 17.3).

Non-Federal entities can apply for “incidental take” authorization when a project or activity does not involve a Federal action and the take is incidental to, and not the purpose of, an otherwise lawful activity (16 USC § 1539(a)(1)(A-B)). Section 10 of the ESA and the USFWS implementing regulations define the circumstances under which an ITP can be issued.

Section 10(a)(2)(A)(i-iv) of the Act requires that an applicant must submit a conservation plan that specifies:

- The impact that will likely result from such taking;
- What steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps, and the procedures to be used to deal with unforeseen circumstances;
- What alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and,
- Such other measures that the Service may require as being necessary or appropriate for purposes of the plan.

Section 10(a)(2)(B), provides that the Service shall issue an ITP if the USFWS finds, after opportunity for public comment, that:

- The taking will be incidental;
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
- The applicant will ensure that adequate funding for the conservation plan and procedures to deal with unforeseen circumstances will be provided;
- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild;
- The measures, if any, required by the Service as being necessary or appropriate for purposes of the plan will be met; and,
- The USFWS has received such other assurances as may be required that the plan will be implemented.

The ESA provides “no surprises” assurances through the USFWS implementing regulations (50 CFR §§ 17.22(b)(5), 17.32(b)(5)). These regulations assure applicants that if “unforeseen circumstances” arise, USFWS will not require the commitment of additional land, water or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond what is required by the ITP and the associated HCP without the permittees’

consent. The USFWS will honor these assurances as long as a permittee is implementing the terms and conditions of the HCP and the Permit.

## 2.5 National Historical Preservation Act

The National Historical Preservation Act of 1966, as amended (U.S.C. 470 et seq.), is the primary Federal law governing the preservation of cultural and historic resources in the United States.

Section 106 of the NHPA requires that Federal agencies consider the effects of their undertakings (including funding, licensing, or permitting the undertakings of other entities) on historic properties and stipulates that affected American Indian tribes must be consulted.

Issuance of ITPs is a Federal undertaking requiring review under the NHPA. The National Register of Historic Places (NRHP) is the Federal list of historic, archaeological, and other cultural resources deemed worthy of preservation. In Washington State, the NRHP is administered by the Washington Department of Archaeology and Historic Preservation (DAHP). Resources listed, or determined eligible for listing, are considered historic properties.

## 2.6 Proposed Action

The proposed action being evaluated in this EA is for USFWS to issue a 20-year term ITP authorizing implementation of the proposed HCP resulting in take of the Olympia pocket gopher incidental to actions related to site management, construction, and vegetation management associated with the construction of the Applicant's proposed warehouse distribution center and the establishment and dedication of Tumwater West Conservation Site. A 20-year permit is requested due to ongoing market and economic risk factors, which have resulted in these sites remaining undeveloped for over a decade while the Applicant actively pursued development options. The project is expected to take up to 3 years to build, but the start date for development is not yet defined. Thus, a 20-year term ITP provides more certainty within current market conditions.

## 2.7 Purpose and Need

In consultation with the Service, the Applicants determined that their proposed activities may result in the take of the ESA-listed Olympia Mazama Pocket Gophers. ESA Section 10(a)(1)(b) of the ESA, non-Federal applicants, whose otherwise lawful activities may result in take of ESA-listed wildlife, can apply to the USFWS for incidental take authority so that their activities may proceed without potential violations of Section 9. The Applicant has applied for an ITP. Consistent with the USFWS' responsibilities under ESA Section 10(a)(1)(b), the Service needs to respond to the ITP application. The Service's purpose is to approve, approve with conditions, or deny the Applicants' request for an ITP for the take of Olympia Mazama Pocket Gopher.

In carrying out this responsibility, the USFWS must comply with a number of laws, regulations, Executive Orders, and agency directives and policies. As USFWS fulfills these responsibilities and obligations, we will, without limitation:

- Ensure that the issuance of the ITP and implementation of the HCP achieve long-term species and ecosystem conservation objectives at ecologically appropriate scales, and
- Ensure that the conservation actions approved with issuance of the ITP occur within a spatially explicit Landscape Conservation Design capable of supporting species mitigation projects over the long-term.

## 3 ALTERNATIVES

### 3.1 Introduction

The NEPA and associated regulations require Federal agencies to analyze and publicly disclose the social, economic, and environmental effects associated with major Federal actions. This requires Federal agencies to study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources (42 USC § 4332). This EA analyzes and compares the effects of the “no action” alternative and the proposed action of issuing an ITP and implementation of the Applicant’s HCP.

### 3.2 Alternatives

#### Alternative 1 – No Action Alternative

Under this alternative, USFWS would not take the proposed Federal action of issuing the requested ITP. Because the listed species and their habitat are located throughout portions of the 79-acre Project Site, the Applicant would not develop Tumwater East site, and the Tumwater West would not be dedicated as a conservation site. In the absence of an ITP authorizing unavoidable incidental take, neither the proposed development, nor the proposed habitat management would proceed. Without vegetation management at either of these sites, the continued spread of woody vegetation would eventually eliminate the management-dependent grassland habitat, which is currently suitable for and/or occupied by Olympia pocket gopher on both sites. Under the No Action alternative, the Applicant would not be able to commercially develop either site. In addition, pocket gopher habitat would potentially decrease over time as woody species expanded into grasslands.

#### Alternative 2 – The Proposed Alternative

Under the Proposed Alternative, USFWS would issue an ITP based on the Applicant’s HCP. The proposed warehouse distribution center would occupy the entire 79-acre Tumwater East Project Site and would impact an additional 4.7 acres of adjacent roadside area. The warehouse distribution center and adjacent road improvements would be constructed in accordance with the ITP and other applicable requirements. The project site contains 60 functional-acres (FA) of Olympia pocket gopher habitat. The Applicant anticipates that the project, once initiated, will take approximately 1 to 3 years to build.

The Applicant proposes mitigation offsetting the loss of degraded habitat for Olympia pocket gopher (60 FA) at the Project Site by permanently protecting and managing the 67.5-acre Conservation Site at Tumwater West. The Conservation Site currently provides 171 FA of habitat, and may provide an additional 32 FA of habitat over time, depending on achievement of habitat-quality habitat management targets.

The Applicant will manage the Conservation Site in perpetuity to maintain habitat for the Olympia pocket gopher. The habitat at the Conservation Site is already high quality, in that the existing soils are “more preferred” types (sandy texture with relatively low gravel content), and the dominant plant community is a mix of grasses and forbs, preferred forage. Conservation Site management over time may increase habitat quality, but enhancement of existing habitat is not an obligation of the mitigation agreement.

The loss of habitat at the Project Site would require use of 60 FA of mitigation credit from the Conservation Site. The remainder of Tumwater West's functional-acres of habitat could provide advanced mitigation for other projects yet to be permitted within the Olympia pocket gopher range. The other projects that may be mitigated by Tumwater West in the future are not known and are not related to the proposed Alternative. The Service anticipates that each applicant or third-party proposing to us mitigation values from Tumwater West would apply for an appropriate ESA permit and appropriate ESA consultations processes would be followed.

### **3.3 Alternatives Considered But Not Analyzed In Detail**

Both Tumwater West and Tumwater East sites were initially proposed to be fully developed. However, the Applicants determined that it was not economically feasible to develop both sites and provide mitigation offsite within the range of the Olympia pocket gopher. Therefore, the Applicants decided to use Tumwater West as the Conservation Site to mitigate for unavoidable incidental take of gophers at Tumwater East. Because the Conservation Site is expected to both (1) fully mitigate for the 60 FA of impacts that would occur if the Project Site were developed, and (2) improve and preserve gopher habitat connectivity, the potential of requiring additional limitations on, and or specification for, development within the Project Site was considered, but not analyzed in detail.

## **4 AFFECTED ENVIRONMENT**

### **4.1 Introduction**

The affected environment includes the human environment within the geographic scope of the area analyzed. An analysis of the human environment includes "the natural and physical environment and the relationship of people with that environment" (40 CFR § 1508.14). The boundary of the affected environment displayed in Figure 2 defines the geographic scope of the analysis. The HCP Plan Area includes the Tumwater West Conservation Site and the Tumwater East Project Site described in the Applicant's HCP and is entirely contained in the Affected Environment along with the extent of the potential effects on the human environment likely to be affected by the proposed Federal action. Effects analyzed include:

- ecological (effects on natural resources)
- aesthetic (noise and visual);
- historic and cultural resources;
- economic (land use, including traffic);
- social (environmental justice); and public health and safety (air quality).

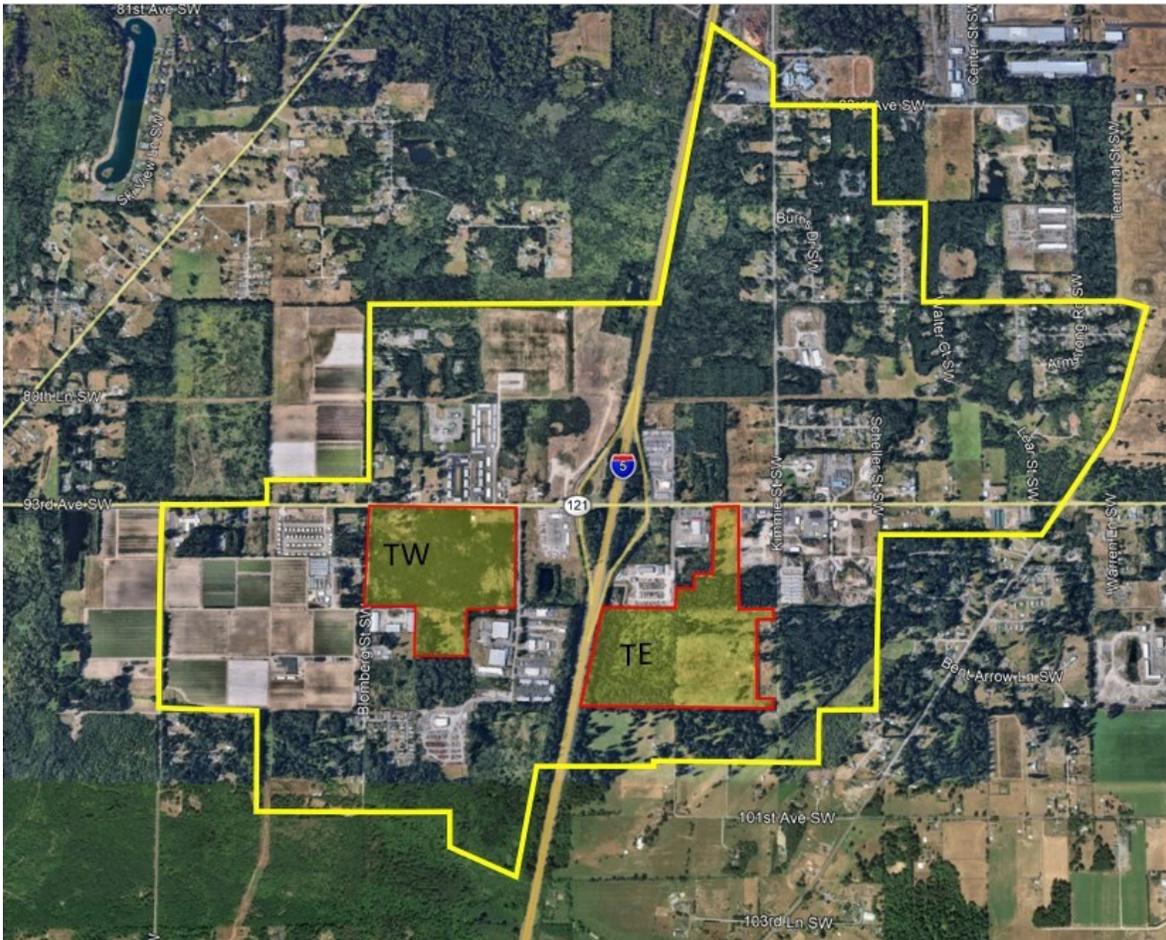
The Affected Environment includes parcels and roads that would be potentially affected by the proposed development.

- All parcels that are directly adjacent to the Project Site or Conservation Site parcels
- All parcels that front on roads that are directly adjacent to the Project Site and Conservation Site – including 93<sup>rd</sup> Avenue, Kimmie Street SW, Interstate 5, Lathrop Industrial Drive SW, and Blomberg Street SW.
- Limited to the southwest by Jones Road SW, to include parcels west of the Conservation Site that are managed the same or commonly owned as those directly adjacent to Blomberg Street.

- Limited to the northwest by the boundary of the City of Tumwater and the Tumwater UGA.
- Limited to the northeast by Port of Olympia properties and Case Road, which feed traffic to 93<sup>rd</sup> Avenue.
- Limited to the southeast by the boundary of the City of Tumwater and the Tumwater UGA.

Most of the AE is within Tumwater or its UGA, but also includes some adjacent parcels to the SE and SW under Thurston County jurisdiction. Both Tumwater West and Tumwater East sites are in the City of Tumwater.

This section describes existing conditions of elements of the human environment that could be affected by the proposed Federal action of issuing the requested ITP. Analysis and comparison of the resulting effects expected under the different alternatives are provided in the following sections (5. Environmental Consequences, and 6. Cumulative Impacts).



**Figure 2. Affected Environment boundary outlined in yellow is mostly within the City of Tumwater or its Urban Growth Area, and is entirely located in Thurston County, Washington.**

## 4.2 Ecological

### Climate and Climate Change

The International Panel on Climate Change (IPCC) defines climate in the following way: “Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind” (IPCC 2019).

The Plan Area is located in Thurston County, Washington, about 60 miles inland from the Pacific Coast at the southern extent of Puget Sound and experiences a temperate maritime climate, with cool, wet, winters and mild summers. Precipitation averages approximately 50 inches/year. The warmest and driest months generally occur in July and August, with December and January generally being the coldest months, and November through February generally receiving the greatest amount of precipitation. Fog is common in the area. The relatively small annual temperature range varies from an average maximum of 60.6°F to an average minimum of 39.9°F (NRCS WETS Tables, 2019).

Climate change predictions for the region indicate a likelihood of longer periods of summer drought and warmer summer temperatures, as well as more violent winter storms and temperature extremes year-round. The Environmental Consequences section below describes how each considered action may contribute to climate change; and the implications of climate change effects on the considered actions.

### Geology

The Plan Area is located at the southern end of the City of Tumwater, about 7 miles south of the southernmost extent of Puget Sound. The Puget Sound Trough is bordered to the west by the Olympic Mountains and to the east by the Cascade Mountains. Most of the geology (and resultant soils) in the Plan Area can be attributed to deposition and erosion from Pleistocene era glaciation, including the advance and retreat of the region’s most recent Vashon glaciation. The Vashon glacier left behind coarse, well-drained, sandy, glacial outwash deposits, which in some areas developed into prairie ecosystems (Noble and Wallace, 1966).

Glacial drift, glacial outwash sands and gravels and more recent (non-glacial origin) sandy alluvial flood deposits are common throughout the Plan Area (Figure 3). Glacial drift is the finely ground remains of rocks crushed by glacial activity. Drift contains silt and clay, which is carried as suspended sediment in floods, then re-settles in layered lakebed deposits. These relatively impermeable soil layers prevent the downward migration of groundwater in parts of Thurston County (Crawford and Hall 1997). In contrast, glacial outwash is a coarse-textured flood deposit; typically is composed of unconsolidated sand and gravel that tend to be highly erodible and have low water holding capacity.

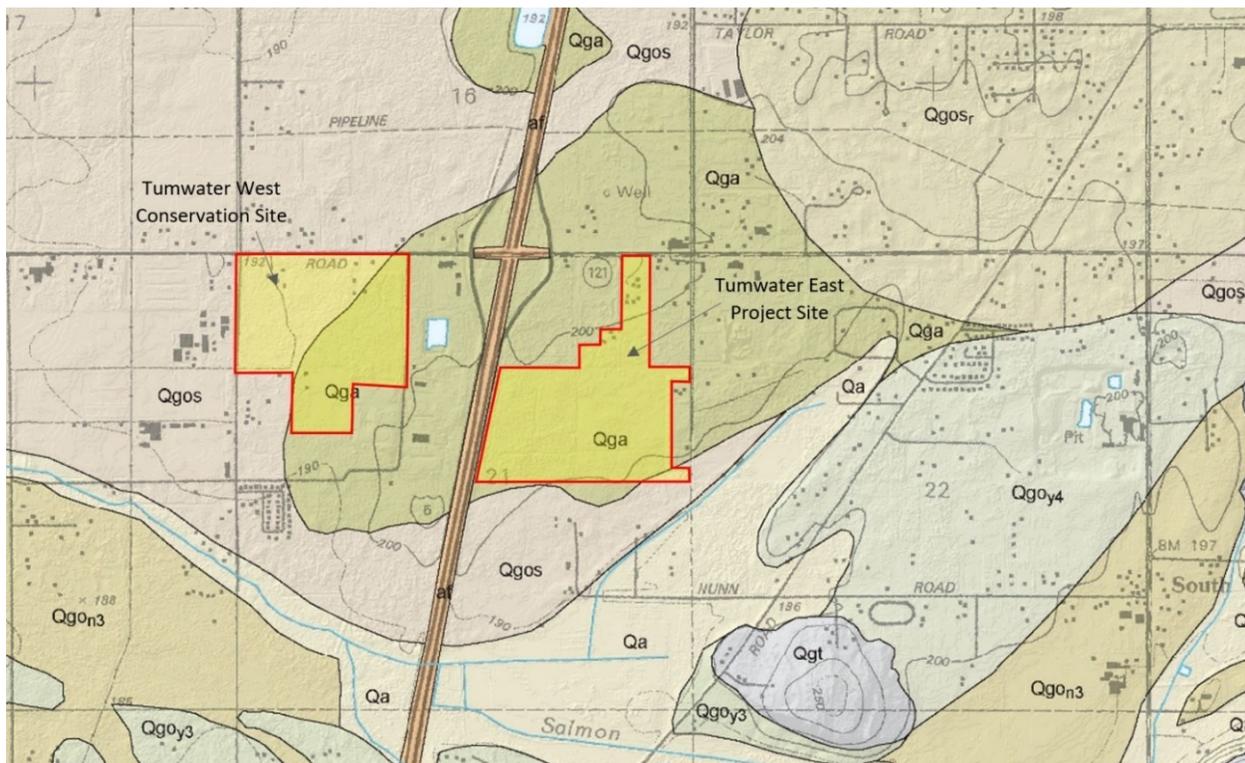
These surface materials are underlain by shallow compact glacial till<sup>1</sup> at various depths, which results in development of a relatively shallow winter groundwater table in the surrounding area.

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<sup>1</sup> Glacial till is unsorted gravel, sand, silt, and clay that is commonly dense and compacted. Till can be compacted materials from below a glacier or can be a mix compacted and loose materials left behind on the surface as the glacier melted. Till can range from being moderately well drained to effectively impervious.

Most of the low elevation areas in northern Thurston County are covered by these flood deposits which emanated from the southern extents of a continental glacial ice sheet that covered all of Canada and extended into the northern edge of the United States. The glacial ice sheet covered about half of Washington State, with one lobe of the glacier creating the Puget Sound. The glacier retreated from Thurston County about 10,000-12,000 years ago, leaving behind deposits from post glacial outwash floods.

The area immediately surrounding the Plan Area is mapped mostly as Vashon advance outwash sand and gravel, and lacustrine clay, silt and sand (Qga map unit). This map unit is surrounded by Vashon recessional outwash sand and silt, with minor gravel interbeds (Qgos) (Figure 3). The Qgos map unit is described as ranging from 4 to 20 ft thick, but no depth description is provided for the Qga map unit (Logan, R.L. et al, 2009).



**Figure 3. Geology of Area near the Project Site and Conservation Site.**

## Soils

The Geology map patterns of glacial deposition are reflected in the Thurston County Soil Survey maps (Figure 4, Table 5). The Natural Resources Conservation Service (NRCS) lists over 100 soil types and sub-types in Thurston County (Pringle, 1990). However, soils mapped in or near the Project Site and Conservation Site include only two glacial outwash soil types (Figure 4). The two soil map units (SMUs) on the Project Site and Conservation Site are the Cagey loamy sand (SMU 20, <2% slopes) and the Everett very gravelly sandy loam (SMU 32, 0-8% slopes); both are formed in glacial outwash deposits. Both of these soils are considered to have characteristics suitable for Olympia pocket gopher habitat, with Cagey loamy sand identified as a more-preferred soil type in guidance from USFWS (USFWS 2018). These and other nearby SMUs are described

in Table 5.

Other nearby soil map units include the Nisqually loamy fine sand or Indianola loamy sand upland soils, and Norma silt loam or fine sandy loam and McKenna gravelly silt loam wetland soils. The Cagey soils, which are dominant at both the Conservation Site and the Project Site are very similar to the Indianola soil series, but the Cagey soils are may have a seasonal perched water table within 6 ft of the soil surface from November through April. The well-drained Everett soils are mapped in small areas on both sites.

**Table 5. NRCS Thurston County Soil Survey Soil Map Unit Descriptions in Plan Area.**

Soil Map Unit	Soil Series Name	Soil Characteristics
20	Cagey loamy sand (<2% slopes)	Deep, moderately well drained soils that formed in sandy glacial drift on terraces. Soil texture is loamy sand grading to fine sand with depth. In some areas, a seasonal water table may be within 18-30 inches of the soil surface from November through April. During summer months, the groundwater is > 60 inches depth.
32	Everett very gravelly sandy loam (0-8% slopes)	Very deep, somewhat excessively drained soils that formed in glacial outwash and drift on outwash terraces and escarpments. Soil texture is very gravelly sandy loam grading to extremely cobbly sand with depth. Groundwater is >60 inches depth.
46	Indianola loamy sand (0-5% slope)	Very deep, somewhat excessively drained soils formed in sandy glacial drift on hills, terraces, terrace escarpments, eskers, and kames of drift or outwash plains. Groundwater is >60 inches depth.
65	McKenna gravelly silt loam	Moderately deep to densic contact, poorly drained soils that formed in alluvium over glacial drift in depressions and drainageways on glacial drift plains. Groundwater is at =1 to -1 ft from surface from November through April.
73	Nisqually loamy fine sand, 0-3% slope	Very deep, somewhat excessively drained soils formed in glacial outwash on terraces. Groundwater is >60 inches depth.
75,76	Norma sandy/silt loam	Deep, poorly drained soils formed in old alluvium in depressions on glacial till plains and drainageways. Groundwater is at =1 to -1 ft from surface from November through April.
85	Gravel Pits	No explanation needed
106	Shalcar variant muck	Very deep, very poorly drained soils formed in organic deposits over alluvium, glacial outwash or glaciomarine material on drift plains, river valleys in depressions of stream terraces and outwash terraces, oxbows, and back swamps.
110	Spanaway gravelly sandy loam, 0-3% slope	Very deep, somewhat excessively drained (sometimes cobbly) soils that formed in glacial outwash. They are on terraces and plains. Groundwater is >60 inches depth.
120	Tisch silt loam	Deep, very poorly drained soils formed in material from diatomaceous earth, volcanic ash and alluvium. They are in upland basins and drainageways. Groundwater is at or near the surface during most of the year.
129	Water	No explanation needed

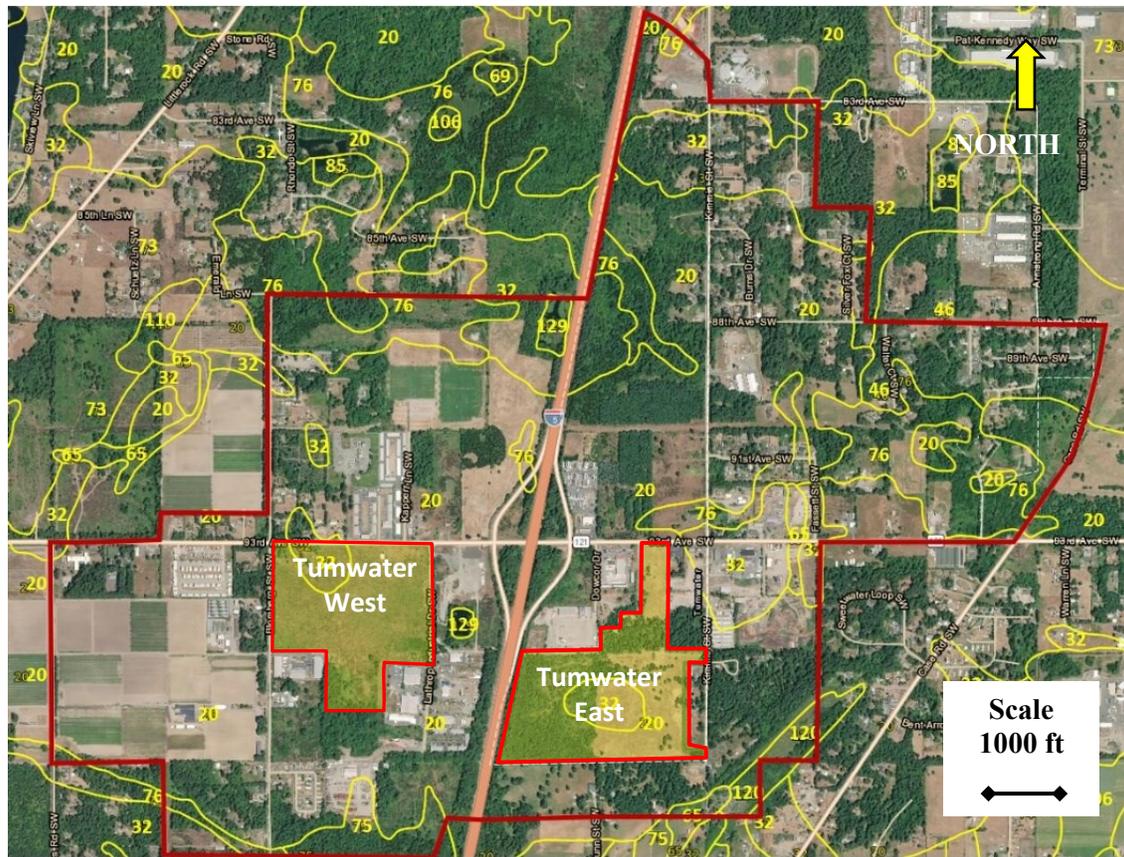


Figure 4. Soil Survey Map of surrounding area and in Affected Area.

## Topography

The Plan Area terrain can be generally described as a flat to rolling glacial outwash plain, which includes engineered drainages to the south, and localized depressions to the north and east. The Project Site and Conservation Site are slightly higher in elevation than surrounding areas. The Project Site has relatively flat surface topography with elevation ranging between 194 and 198 ft above mean sea level (MSL). Topography at the Conservation Site is also relatively flat, with elevation ranges between 192 and 196 ft. Depressions and drainages in the Plan Area are typically at elevations of about 180-188 feet.

## Surface and Groundwater

Thurston County's water resources are strongly influenced by conditions that are affected by past glacial events. Areas of glacial drift and till typically include a shallow, confining layer that traps or perches ground water near the surface, while glacial outwash areas are typically well drained and do not trap groundwater near the surface. Because glacial outwash is so well drained, prairie ecosystems in those areas often experience seasonal drought conditions during the summer months.

The Project Site and Conservation Site are located within the Upper Black River sub-basin (US Geologic Survey Hydrologic Unit Code 171001030501). The Project Site and Conservation Site are both within the Salmon Creek Drainage Basin, a smaller sub-basin within the Upper Black River HUC which has a specific Comprehensive Drainage Basin Plan due to extensive groundwater

flooding that occurred in the sub-basin during the 1990s. This means that the Project Site will be required to meet certain standards for stormwater system design. Setbacks from an offsite High Groundwater Hazard Area (HGHA) overlay the far southeast corner of the Project Site. Significant groundwater flooding occurred in the Salmon Creek Basin in the late 1990s, and new development in the area is required to take shallow groundwater tables into account when designing stormwater management systems. Surface elevation across the rest of the Project Site is high enough that groundwater conditions are not expected to significantly impact development planning. No HGHAs are mapped on the Conservation Site.

Regional water quality concerns in north Thurston County are primarily associated with shallow, perched water tables in areas dominated by glacial drift and till soils. This results in high nitrate and phosphate levels in ground and surface water from agricultural activities (fertilizers, pesticides, barnyard or dairy waste); and high nitrate levels associated with septic systems (Drost, Turney, & Jones, 1998). However, neither the Project Site nor the Conservation Site are mapped as being areas of groundwater concern or groundwater sensitive areas. Neither site will be applying excessive fertilizers, thus water quality impacts to the shallow groundwater aquifer from project impacts are not expected. The Project Site is within the City of Tumwater Water Service Area, and will be served by a public water supply and public sewer system.

The Washington State Department of Ecology (WA DOE) and the Environmental Protection Agency (EPA) are responsible for setting and regulating water quality standards for both ground and surface water. Other state agencies that regulate some aspect of surface or ground water quality include the Department of Health (on-site sewage systems), the Department of Agriculture (enforcement of groundwater quality standards on agricultural sites); and local Health Departments (through issuance of solid waste permits for landfills).

Groundwater quality standards are defined in Chapter 173-200 WAC, and guidance for implementation of groundwater quality standards are described in the WA DOE Publication 96- 02, updated October 2005. The WA DOE is responsible for regulating state waste discharges permits; National Pollutant Discharge Elimination System (NPDES) permits; general permits; and independent cleanup sites. The WA DOE provides a Stormwater Treatment and Erosion Control Design Manual describing BMPs and stormwater facility standards designed to maintain ground water and surface water quality associated with development.

City of Tumwater has adopted a stormwater design manual that is similar to the WA DOE model. Application of the manual is required to design onsite stormwater management systems. It is intended that proper application of the BMPs required in the manual for actions both during construction and after construction is complete will ensure that state water quality standards are met.

### **Wetlands and Streams**

Thurston County has extensive stream networks and historically abundant wetlands. Throughout the County, wetlands and streams can be either perennial or seasonally-wetted. The current distribution of wetlands reflects climate, natural landscape formation, and (intentional and incidental) water management at a variety of scales.

Within the Salmon Creek Basin, the Hopkins Ditch District #2 was established in 1901 to improve agricultural opportunities south of Tumwater. The Hopkins Ditch system includes sections of Salmon Creek, and is approximately seven miles long, draining about 7,500 acres of land, of which the Project Site is a small part. The Ditch is to be maintained by the local Conservation District, though maintenance is inconsistent over time and across sites.

The Project Site does not contain any wetlands or streams. The closest mapped wetlands are associated with Hopkins Ditch which flows from northeast to the southwest about 330 ft from the Project Site's southeast corner. Surface elevation at Hopkins Ditch in that area is mapped as being about 188 ft, which is two to ten feet lower in elevation than the Project Site surface.

During high rainfall winters in the late 1990s, groundwater tables in the Salmon Creek Basin rose to the surface in some areas, but no flooding was documented during that period on either the Project Site or the Conservation Site. Due to this flooding, the City of Tumwater improved some regional stormwater management infrastructure in the surrounding area to reduce risks of flooding recurrence. On average, the groundwater table across most of the Project Site is expected to persist at a depth greater than six to eight ft below the surface during the wettest winter months and into the spring.

The Conservation Site does not contain any wetlands. The closest mapped wetlands are also associated with Hopkins Ditch, which flows from east to west about 1,500-2,000 ft south of the site at about 180 ft elevation. An excavated stormwater pond located about 270 ft east of the site has a year-round water surface mapped at about 188 ft elevation. In comparison to the 180-ft water surface elevation at Hopkins Ditch, this indicates a sloped groundwater gradient to the south. Only the areas around Hopkins Ditch flooded during the late 1990s, and for that reason, the groundwater surface across most of the Conservation Site is also expected to persist at greater than six to eight ft depths during winter months and into the spring in most years.

## Vegetation

Prairie vegetation in the greater Puget Sound region is dependent on disturbance. Historically, these disturbances were mostly related to fire, and more recently are related to farming and other management-based disturbances. Without regular disturbances, the region's glacial outwash soils would be more likely to support forest vegetation communities (Crawford and Hall 1997). Native Americans maintained and expanded the prairie ecosystem until Europeans arrived by using periodic, low intensity fires which encouraged forbs and bunch grasses, and discouraged the establishment of shrubs and woody vegetation.

Native prairies in the south Puget Sound are usually found on glacial outwash soils, and are represented by the Idaho fescue- white-topped aster vegetation community. This community is characterized by a group of native forbs, which distinguishes it from similar communities that develop on shallow bedrock soils elsewhere in the Puget Sound (Chappell and Crawford 1997). Typical plants found in intact examples of this prairie community include Idaho fescue (*Festuca idahoensis*); forbs such as common camas (*Camassia quamash*); sedges such as long-stolon sedge (*Carex inops*); and sparsely scattered shrubs such as the dwarf shrub, kinnikinnick (*Arctostaphylos uva-ursi*).

The impact of changes in management is demonstrated by changing vegetation structure. Over the past 100+ years, the practice of burning prairies has diminished greatly or entirely ceased. This has resulted in increased conifer and woody-shrub encroachment. Native prairies in Thurston County are transitioning toward forested cover as trees such as Douglas-fir (*Pseudotsuga menziesii*) and/or lodgepole pine (*Pinus contorta*) invade prairie landscapes. The Nisqually soil series reflects this transition, as this soil with a deep, dark-colored surface horizon is believed to have developed entirely as a prairie grassland soil, but most of this soil type is currently forested. By the early 2000's, only about 8 percent of the original South Puget Sound prairies continued to support grassland vegetation, and only about 2-3 percent were dominated by native prairie vegetation

(Stinson 2005a).

The cessation of periodic burns on the prairies also allowed expansion and invasion of several non-native species that thrive on the former native prairies (Hamman et al, 2011). Scotch broom (*Cytisus scoparius*) invaded much of the original prairie habitat and aggressively out-competes many native plant species. According to Chappell and Crawford (1997), other invasive species now common to remnant prairies include several perennial grasses and both perennial and annual forbs, including colonial bentgrass (*Agrostis tenuis*), common velvetgrass (*Holcus lanatus*), Kentucky bluegrass (*Poa pratensis*), hairy catsear (*Hypochaeris radicata*), common St. Johns-wort (*Hypericum perforatum*), buckhorn plantain (*Plantago lanceolata*), oxeye-daisy (*Chrysanthemum leucanthemum*), sheep sorrel (*Rumex acetosella*), and teasdalia (*Teesdalia nudicaulis*).

For at least several decades, former grassland prairies in the surrounding area have been farmed or are surrounded by commercial and residential development. The grassland areas on the Project Site and Conservation Site were historically prairies with low-density residential land uses that have been vacant for a number of years and the resulting plant communities now include many of these invasive plant species and few native species.

At the Conservation Site, due to historic management as pasture or farmland and recent mowing, the plant community is dominated by non-native herbaceous plant species, such as pasture grasses, with some native trees and mixed native/non-native shrubs. Even with a degraded plant community, the site is occupied by Olympia pocket gopher and the plant community supports suitable forage.

### Fish and Wildlife

The highly varied topography, soils, and vegetation communities in Thurston County support a wide range of fish and wildlife species, including several state or federally-listed species that are dependent on aquatic, forest or prairie habitats. Freshwater aquatic species include eight different species of salmonids (listed below), salamanders, frogs, toad, turtles, lampreys and Olympic mudminnows. Saltwater aquatic species include the anadromous salmonids; forage fish species (such as herring, sand lance and surf smelt); and sea mammals (such as orcas, seals and sea lions). Bird species include migratory seabirds (such as loons, grebes, cormorants); raptors (such as bald eagles, falcons and merlins); and a wide variety of songbirds. Common terrestrial mammals include bats, squirrels, deer and elk. Priority species documented by WDFW as potentially occurring in the county are listed below in Table 6. Endangered or threatened species known to occur in Thurston County (starred\* below) include three of the four listed subspecies of the Mazama pocket gopher, the Taylor checkerspot butterfly, the Mardon skipper, the streaked horned lark, the Oregon spotted frog, chinook salmon and steelhead.

**Table 6. Thurston County WDFW Priority Species List (Source: WDFW PHS Database)**

	WDFW Priority Species	State Status	Federal Status
Fishes	Pacific Lamprey		
	River Lamprey	Candidate	
	White Sturgeon		
	Olympic Mudminnow	Sensitive	
	Pacific Herring	Candidate	
	Longfin Smelt		
	Surf smelt		
	Bull Trout/ Dolly Varden	<u>Candidate *</u>	<u>Threatened *</u>

	<b>WDFW Priority Species</b>	<b>State Status</b>	<b>Federal Status</b>
	Chinook Salmon	Candidate	Threatened (Upper Columbia Spring run is Endangered)
	Chum Salmon	Candidate	Threatened
	Coastal Res./ Searun Cutthroat		Species of Concern
	Coho Salmon		Threatened – Lower Columbia Species of Concern – Puget Sound
	Pink Salmon		
	Rainbow Trout/ Steelhead/ Inland Redband Trout	<u>Candidate **</u>	<u>Threatened **</u>
	Sockeye Salmon	Candidate	Threatened – Ozette Lake Endangered – Snake River
	Pacific Cod	Candidate	Species of Concern
	Pacific Hake	Candidate	Species of Concern
	Walleye Pollock	Candidate	
	Brown Rockfish	Candidate	
	Copper Rockfish	Candidate	
	Quillback Rockfish	Candidate	
	Lingcod		
	Pacific Sand Lance		
	English Sole		
	Rock Sole		
Amphibians	Cascade Torrent Salamander	Candidate	
	Van Dyke's Salamander	Candidate	
	Oregon Spotted Frog	Endangered	Threatened
	Western Toad	Candidate	
Reptiles	Western Pond Turtle (formerly Pacific Pond Turtle)	Endangered	
Birds	Common Loon	Sensitive	
	Marbled Murrelet	Threatened	Threatened
	Western grebe	Candidate	
	W WA nonbreeding concentrations of: Loons, Grebes, Cormorants, Fulmar, Shearwaters, Storm-petrels, Alcids		
	W WA breeding concentrations of: Cormorants, Storm-petrels, Terns, Alcids		
	Great Blue Heron		
	Western High Arctic Brant (formerly called Brant)		
	Cavity-nesting ducks: Wood Duck, Barrow's Goldeneye, Common Goldeneye, Bufflehead, Hooded Merganser		
	Western Washington nonbreeding concentrations of: Barrow's Goldeneye, Common Goldeneye, Bufflehead		
	Harlequin Duck		
	Waterfowl Concentrations		
	Golden Eagle	Candidate	

	WDFW Priority Species	State Status	Federal Status
	Mountain Quail		
	Sooty Grouse		
	Wild Turkey		
	W WA nonbreeding concentrations of: Charadriidae, Scolopacidae, Phalaropodidae		
	Band-tailed Pigeon		
	Yellow-billed Cuckoo	Endangered	Threatened
	Northern Spotted Owl (formerly called Spotted Owl)	Endangered	Threatened
	Vaux's Swift	Candidate	
	Pileated Woodpecker	Candidate	
	Oregon Vesper Sparrow	Candidate	
	Slender-billed White-breasted Nuthatch	Candidate	
	Streaked Horned Lark	Endangered	Threatened
Mammals	Dall's Porpoise		
	Harbor Seal		
	Orca (Killer Whale)	Endangered	Endangered
	Harbor Porpoise (formerly called Pacific Harbor Porpoise)	Candidate	
	California Sea Lion		
	Roosting Concentrations of: Big-brown Bat, Myotis bats, Pallid Bat		
	Townsend's Big-eared Bat	Candidate	
	Western Gray Squirrel	Threatened	
	Mazama (Western) Pocket Gopher	Threatened	<b>Threatened</b> - glacialis, pugetensis, tumuli, yelmensis subspecies <b>Species of Concern</b> - couchi louiei, melanops subspecies Species of Concern
	Fisher	Endangered	
	Marten		
	Columbian Black-tailed Deer		
	Elk		
Invertebrates	Pacific Geoduck (formerly Geoduck)		
	Butter Clam		
	Native Littleneck Clam		
	Manila (Japanese) Littleneck Clam (formerly called Manila Clam)		
	Olympia Oyster	Candidate	
	Pacific Oyster		
	Dungeness Crab		
	Pandalid shrimp (Pandalidae)		
	Beller's Ground Beetle	Candidate	
	Pacific Cluetail	Candidate	
	Leschi's Millipede	Candidate	
	Mardon Skipper	Endangered	

	WDFW Priority Species	State Status	Federal Status
	Puget Blue	Candidate	
	Valley Silverspot	Candidate	
	Taylor's Checkerspot	Endangered	Endangered
		* Bull Trout only	
		** Steelhead only	
<b>** Important Note **</b>			
<p>These are the species and habitats identified for Thurston County. This list of species and habitats was developed using the distribution maps found in the Priority Habitat and Species (PHS) List (see <a href="http://wdfw.wa.gov/conservation/phs/">http://wdfw.wa.gov/conservation/phs/</a>). Species distribution maps depict counties where each priority species is known to occur as well as other counties where habitat primarily associated with the species exists. Two assumptions were made when developing distribution maps for each species:</p> <p>1) There is a high likelihood a species is present in a county, even if it has not been directly observed, if the habitat with which it is primarily associated exists.</p> <p>2) Over time, species can naturally change their distribution and move to new counties where usable habitat exists.</p> <p>Distribution maps in the PHS List were developed using the best information available. As new information becomes available, known distribution for some species may expand or contract. WDFW will periodically review and update the distribution maps in PHS list.</p>			

Of the species with federal listing status that may occur in Thurston County (Table 7), only the Olympia pocket gopher is known to occur in the Plan Area. The Project Site and Conservation Site are each known to be occupied by Olympia pocket gophers. Observed occupancy varies significantly between the two sites and is described in more detail below.

The Project Site is less than two miles from the Olympia Regional Airport, which is designated critical habitat for the Olympia pocket gopher. The Taylor’s checkerspot butterfly is another listed prairie-dependent species in Thurston County, with designated critical habitat farther south.

Neither the streaked horned lark nor the Taylor checkerspot butterfly have been documented at either the Project Site or the Conservation Site, and neither are likely to occur there based on the small size of contiguous grasslands, the plant composition and density.

Table 7. Federally Listed Species Status and Critical Habitat in the Plan Area

Species	Federal/State Listing Status	Designation of Critical Habitat (federal)	Likelihood to be affected by the proposed Federal action
Taylor’s checkerspot butterfly	Endangered/ Endangered	Designated 10/03/2013 (78 FR 61505 61589) Species listed 11/04/2013	Species is known from only a few sites in Thurston County and has short dispersal capabilities. Species has not been documented to occur on the Project or Conservation Sites. Current habitat conditions and land uses make the presence of this species on either site highly unlikely. Species is unlikely to be affected by the proposed action. Designated critical habitat does not occur in the affected environment.

Species	Federal/State Listing Status	Designation of Critical Habitat (federal)	Likelihood to be affected by the proposed Federal action
Streaked horned lark	Threatened/Endangered	Designated 10-03-2013 (78 FR 61505 61589) Species Listed 11/04/2013	Species is known to nest in open areas on the nearby Olympia Regional Airport, designated critical habitat for the species. Species in this portion of the range uses large (typ. >300 acres) open areas with short-statured grasses, forbs and bare soil. Species has not been documented to occur on the Project or Conservation Sites. Species is unlikely to be affected by the project or the proposed federal action. Designated critical habitat does not occur in the affected environment.
Three subspecies of Mazama pocket gopher*	Threatened/Threatened	Designated 04-09-2014 (79 FR 19711 19757) Species Listed 05/09/2014	The Olympia subspecies ( <i>T. mazama pugetensis</i> ) is known to occur on the Project Site and the Conservation Site. Designated critical habitat does not occur in the affected environment. <b>Olympia subspecies will be affected by the proposed Federal action</b>

\**T. mazama pugetensis*, *T. mazama yelmensis*, and *T. mazama tumuli*

### Olympia pocket gopher

April 9, 2014, USFWS listed the Olympia pocket gopher as threatened under the ESA (79 FR 19760) and published a final rule designating critical habitat for the species (79 FR 19712). The final rule also listed the other extant subspecies of Mazama pocket gopher in Thurston and Pierce counties as threatened. Only the Olympia subspecies occurs in the affected environment.

The distribution and abundance of Mazama pocket gophers is greatly affected by soils. Soil characteristics that affect gophers include depth and texture, particularly clay content that affects burrowing ability, permeability that can result in periodic flooding of burrows, and water-holding capacity and fertility that affect growth of plant foods. Pocket gopher distribution is affected by the soil types and conditions, drainage, forage availability, and predation (Case and Jasch 1994; Hafner et al. 1998; Reichman 2007; Steinberg and Heller 1997; Stinson 2005b; WDFW 2009). Pocket gophers generally prefer deep, light-textured, porous, well-drained soils, and do not occur in peat or heavy clay soils (Chase et al. 1982, Baker et al. 2003).

Prairies and meadows used by pocket gophers have a naturally patchy distribution. Pocket gopher burrows consist of a series of main runways, off which lateral tunnels lead to the surface of the ground (Wight 1918). Nests containing dried vegetation are generally located near the center of each pocket gopher's home tunnel system (Wight 1918). Food caches and store piles are usually placed near the nest (Wight 1918). Adult Mazama pocket gophers do not hibernate in winter; although they remain active throughout the year (Case and Jasch 1994), foraging efficiency is likely best during the plant growing season.

Olympia pocket gophers forage on a variety of soft plant material, including leafy vegetation, roots, shoots, and tubers (USFWS 2014a). Pocket gophers play a key ecological role by aerating soils, activating the seed bank, and stimulating plant growth, though they have been treated as pests in

agricultural systems. In prairie and meadow ecosystems, pocket gopher activity plays a role in maintaining plant diversity. Foraging primarily takes place below the surface of the soil or within a few ft of a burrow opening (Wight 1918). Any water they need is obtained from their food (Gettinger 1984; Wight 1918).

The probability of pocket gopher occupancy is much higher in areas with less than 10 percent woody vegetation cover (Olson 2011a), presumably because such vegetation will shade out the forbs, bulbs, and grasses that pocket gophers prefer to eat, and high densities of woody plant roots make movement in the soil difficult.

The pocket gopher's home range is composed of suitable breeding and foraging habitat. Home range size varies based on factors such as soil type, climate, and density and type of vegetative cover (Case and Jasch 1994; Cox and Hunt 1992; Hafner et al. 1998). Pocket gopher density likely varies greatly due to local climate, soil suitability, and vegetation types (Case and Jasch 1994; Howard and Childs Jr. 1959); and densities are likely to be higher where habitat quality is better.

Studies using live-capture and enumeration continue to find that densities of *Mazama* pocket gopher vary significantly between sites with dissimilar characteristics, between sites with similar characteristics, and within the same sites over time (Olson 2011a, 2011b, 2013).

Pocket gophers rarely surface completely from their burrow except as juveniles, when they disperse above ground from spring through early fall (Howard and Childs Jr. 1959; Ingles 1952). They are highly asocial and intolerant of other pocket gophers except for brief periods during mating seasons and prior to weaning young (Ingles 1952; Marsh and Steele 1992; Witmer and Engeman 2007).

Population density is often influenced by forage density and soil suitability for burrowing (Patton and Smith 1990). On sites with varying soil depth and rockiness, pocket gopher density was estimated to vary five-fold (Steinberg 1996).

Pocket gophers have limited dispersal capabilities (Williams and Baker 1976). Dispersal distances may vary based on surface, soil conditions and size of the animal, and other unknown factors.

Initial results from research being conducted on Joint Base Lewis McChord indicate that juvenile *Mazama* pocket gophers usually make movements from 13.1 to 32.8 ft (4-10 meters), though these may not be dispersal movements. One monitored juvenile made a distinct dispersal movement of 525 ft (160 meters) in a single day (Olson 2012). Maximum dispersal limits are not known.

Dispersal occurs above-ground across areas of suitable or unsuitable habitat. Dispersal can be limited by barriers, such as waterways or ridges. Pocket gopher dispersal is a dangerous developmental stage because above-ground movements expose individuals to predation, crushing by vehicles, and the risk of not finding suitable burrowing habitat.

The Olympia pocket gopher faces significant threats that contribute to a risk of endangerment. The best available scientific and commercial information identifies the following significant threats to the subspecies: Destruction, modification, or curtailment of habitat and range, including the on-going, cumulative effects of development, military training, and loss or curtailment of natural disturbance processes; poor connectivity between small and isolated populations; and predation and pest control, including that which is attributable to domesticated pets. Additional information about these threats is found in the listing rule (79 FR 19760).

Olympia pocket gopher occur on the Project Site and the Conservation Site. Iterative surveys on the Project site identified severely degraded habitat conditions for Olympia pocket gopher and, on most

survey dates, no evidence of Olympia pocket gopher presence was detected on the Project Site. In 2018, additional surveys identified a grouping of Olympia pocket gopher mounds in a portion of the suitable habitat near the southern boundaries of the Project Site.

Evidence of Olympia pocket gopher has been regularly identified on the Conservation Site. Observations confirming presence date back to 2007 (WDFW 2019). Recent removal of Scots broom from the site, which had filled in to varying density across the site, was followed by observations of Olympia pocket gopher mounds throughout the site the following season.

### 4.3 Aesthetic

#### Noise

The Project Site and Conservation site are in the City of Tumwater jurisdiction at the southern edge of the greater Tumwater commercial/ industrial zone south of 93<sup>rd</sup> Avenue SW. The surrounding area at both sites includes a combination of residential and commercial uses. Zoning at both Conservation and Project Sites is Light Industrial (LI).

At the Project Site, directly offsite to the south and east, zoning is Rural 1/10 (R 1/10), a special zoning developed for the Salmon Creek basin to ensure low density residential development (one unit/10 acres) in an area prone to groundwater flooding. There are residences in the R 1/10 zoned parcels directly adjacent east and south of the Project Site, and also one apparent residence on an LI zoned parcel directly east (Adair Homes site). Parcels west of the Project Site are commercial operations, including a hardware store (with espresso stand and food truck), and what appears to be a semi-truck service center. Interstate 5 parallels the far southwestern Project Site Boundary.

At the Conservation Site, R 1/10 zoning is directly adjacent to the southwest. The rest of the site is surrounded by LI zoning. The residentially-zoned parcels to the southwest are currently used by Washington Dept. of Natural Resources (WADNR) and U.S. Forest Service (USFS) as tree nurseries. There are residences in parcels zoned for light industry across 93<sup>rd</sup> to the northwest.

The rest of the surrounding parcels already support commercial or light industrial development, such as storage rental units to the north and office/commercial-industrial businesses in the Lathrop Industrial Park to the southeast.

The Washington Administrative Code (WAC) establishes maximum permissible sound level limits (in dBAs<sup>2</sup>) based on land use zoning of noise source(s) and receiving properties (WAC Chapter 173-60). The residential areas east and south of the Project Site, and north and west of the Conservation Site would be designated Class A EDNA<sup>3</sup>, i.e., lands where human beings reside and sleep. The commercial properties west of the Project Site and around the rest of the Conservation Site would likely be designated Class B EDNA, i.e., lands involving uses that may require protection against noise interference with speech. Class B EDNA areas would include: commercial living accommodations, commercial dining establishments, motor vehicle services, retail services, banks and office buildings, miscellaneous commercial services, recreation and entertainment, and

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<sup>2</sup> “dBA” means the sound pressure level in decibels measured using the “A” weighting network on a sound level meter. The sound pressure level, in decibels, of a sound is twenty times the logarithm to the base ten of the ratio of pressure of the sound to a reference pressure of twenty micropascals

<sup>33</sup> “EDNA” means the environmental designation for noise abatement, being an area or zone (environment) within which maximum permissible noise levels are established.

property not used for human habitation (e.g., theaters, stadiums, fairgrounds, and amusement parks, educational, religious, governmental, cultural and recreational facilities).

The freeway corridor to the southwest of the Project Site might be designated Class C EDNA, although the noise designations may not apply to a travel corridor. Class C EDNA code is applied to lands involving activities with higher noise levels, i.e., storage, warehouse and distribution facilities; industrial property used for the production and fabrication of durable and nondurable man-made goods; and agricultural and silvicultural property used for the production of crops, wood products, or livestock.

The City of Tumwater identifies additional sources of and limits on noise that are considered unnecessary or a nuisance (Tumwater Municipal Code, Chapter 8.08), and sets civil penalties for noise violations that constitute a public nuisance. Examples of such noises include construction activity clearly audible from another location in a residential district or at a dwelling in any district, other than between 7:00 a.m. and 8:00 p.m. on weekdays, or between 9:00 a.m. and 8:00 p.m. on weekends. In general, Tumwater code restricts noises – including construction noises – that exceed 55 dBA between 7:00 am and 10:00 pm, and 45 dBA between 10:00 pm and 7:00 am, as measured at the edge of nearby residential properties. Sounds levels in Class B and C areas are slightly more lenient. Specific exemptions to this rule include (but are not limited to) emergency alarms or sirens; emergency services, parades or other activities that have been legally permitted by the City.

#### **4.4 Historic and Cultural Resources**

The proposed issuance of a Federal permit constitutes an undertaking as defined by Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA). The permitted activities may involve the take of Covered Species. According to various sources, the species subject to take might be considered culturally or religiously significant by the Nisqually Tribe, the Squaxin Island Tribe, the Confederated Tribes of the Chehalis Reservation, the Samish Indian Nation, the Sauk- Suiattle Indian Tribe, the Yakama Tribe, the Cowlitz Tribe and the Quinault Nation in the project area. The API is located in the traditional territories of the Nisqually, Chehalis and Cowlitz Tribes.

Prior to the early 1900s, Native Americans periodically burned the prairies (approximately every 1-5 years) to reinvigorate the grasses and forbs, which were important food sources, and to prevent the growth and expansion of coniferous trees (South Sound Prairies, 2014). These areas were managed and burned repeatedly for thousands of years, which created unique prairie habitat in the South Puget Sound, and supported many plant and animal species that are found nowhere else.

Non-indigenous people began arriving in the early 1800s and transformed many of the prairies into cultivated fields and livestock pastures, and the Native American practice of burning and managing native prairies was greatly reduced. Since the early 2000's, only about 8 percent of the original prairie still supports grassland vegetation, and only about 2-3 percent of the original prairie is still characterized as native prairie vegetation (Stinson, 2005a).

No potential or registered historic properties are inventoried within or near the Project Site. Based only on an Assessor's inventory, which identifies built-dates, one potential historic property (house built in 1940) is mapped on the Project Site, and several potential historic properties (houses with built dates ranging from 1901-1965) are mapped on or near the Conservation Site. But none of these are currently identified as historic homes or Natural Heritage sites, and none were determined to be eligible for listing.

Historic General Land Office maps do not display any old trails, Native American sites or critical

water features in any Sections within Township 17N (T17N), Range 2W (R2W) – the T&R for Project and Conservation Sites, despite these features being mapped in surrounding T&Rs. However, the WISAARD Predictive Model mapping indicates that the area around both the Project Site and Conservation Site are “Moderate Risk” to “High Risk”, which may indicate a DAHP recommendation for an inadvertent discovery plan be in place prior to any ground disturbance.

As required by Section 106 of the NHPA, the USFWS considered the effect of its issuance of the subject ITP on historic properties. The project archaeologist working for the Applicant has concluded that there are no known cultural or historical resources on the Project Site.

Seven past cultural resource surveys conducted within a mile of the Project Site Area of Potential Impact (API) have not had any significant findings, and although there are 92 potential historic properties within 1 mile of the API Site, none have been evaluated for the National Register of Historic Properties (NRHP), and only one of these properties will be affected by the proposed undertaking -- an abandoned single-family home structure in disrepair on Parcel Number 12721110400 which will be demolished.

Based on a review of geologic and hydrologic processes, past and present land use, and the results of cultural resource identification efforts, the USFWS (in letter FWS/IR09/IR12, May 28, 2020) has evaluated the potential impact of the proposed project on cultural resources at the Project Site and Conservation Site, and does not anticipate that the project would affect or impact historic properties. No additional field inventory for cultural resources is warranted in regard to this project.

To ensure this outcome, the USFWS letter (FWS/IR09/IR12, May 28, 2020) recommends, and the applicant commits to implement the Inadvertent Discovery Plan (IDP) outlined in the Project Area cultural resources report (Attachment A) if archaeological resources or human remains are discovered during site development. If this protocol is followed, the project can be considered in compliance with Section 106. This determination of effect applies only to the activities described in the HCP. Plans for future federally-funded ground disturbing activities within the same location may require a separate determination of effect, and may require additional consultation and inventory efforts to ensure Section 106 compliance.

## **4.5 Economic**

### **Socioeconomics**

The estimated population of the City of Tumwater in 2019 was 23,688, an increase from the 2010 Census population of 17,371. The estimated population of Thurston County in July 2018 was 286,419, and increase of approximately 13.5 percent from 252,264 in 2010 (US Census Bureau).

The largest employment sectors in Tumwater are public administration; educational services; health care and social assistance; retail trade; and professional, scientific, and technical services.

The Olympia-Tumwater unemployment rate as of July 2019, was 5.3 percent (U.S. Bureau of Labor Statistics data). The Thurston County unemployment rate in April 2019, was 5.2 percent. Washington state’s unemployment rate as of July 2019, was 4.6 percent compared to 3.7 percent reported for the United States as a whole (U.S. Bureau of Labor Statistics).

Median household income and poverty rate information are provided in the section addressing Environmental Justice issues.

### **Land Use**

The City of Tumwater is approximately 17.76 square miles in area. In addition to residential neighborhoods, the City of Tumwater includes the Olympia Regional Airport and its surrounding industrial park; a large complex of office buildings along Capitol Boulevard northeast of the airport; the Old Olympia Brewery properties farther north on Capitol Boulevard; the Mottman Industrial Park to the northwest and commercial/industrial areas to the south.

The Project Site is located in southwest Tumwater, southeast of the 93<sup>rd</sup> Avenue Interchange at Interstate-5 (I-5), and the Conservation Site is located southwest of the same intersection. The northern boundary of the Project Site and Conservation Site is defined by 93<sup>rd</sup> Avenue SW, a west to east route along the southern edge of Tumwater connecting I-5 to Old Highway 99 (southern extension of Capitol Boulevard) about 3.4 miles to the east and to Little Rock Road about 1.6 miles to the west. Commercial trucks and passenger vehicles regularly use 93<sup>rd</sup> Avenue.

The area surrounding the Project Site includes several commercial establishments :a hardware store, a large truck stop/ travel center and restaurant; private sector consulting offices, rental storage units; a modular home sales office; and nearby campgrounds. There is some residential development in the vicinity – typically separate single-family homes on lands with either current or past agricultural operations.

The Conservation Site has somewhat similar surrounding land uses, being mostly commercial or light industrial businesses, with a few single-family homes on 1- to 5-acre lots to the north, and intensive tree-nursery operations (WDNR and USFS) to the west. The Conservation Site was previously mostly in agricultural use. The Conservation Site is zoned L1 and would be dedicated to the perpetual management and conservation of the Olympia pocket gopher as a permanent mitigation site.

According to the current City of Tumwater Comprehensive Plan, high groundwater areas are mapped south and northeast of the Project Site and Conservation Site. This affects stormwater design and associated land use options in the area surrounding the Project and Conservation Sites. Both sites are outside of the area defined as being potentially affected by current or future airport runway impacts.

### **Hazardous Materials**

There are four cleanup sites mapped within a mile of the Project Site (per Ecology Toxics Cleanup Program: <https://fortress.wa.gov/ecy/neighborhood/>). Three of the four are described as already having completed cleanup. Only the WADNR tree nursery site cleanup is still in progress – however, that site is on the opposite side of I-5 from the Project Site, and therefore is not expected to impact activities at the Project Site:

- Rest Over Truck Stop west of I-5 (cleanup completed in 2015);
- Shell Station east of the I-5 onramp (cleanup completed in 1992);
- American Fiberglass, E of I-5, about ½ mile north of 93<sup>rd</sup> (cleanup completed in 1993), and
- WADNR tree nursery west of I-5, where cleanup has started.

There are five cleanup sites mapped within a mile of the Conservation Site, four of which were already described above. Four of the five are described as having already completed cleanup, and in common with the Project Site, only the WADNR tree nursery site cleanup is still in progress. However, the nursery site is adjacent to the Conservation Site (described in greater detail below):

- Rest Over Truck Stop west of I-5 (cleanup completed in 2015);

- Shell Station east of the I-5 onramp (cleanup completed in 1992);
- American Fiberglass, E of I-5, about ½ mile north of 93<sup>rd</sup> (cleanup completed in 1993),
- WADNR tree nursery west of I-5, SW of Conservation Site, where cleanup has started; and
- USDA Pacific Northwest Experiment Station, 0.5mi west on 93<sup>rd</sup> (cleanup completed in 1991)

At the WADNR nursery site in 2018, a leaking underground storage tank (UST) containing the pesticide heptachlor epoxide was discovered. The tank and contaminated soils were removed, and groundwater was monitored to assess potential impacts. Results from groundwater monitoring indicate that contamination has not migrated offsite; however, the pesticide is present above cleanup levels in groundwater near the former UST. Additional soils may need to be removed to complete cleanup, but no offsite impacts are expected.

### **Public Service and Utilities**

Public utilities are located along 93<sup>rd</sup> avenue to the north of both the Project Site and the Conservation Site. A regional high-pressure natural gas pipeline corridor runs from east to west, paralleling 93<sup>rd</sup> Avenue about 1/3 miles north of both the Project Site and the Conservation Site. A regional powerline utility corridor runs from north to south about 0.25 mi west of the Conservation Site.

## **4.6 Social**

### **Environmental Justice**

The US Environmental Protection Agency's (EPA) Office of Environmental Justice defines environmental justice as:

*“The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies.”*

The concept of environmental justice is rooted in the Civil Rights Act of 1964, which prohibited discrimination in federally-assisted programs, and in Executive Order 12898, *“Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,”* issued February 11, 1994. Executive Order 12898 was intended to ensure that Federal actions and policies do not result in disproportionately high adverse effects on minority or low-income populations.

Environmental justice issues are mandated and regulated at the Federal level, and compliance with NEPA requires analysis of environmental justice effects.

An analysis of environmental justice issues addresses demographics, including population and race/ethnicity; and measures of social and economic well-being, including median household income and poverty rates.

The predominant racial group in Tumwater is White (Caucasian), comprising roughly 84 percent of the City of Tumwater population in 2018. The remaining racial and ethnic groups in the City of Tumwater are American Indian/Alaskan Native (AIAN) (0.6%), Asians (4.1%), Black (2.8%), Hispanic/Latino (6.4%), Native Hawaiian or Other Pacific Islanders (OPI) (0.5%) and Two or More

Races (6.9%).

Per capita income in Tumwater in 2017 (projected from 2013-2017 surveys) was \$32,396, as compared to \$32,410 for Thurston County, and \$34,869 for Washington State (US Census data). Median household income for Tumwater in 2017 (projected from 2013-2017 surveys) was

\$64,796, as compared to \$66,113 in Thurston County; \$66,174 in Washington State; and \$57,652 in the whole United States (US Census data).

Poverty rates represent the percentage of an area's total population living at or below the poverty threshold established by the US Census Bureau. Based on a projection of 2010 Census data, the poverty rate in 2017 was 9.7 percent in Tumwater and 10.5 percent in Thurston County, as compared to the poverty rate in the state of Washington at 11.0 percent and in the United States at

11.8 percent.

## 4.7 Health

### Air Quality

The Washington State Department of Ecology (WA DOE) and the EPA monitor air pollutants and may designate regions as being in "attainment" or "nonattainment" with respect to National Ambient Air Quality Standards (NAAQS) for certain pollutants. In the 1980's, Thurston County air quality exceeded the EPA 24-hour standard for particulate matter (PM10) of 150 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). The exceedance was attributed to wood-burning stoves. For this reason, Thurston County was classified as a "nonattainment area", and was required to address air quality issues. Subsequent efforts by the Olympia Region Clean Air Agency (ORCAA) to improve air quality succeeded in meeting the standard by the early 1990s.

Nonattainment areas that improve air quality and meet NAAQS requirements can request re-designation as being in attainment. Re-designation requires development of an EPA-approved Maintenance State Implementation Plan (SIP) and compliance with NAAQS requirements for a 20-year period. Thurston County created an EPA-approved SIP and was designated a PM10 air quality maintenance area for PM10 in 2000. The SIP for a second 10-year period was approved by the EPA on October 3, 2013 (78 FR 47259). The program designed to ensure that air quality will be maintained at these levels is described in Ecology Publication no. 13-02-008, June 2013, "SIP Revision for the Thurston County, Washington Second 10-Year Limited Maintenance Plan for PM10".

The Limited Maintenance Plan (LMP) plan requires curtailment of wood burning devices during periods of impaired air quality, certification of new wood burning devices, rules governing sale and removal of uncertified wood stoves, and restrictions on outdoor burning.

This plan requires that Thurston County: 1) continues to meet the NAAQS; 2) does not exceed an average 24-hour PM10 value of 98  $\mu\text{g}/\text{m}^3$ , and 3) should expect only limited growth in on-road motor vehicle emissions. The four most significant sources of PM10 in Thurston County are residential wood combustion, road dust from paved roads, vehicle exhaust and tire wear, and construction dust.

In 2015, the Olympia Region Clean Air Agency began an hourly air quality monitoring program with stations at ORCAA headquarters as well as at several Olympia area elementary schools as well as at schools in Tenino and Rochester areas. No stations were located in Tumwater, but the patterns are assumed to extrapolate to Tumwater air quality patterns. Graphical data displayed on

the ORCAA website indicated exceedances of PM10 were more common in winter months, and during night time hours.

## 5 ENVIRONMENTAL CONSEQUENCES

### 5.1 Alternatives Assessment

An assessment of the alternatives compares the anticipated effects of the No Action Alternative on the affected human environment with those expected under the Proposed Alternative.

This section describes the direct and indirect effects of the considered alternatives. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time, or farther removed in distance, but are still reasonably foreseeable.

Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate; and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).

Section 6 describes cumulative impacts. Cumulative impacts are the impacts on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). Cumulative impacts are described in Section 5.

### 5.2 Ecological

#### Climate and Climate Change

There are two distinct ways that climate and climate change may be relevant to an impact analysis:

1) an action's contribution to climate change; and 2) the implications of climate change effects on an action.

#### *Alternative 1 – No Action Alternative*

Under the No Action Alternative, no Federal permit would be issued, and no construction would be carried out. The No Action alternative cannot contribute to or be affected by climate impacts.

#### *Alternative 2 – The Proposed Alternative*

The direct and indirect effects of issuing the proposed ITP, include those resulting from construction of the proposed warehouse distribution and commercial center at the Project Site, and maintenance of the Conservation Site as Olympia pocket gopher habitat. Both actions are very unlikely to generate measurable impacts to the local or regional climate or weather relative to pre-permit conditions. Measurable changes in climate conditions or anticipated changes in climate beyond the current and modeled annual ranges of variation during the proposed 20-year permit period are unlikely.

No direct or indirect impacts to climate or climate change from the project would be expected at either the Project Site or Conservation Site, or at other scales in the affected environment.

## **Geology**

### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, no Federal permit would be issued, and no construction would be carried out. No direct or indirect changes affecting geology at the Project Site or Conservation Site would result.

### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, some surface grading will occur, but no surface or subsurface mining of local gravels or sands for road bed materials or fill pads are expected; therefore, no activities that might directly or indirectly significantly impact the geology of the Project Area are anticipated. The likely addition of impervious surface cover may alter exposure and weathering of underlying geology by surface water. However, because the rate of geologic weathering is very slow, these changes at the surface of the site have limited potential for deeper alteration, and thus, this impact is not anticipated to significantly affect geological patterns or processes.

## **Soils**

### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, the requested ITP would not be issued, and no construction would occur on the Covered Lands. No direct or indirect impacts to soil at the Project Site or Conservation Site would be expected.

### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, soils at the Project Site would be affected by grading, excavation and paving associated with building pads, parking lots and roads. Soils on the 79-acre Project Site may be piled, redistributed onsite, and/or used for landscaping or surface restoration associated with the construction zone. Stormwater management BMPS require that bare soil surfaces be protected from erosion by controlling runoff or seeding with an erosion control mix. These potential construction impacts affect stormwater infiltration potential within the site, but are not considered significant direct or indirect impacts to soils at a regional scale. Natural soil functions, such as infiltration of stormwater or for growing plants will be replaced with BMPs designed to mimic natural soil infiltration and treatment functions at the site scale. The rest of the onsite soils will be engineered for use as a base under parking lots, buildings, or roads. Due to on-site stormwater management, offsite effects on soils are not anticipated.

The Conservation Site soils would remain mostly undisturbed, aside from extremely minor impacts localized at within-site scales associated with restoring prairie vegetation that may be caused by removing shrubs and trees over time. Measures to avoid significant soil compaction will be implemented for tree removal. These soils will be managed primarily to grow plants preferred as forage by the Olympia pocket gopher, and to provide suitable substrate for Olympia pocket gopher to build durable burrows. Monitoring on the conservation site will evaluate plant composition and distribution of Olympia pocket gopher mounds, which are meaningful indicators of soil condition in an otherwise occupied site. Achievement of Conservation Site performance targets will confirm adequate soil management.

The direct or indirect impacts to soil anticipated at the Project Site or Conservation Site are not be expected to be significant.

## **Topography**

### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, no construction or grading would occur at either the Project or Conservation Site, and therefore, there would be no impacts to topography at either site.

### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, topography on the Project Site will not change significantly. The surface area is already relatively flat, and will be at a similar grade after construction is complete. The pre-construction surface ranges from 194 to 198 ft elevation. Building pads and parking lots will slope toward perimeter stormwater treatment facilities. The proposed fill pad elevation is at 198 ft, with a finished floor elevation of 199 ft. The base elevation of the settling pond and water quality treatment ponds will be 188 ft with top of pond perimeter at 194 ft; the infiltration pond bases are at 191 ft with top of pond perimeter also at 194 ft. Therefore, the overall average surface elevation will be similar to the pre-construction elevation range of 194-198 ft, with somewhat deeper base elevation for stormwater facilities (188 ft to 191 ft), as needed to allow for gravity flow collection of runoff. These proposed impacts to topography are relatively minor, limited to a small portion of the Project Site and are designed to avoid more significant effects on stormwater. Therefore, no significant direct or indirect impacts on topography are anticipated at the Project Site.

Tree removal at the Conservation Site to enhance soil conditions for Olympia pocket gopher habitat will result in minor grading and surface disturbance impacts at those locations. No significant direct or indirect changes to topography are anticipated at the Conservation Site, as no significant grading or excavation is proposed. These activities will result in minor, localized surface disturbance, as may be needed to restore the affected area to the original topography and soil condition.

## **Surface and Groundwater**

### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, no permit would be issued, so no construction would occur on the Covered Lands, and thus no significant direct or indirect impacts to surface or groundwater are anticipated.

### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, impervious surface in the form of buildings, pavement or water quality treatment ponds will cover 76% of the surface, approx. 60 out of 79 acres at the Project Site<sup>4</sup>. During construction phases, stormwater runoff from the warehouse distribution center and associated commercial development roads, buildings and parking lots will first be captured in Temporary Erosion and Sediment Control (TESC) ponds, to allow for initial sediment settling.

These TESC ponds would overflow into six permanent water quality/ detention pond facilities (labeled A through F in project site drawings) which surround the southern part of the site where the large warehouse structures are proposed. These permanent stormwater facilities include a pre-settling cell (to allow suspended sediment to settle); followed by a water quality pond

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<sup>4</sup> Preliminary Erosion and Sediment Control Plan drawings are provided in the appendices.

(presumably with a sealed base), and finally an infiltration pond designed for two feet of ponding depth. The infiltration pond also receives all roof runoff, which does not require pre-treatment per the stormwater manual. Therefore, stormwater runoff from all impervious surfaces (except roof surfaces) is proposed to be treated and then infiltrated on the Project Site to prevent off-site effects on surface water or groundwater quantity, quality, or timing. Stormwater management design is required to implement the Tumwater Drainage Design and Erosion Control Manual. Prescriptive BMPs required in stormwater management design are applied to ensure that there are no significant direct or indirect impacts to surface or groundwater.

## **Wetlands and Streams**

### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, no permit would be issued, so no construction would occur, and no impacts to wetland or streams would result.

### ***Alternative 2 – The Proposed Alternative***

There are no streams or wetland within the Project Site or Conservation Site and no offsite impacts to these resources would be expected under the proposed alternative. The nearest wetland and/or stream relative to the Project Site is about 350 ft from the southeast corner, a section of Hopkins Ditch that flows from northeast to southwest in that area. Hopkins Ditch and its wetlands also flow west about 1,500 feet south of the Conservation site. No direct or indirect impacts from developing the Project Site or managing the Conservation Site are proposed or expected in the wetland, stream or buffers.

## **Vegetation**

### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative the requested ITP would not be issued, and no construction would occur. No project-related direct vegetation impacts would result. Because there would be no management plan under this alternative, the vegetation on Covered Lands would likely shift to shrub or tree cover, reducing habitat suitability for Olympia pocket gopher at within-site scales. Future tree harvest on forested portions of Covered Lands may be permitted through WADNR Forest Practices Act. Over time, prairie attributes would be lost through succession of the plant community toward woody plant cover in an un-managed scenario.

### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, changes in vegetation would occur at the Project Site and the Conservation Site. Minor changes in vegetation would also occur on limited areas of minor infrastructure improvements along approximately 0.75 miles of existing public roadway used to access the Project Site. The affected roadside areas are typically characterized by sparse non-native grasses, mixed with compacted gravel.

During construction, most vegetation would be cleared from the 79-acre Project Site and from the shoulder of approximately 0.75 miles of existing public roadway. Cleared vegetation would include grasses, forbs, shrubs, and young forest. There are no rare plant species known to occur in the project area. Most of the upper root zone will be removed from areas that will later support buildings, pavement or stormwater facilities (about 60 out of 79 acres at the Project Site).

Site plans indicate that less than 25% of Project Site will be vegetated after development is

complete. Landscaping required in code would be installed after construction is complete on the Project Site and in roadside areas. The resulting vegetation on the Project Site would generally match the character of developed lands elsewhere in the affected environment with grass, shrubs and trees along site margins and throughout any other areas not covered with impervious surfaces. Landscapers would use commercially available seeds and shrubs suitable for the landscaping required under local code. Regular vegetation maintenance would likely include mowing and pruning, as is typical of developed sites in the affected environment. Therefore, direct impacts to vegetation anticipated at the Project Site are consistent with the vegetation patterns on commercially-developed lands elsewhere in the affected environment.

The grasslands to be removed from the Project Site provide forage and habitat preferred by the Olympia pocket gopher, the loss of which the Applicant would mitigate on the Conservation Site by maintaining grasslands and restoring higher-quality forage in habitat occupied by Olympia pocket gopher.

Under this alternative, the Conservation Site would be managed under a dedicated management plan to implement the HCP's conservation program and to maintain the conservation values identified in the conservation easement. Monitoring and management would develop or maintain prairie vegetation on the 67.5-acre Conservation Site, with special emphasis on growing forbs preferred as forage by Olympia pocket gophers. Portions of the Conservation Site with tree cover would be converted to grasslands or native prairie, to maximize the role of the Conservation Site in providing habitat to support Olympia pocket gopher and the native prairie plant community. The resulting vegetation conditions would contribute to the South Puget prairie ecosystem. The Applicant proposes that direct and indirect impacts to vegetation anticipated at the Conservation Site would mitigate for impacts to Olympia pocket gopher through vegetation management. By managing for native prairie conditions on the Conservation Site, the project would avoid significant effects on the local vegetation community and the project would support forage for Olympia pocket gopher.

## **Fish and Wildlife**

### ***Alternative 1 – No Action Alternative***

Under the "No Action" alternative, no Federal permit would be issued, and the Applicant would not construct the warehouse distribution center and other commercial facilities. No direct impacts to fish and wildlife are expected under the No Action Alternative, as no Federal permit facilitating construction activities would be issued. Indirect impacts would result from not managing the Covered Lands to maintain current habitat.

As described above, the habitat conditions for wildlife would shift toward woody cover gradually under the No Action Alternative. A corresponding shift in common wildlife species using the site from prairie- and grassland-associated species – such as songbirds, swallows or burrowing rodents, to forest-associated species – such as deer, racoons or bears would occur. This outcome would be limited to the Covered Lands; therefore, these effects are considered minor and insignificant to these common wildlife species. At broader scales, the No Action Alternative would have no effect on common wildlife species.

Without management, vegetation would likely shift toward woody plants. Habitat suitability for Olympia pocket gopher on the Covered Lands would likely decline over time as a result of changes in vegetation, as described above. Gradually, these indirect impacts would reduce or eliminate Olympia pocket gopher habitat at both sites. At the scale of the affected environment,

the loss of Olympia pocket gopher from the Covered Lands would occur gradually and the effect on the subspecies would be relatively minor due to the limited scale of the two sites. Other threatened and endangered species are not likely to use the Covered Lands, so they would not be impacted by this Alternative.

### ***Alternative 2 – The Proposed Alternative***

The Proposed Alternative would result in negative impacts to individuals of wildlife species that occupy or use the Project Site and positive impacts to those on the Conservation Site. Except for the Olympia pocket gopher, most species that may be impacted on the Project Site are common throughout the affected environment and Thurston County, including birds such as sparrows, swallows or raptors, and mammals such as deer, racoons, rodents or possums.

Developing the Project Site would eliminate currently occupied Olympia pocket gopher habitat as well as feeding, nesting, perching, roosting, and cover areas for other common bird and animal wildlife species that currently use the Project Site. Development of the Project Site would not measurably alter the population or distribution of any common wildlife species at the scale of the affected environment, so habitat loss from the Project Site is insignificant to the common wildlife species on the site. Enhancement and perpetual management of prairie attributes on the Conservation Site will benefit the native wildlife present. Tree removal in the southern portion of the Conservation Site would remove some nests or roost sites of common bird species. These habitat features and species are commonly found elsewhere in the affected environment, so impacts from losses of habitat for common species on the Project Site and Construction Site are insignificant.

The Proposed Alternative will negatively impact individuals of Olympia pocket gopher on the Project Site and positively impact them on the Conservation Site. Impacts to Olympia pocket gopher habitat on the Project Site are associated with clearing, grading, and construction of new impervious surfaces. These actions will eliminate habitat used by the pocket gopher, but degraded by previous land uses. Repeated monitoring has demonstrated very limited distribution of Olympia pocket gopher mounds (visible evidence of presence) within a 22.2-acre patch of suitable occupied habitat in the southern portion of the Project Site. The remainder of the site is not currently suitable for Olympia pocket gopher due to coverage by woody plants or prior soil disturbance. Full development of the Project Site would destroy the suitable and occupied habitat on the Project Site and would crush, injure, or displace the few individuals that are using this habitat.

Considering evidence of gopher occupancy, vegetation conditions, soil conditions, and geographic location, the Project Site has 60 “functional-acres” of Olympia pocket gopher habitat<sup>5</sup>. All 60 functional acres along with all individual Olympia pocket gopher occupying the site would be lost during grading, clearing, and installation of new impervious surfaces. Habitat loss and injury or mortality of individual Olympia pocket gopher would be permanent impacts.

To mitigate for project impacts to Olympia pocket gopher, 60 functional-acres of occupied habitat on the Conservation Site would be permanently protected to offset the anticipated impacts.

Occupied habitat would be protected and managed in perpetuity.

The Conservation Site is approximately a mile west of the Project Site. The Conservation Site has 67.5 acres of contiguous suitable habitat with vegetation and soil attributes that are supporting well-

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<sup>5</sup> Refer to HCP, Appendix A definition: Functional-acres are a quantitative measure of Olympia pocket gopher habitat quality.

distributed Olympia pocket gopher productivity throughout the site. Using the same calculator described above and, in the HCP, (Appendix A), Conservation Site Management would produce a minimum of 171 functional-acres, and up to 203 functional-acres of Olympia pocket gopher habitat depending on vegetation conditions and observed occupancy to be regularly confirmed through monitoring. Functional-acres not allocated to offset impacts on the Project Site are advanced mitigation that may be proposed for use in other unidentified projects that would be permitted separately.

Incidental take of individuals of a listed subspecies is expected to occur due to the loss of individuals and habitat on the Project Site. These effects are fully offset when considering both the intensity of the effects resulting from the proposed federal action and the proposed offsetting mitigation measures at the Conservation Site. Overall, the project will maintain or marginally improve the status of Olympia pocket gopher.

In addition, this Alternative would provide additional conservation benefits for the Olympia pocket gopher because the large Conservation Site enables mitigation for separate projects to block together for a larger, more stable habitat management unit. This strategy addresses existing threats to the subspecies related to habitat fragmentation and isolation, and habitat stability.

### **5.3 Aesthetic**

#### **Noise**

##### ***Alternative 1 – No Action Alternative***

No Federal permit facilitating construction of the proposed project would be issued and no changes to current noise levels would be expected under the No Action Alternative.

##### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, permit issuance would be expected to facilitate Project Site preparation and construction activities that would be expected to generate temporarily increased noise levels while construction activities are underway. These increases in noise would emanate from a sources including heavy equipment and activities such as site clearing, grading, paving, material delivery and landscaping.

Traffic and commercial development noises from ongoing activities at nearby commercial sites, on 93<sup>rd</sup> Avenue SW; Interstate 5 to the west, and residential/ agricultural activities east and south of the Project Site provide sources of background noises in the area, and are presumed to meet locally regulated standards. Temporary additional noises related to construction during the site development are expected to be limited to hours between 7:00 am and 10:00 pm, and are not expected to exceed state and local noise management standards (WAC 173-60, TMC 8.08, TMC 8.08.030(g), and TMC 18.400.030) throughout the construction process. After construction is complete, new noises would be associated with vehicles entering, loading and exiting the warehouse distribution center. This noise would be comparable to noise currently emanating from other commercial, industrial sites that exist on some adjacent sites and are abundant in the affected environment. Noise from the project is not expected to exceed state and local noise management standards. No long-term or indirect impacts on noise levels are anticipated with the Proposed Alternative.

At the Conservation Site, the only noise impacts would be from initial clearing of trees and shrubs, primarily in the southernmost portion of the site. Other management actions related to enhancing the plant community to support Olympia pocket gopher habitat would employ hand tools or small to

medium equipment, such as mowers, tillers, or weed trimmers that would generate insignificant noises consistent with background levels. No long-term or indirect impacts on noise levels are anticipated.

## **5.4 Historic and Cultural Resources**

### ***Alternative 1 – No Action Alternative***

No proposed construction or dirt moving would occur at the Project Site in the absence of the requested Federal permit. Thus, no significant impacts to historic or cultural resources would be expected under the No Action Alternative.

### ***Alternative 2 – The Proposed Alternative***

Detailed information from a review letter prepared by the USFWS Cultural Resources Team is summarized below. The USFWS letter is provided in the appendices.

In 2019, a private contractor working for the applicant carried out a cultural resource investigation of Tumwater East. The work included standard archival research, visual and subsurface inspection of the APE. Publicly-available data on the State Department of Archaeology and Historic Preservation (DAHP) website did not indicate any known cultural resources, historic homes or Natural Heritage sites within or near the Project Site or Conservation Site. Shovel test probes and auger tests excavated throughout the development area did not document any prehistoric or historic cultural materials. An abandoned single-family home structure dating to approximately 1940 with two outbuildings was identified, recorded, and determined not eligible (DAHP 4 February 2020). The contractor also consulted with the Nisqually Tribe. Their cultural resource specialist had no concerns about the proposed work.

The USFWS Cultural Resources Team (CRT) reviewed the results of cultural resource work described above as well as the geologic and hydrologic processes at the site, and past and present land use. The CRT letter (FWS/IR09/IR12, May 28, 2020 – see Appendices) concluded that the proposed activities are not expected to affect or impact historic properties, and no additional field inventory for cultural resources is warranted in regard to the project.

The CRT letter also concluded that the applicant should share the inadvertent discovery plan (IDP) protocol provided in the 2019 Cultural Resources report with all field crews to ensure that appropriate steps will be taken to address inadvertent discovery of archaeological resources or human remains during project construction. If any such artifacts are encountered, work would be expected to stop until the materials are properly assessed in accordance with DAHP guidance.

No significant direct or indirect impacts to historic or cultural resources would be expected under the Proposed Alternative.

## **5.5 Economic**

### **Socioeconomics**

#### ***Alternative 1 – No Action Alternative***

No Federal permit would be issued, so activities at the Covered Lands that may affect socioeconomics would not be expected to change significantly. Therefore, no significant changes to current socioeconomic conditions would be expected under the No Action Alternative.

***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, the construction project would be expected to generate short-term skilled construction trades employment, and in the long term, would generate new employment opportunities at the new commercial facilities.

New jobs generated by the project would provide local socioeconomic benefits, but no significant regionwide changes in socioeconomic conditions are anticipated from the Proposed Alternative. The proposed project is not anticipated to result in a change in local zoning or cost of living, and therefore will not have direct or indirect significant impacts.

**Land Use*****Alternative 1 – No Action Alternative***

Because the requested ITP would not be issued and the project would not be constructed, no resulting land use impacts would be expected. No direct or indirect significant impacts to land use are anticipated under the No Action Alternative.

***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, land use would change when the Project Site is converted into a commercial facility from its current more passive use as forest land or open-space. However, the parcel is zoned for Light Industrial use, and thus would presumably be used as intended in Tumwater's long-range planning documents (e.g., City of Tumwater City-Wide Land Use Map, 2019). For this reason, although land use would change, zoning would not change, and development of the Project Site is not considered a significant direct or indirect Land Use impact.

Likewise, land use at the Conservation site would change from its current passive use as open-space as it is enhanced and managed over time to develop prairie grassland vegetation community suitable for Olympia pocket gopher habitat. The Conservation Site is also zoned for Light Industrial use. Zoning would not change, as spot-zoning is not allowed. However, development rights would be extinguished under a conservation easement with an associated management plan ensuring the site would be managed in perpetuity as Olympia pocket gopher habitat. The Proposed Alternative would preclude use of the Conservation Site as a potential future light industrial site.

This Land Use impact is intended to offset impacts to Olympia pocket gopher at the Project Site. However, because other nearby properties are available for future light-industrial development, this Land Use impact is not considered significant. By generating additional advanced mitigation, the Proposed Alternative may also serve as mitigation to offset development opportunities for limited other lands in the range of the Olympia pocket gopher, subject to future USFWS permitting and public review.

**Traffic Impacts*****Alternative 1 – No Action Alternative***

Under the No Action Alternative, no ITP would be issued, and the project would not be constructed. The No Action Alternative could delay certain traffic-improvement projects, but would not directly cause any changes to regional or local traffic patterns therefore, no changes to traffic caused by development or management changes at the Covered Lands would be expected under the No Action Alternative.

## ***Alternative 2 – The Proposed Alternative***

Development of the Project Site would marginally increase traffic along 93<sup>rd</sup> Avenue SW, an existing route providing for west to east traffic to and from the I-5 corridor. The Applicant is required to assess and mitigate for those impacts consistent with local code, to ensure safe conditions at the Project Site vehicle access points.

The Draft Transportation Master Plan (City of Tumwater, 2016) identified expectations to widen 93<sup>rd</sup> Avenue to five lanes at and beyond the Project Site. The Project Site Traffic Impact Analysis (TIA, 2016) study prepared by the Applicant assessed impacts from the proposed project on the nearby surface roads, in addition to the assumed two percent annual increase in background traffic volumes and impacts from other projects that are expected to use nearby roads in the near future.

These projected traffic impacts from the Project Site are estimated to account for less than 5% of the total traffic impacts on the 93<sup>rd</sup> Avenue corridor in 2018, however, the City of Tumwater would still require mitigation for traffic impacts as part of the Proposed Alternative.

Existing plans already exist to improve transportation options in the affected environment. With or without the proposed Tumwater East Project, the Level of Service (LOS) at existing 93<sup>rd</sup> Avenue SE intersections at I-5 southbound and northbound ramps, at Kimmie Street SW, and at Case Road, were projected to operate at LOS F (i.e., failing) by 2018. However, improvements associated with this Project development at surrounding intersections are projected to improve the LOS to acceptable levels.

To partially offset regional traffic impacts from the Project Site, the City of Tumwater will collect Traffic Impact Fees (TIF) per the fee schedule in effect at the time of permit review. In addition, the City may collect proportionate share mitigations for other affected traffic improvement projects that are not included in the calculation of the TIF rate.

To mitigate for Project Site traffic impacts at 93<sup>rd</sup>, the following improvements are required of the Applicant by the City.

- Improvements to 93<sup>rd</sup> Avenue, from I-5 to Kimmie Street: If the proposed five-lane expansion on 93<sup>rd</sup> Avenue is not constructed prior to occupancy of the Project Site, the Applicant will construct a second eastbound receiving lane at the northbound ramp within available right-of-way to improve safety for eastbound traffic. This project will also extend the center turn lane on 93<sup>rd</sup> Avenue SW to Kimmie Street, and will provide 12-foot lanes and 6-foot shoulders.
- Improvements at Northbound Interstate Ramp: A traffic signal and geometric improvements are required the NB ramp terminal. If these intersection improvements are not constructed or funded prior to occupancy of the Project Site, the Applicant will be required to construct them.
- Improvements to Kimmie Street: The Applicant will construct improvements to Kimmie Street between 93<sup>rd</sup> Avenue and the Project Site entry driveway located about 1,300 ft south of 93<sup>rd</sup>. This will include improving the structural section to accommodate truck traffic and widening to a 24 foot cross-section with a paved shoulder west of the roadway.
- Frontage Improvements on 93<sup>rd</sup> Avenue: The Applicant will construct an east-bound to southbound right-turn deceleration lane on 93<sup>rd</sup> Avenue at the Project Site entry driveway. The Applicant may also be required to construct frontage improvements on 93<sup>rd</sup> Avenue if

directed by the City of Tumwater to accommodate a five-lane section on 93rd Avenue.

- Interim Improvements to Kimmie Street/93rd Avenue Intersection: If improvements at this intersection are not constructed prior to the Project Site development, the Applicant will construct interim improvements to the intersection, as determined by the City of Tumwater in conjunction with WSDOT. Improvements may include:
  - Signalization of the intersection;
  - NB and SB left-turn lanes on Kimmie Street;
  - EB and WB left-turn lanes on 93rd Avenue;
  - Accommodations for an ultimate 5-lane section on 93rd Avenue SW.

The 93<sup>rd</sup> Avenue safety and infrastructure improvements described above are expected to maintain safety and reduce potential for traffic impacts at the Project Site entry. During construction, the Proposed Alternative may cause temporary impacts to traffic and access to localized areas through temporary detours and road closures that would be likely to occur even without the project. No long-term significant adverse direct or indirect traffic impacts are expected from the Project Site.

West of Interstate 5, near the Conservation Site, no changes to traffic patterns or safety improvements for site access would be anticipated. No direct or indirect impacts to traffic would occur.

Overall, minor changes to traffic and transportation infrastructure, primarily along 93<sup>rd</sup> Avenue SW and Kimmie Rd SW would be anticipated with the Proposed Alternative consistent with Tumwater's strategic development plans. The Proposed Alternative may result in these transportation system upgrades occurring slightly sooner than they would otherwise. The changes are necessary to address existing and projected traffic demands. The Proposed Alternative would marginally increase traffic between Interstate 5 and the Project Site. Northbound and southbound access to the interstate highway are approximately 0.33 and 0.16 miles west of the Project Site, so the marginal increase in potential traffic along with otherwise-anticipated road upgrades would provide equivalent or improved safety performance as compared to the No Action. The Proposed Alternative would not significantly alter traffic volumes or patterns in the affected environment.

## **Hazardous Materials**

### ***Alternative 1 – No Action Alternative***

Because there are no known current sources of hazardous materials in the Covered Lands, and no project-related activities would occur under the No Action Alternative, no impacts related to hazardous materials would be anticipated from the No Action Alternative.

### ***Alternative 2 – The Proposed Alternative***

At the Project site, during construction phases, fuel, motor oil and other similar materials associated with operation and maintenance of heavy equipment would be stored or located in construction staging areas or in construction zones. The project would be expected to follow a standard safety and spill response plan for appropriate and safe management of these materials.

During operational phases after construction is complete, standard safety and spill response plans and management of potentially hazardous materials connected with warehouse and commercial development would minimize risk of future contamination or pollution associated with the Project Site.

No impacts are anticipated, and expected BMPs would avoid or minimize risks associated with

inadvertent spills. No significant direct or indirect risk of hazardous materials is anticipated under the Proposed Alternative at the Project Site.

At the Conservation Site, there would be no storage of petroleum or toxic materials. There may be periodic use of certain herbicides, if necessary, to manage certain undesirable plants to maintain or restore prairie habitat for Olympia pocket gopher. Any herbicide use would be limited to methods and amounts within Environmental Protection Agency labeling criteria. There would be no on-site storage of any herbicides, and no use of poisons for animal control. Standard safety and spill response plans associated with management of these potentially hazardous materials would be employed to avoid or minimize risks associated with inadvertent spills. No direct or indirect long-term impacts are anticipated from hazardous materials at the Conservation Site.

Overall, the Proposed Alternative would result in insignificant risks associated with hazardous materials storage or exposure of hazardous materials to the environment. As a result, impacts related to hazardous material would be insignificant.

## **Utilities**

### ***Alternative 1 – No Action Alternative***

No Federally-permitted construction would occur and therefore no significant impacts to public utilities would be anticipated under the No Action Alternative.

### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, existing public utilities along 93<sup>rd</sup> Avenue, north of the Project Site, would be temporarily impacted during construction. As needed, piped utilities may be relocated, and overhead wires may be converted to underground conduits – as required in code. New utility services will be expanded to serve the warehouse/ commercial facility. However, expansion of public utilities to serve new businesses is already addressed in Tumwater long-range planning for this light industrial area. Utility revisions during construction could cause short term disruptions to service. No significant direct or indirect impacts to public utilities are anticipated under the Proposed Alternative at the Project Site.

At the Conservation Site, no new utilities will be required, and thus no significant new direct or indirect impacts to public utilities are expected.

## **5.6 Social**

### **Environmental Justice**

#### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, project-related construction or other changes would not occur at the Project Site, and thus nothing is expected to disproportionately or negatively affect economically disadvantaged or minority communities. Therefore, no significant changes to environmental justice would be expected under the No Action Alternative at either the Project Site or the Conservations Site.

#### ***Alternative 2 – The Proposed Alternative***

The Proposed Alternative would not be expected to generate any environmental justice impacts. Neither the Project Site, nor the Conservation Site are located near, or are expected to disproportionately or negatively affect, economically disadvantaged or minority communities. No

significant impacts to environmental justice are anticipated from this project.

## **5.7 Health**

### **Air Quality**

#### ***Alternative 1 – No Action Alternative***

Under the No Action Alternative, no ITP would be issued for the proposed construction at the Project Site and no changes to current air quality would be anticipated. No significant impacts to air quality would be expected under the No Action Alternative.

#### ***Alternative 2 – The Proposed Alternative***

Under the Proposed Alternative, construction activities could temporarily impact air quality at and near the construction project. Fine particulate matter related to heavy equipment operations; dust associated with clearing, excavation, or grading activities; and odors from paving activities would be generated during road and sidewalk construction. These effects would be expected to be short-term, but could be problematic for at-risk groups such as children with asthma, if they occur on site. However, there is little chance of exposure because best practices are used to limit the spread of dust and any public exposure would be extremely short in duration as they pass by the site on public roads. These impacts will end once construction activities are complete.

Once the Project Site is developed, fine particulate matter related to diesel truck emissions will increase at the site. These effects could be problematic for at-risk groups such as children with asthma, but because most adjacent development is mostly commercial with few adjacent residential homes, there is little chance of exposure. Therefore, no significant air quality impacts are anticipated under the Proposed Alternative at either the Project Site or Conservations Site.

## **6 CUMULATIVE IMPACTS**

### **6.1 Cumulative Impacts of the Alternatives**

In addition to assessment of direct and indirect impacts of the Project, NEPA requires consideration of the cumulative impacts of these actions. Cumulative effects are defined as: the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.” (40 CFR ~ 1508.7) Therefore, cumulative impacts include the composite of direct effects plus indirect effects plus “impacts of past, present and reasonably foreseeable future actions”.

Natural events, such as storms or floods, or other general changes to a local area, such as population growth, are not “actions”. Therefore, effects of these natural events are described in the “Affected Environment” section, but are not part of the cumulative impact analysis.

A cumulative effects analysis focuses on information that is relevant to reasonably foreseeable future actions that may result in significant adverse impacts of the Proposed and Alternative Actions, because this information provides additional context for making an informed choice among the alternatives considered.

Assessing present effects of past actions that are similar to the proposal provides a basis for understanding the cause-and-effect relationship of the proposal. This effort also provides

information that may help define ways to minimize or modify those impacts.

The Service has issued ITPs for projects that are completed, ongoing, or reasonably certain to occur. The following are the past, current and reasonably foreseeable future projects proximate to the Project Site within the Plan Area.

- In 2016, the Service issued an ITP covering impacts to listed species incidental to development of several commercial sites, several of which are within the vicinity of the Project site (the Kaufman HCP), and includes the entire 51-acre Deschutes Corridor Conservation Site.
- In 2016, the Service also issued an ITP for construction of a commercial development (the Meier HCP) not far from the Project Site.
- In 2017, the Service issued an ITP for development of one single-family home near the proposed Project Site (the McLain HCP).

Each of these present or reasonably foreseeable future projects represents loss of occupied habitat for Olympia pocket gopher along with commensurate mitigation, maintained in perpetuity. The mitigation selected for each project was intended to ensure survival of the listed species. By permanently protecting occupied Olympia pocket gopher habitat, these HCPs collectively improve certainty for the species even with the loss of habitat on the development sites. The cumulative impact of these ITPs maintains or improves the status of the species. Considered together with the impacts of the proposed alternative, the growing network of strategically-located conservation sites positively contributes to the status of Olympia pocket gopher.

## **6.2 Ecological Alternatives Assessment**

### **Cumulative Climate Impacts**

The considered alternatives are not anticipated to generate measurable effects to climate, either singly or when aggregated with existing or anticipated effects of other past, present, or reasonably foreseeable future projects.

### **Cumulative Geology Impacts**

The considered alternatives do not include surface or subsurface mining or other activities expected to affect the geology of the area. Likewise, none of the other current or anticipated future projects include significant impacts to local geology or geological resources. Cumulative effects of the considered alternatives when combined with the effects of other projects would not therefore be expected to generate impacts to geology or geological resources.

### **Cumulative Soils Impacts**

Though some localized impacts to soil structure, related infiltration potential, and loss of topsoil would be expected under the proposed alternative, local regulations intended to reduce and manage soil impacts within levels established under state and local regulation would apply to construction activities. None of the other current or anticipated future projects include impacts deemed significant to soils from a regional perspective, as long as stormwater systems are designed to infiltrate and treat water onsite. Within the context of protecting soils that are more suitable as Olympia pocket gopher habitat, as long as Conservation Sites are developed to preserve large tracts of suitable soils, cumulative impacts of development on soils as pocket gopher habitat would not be deemed significant. The cumulative effects of the considered alternatives when aggregated with the overall effects of present and reasonably foreseeable future projects would not be expected to

generate significant soil impacts.

### **Cumulative Topography Impacts**

The considered alternatives together with anticipated future projects are not expected to generate effects that would result in significant impacts to topography, either independently or cumulatively.

### **Cumulative Surface and Groundwater Impacts**

The considered alternatives are not expected to affect surface or groundwater resources. None of the current or reasonably expected future projects are anticipated to generate significant surface or groundwater impacts or water demands, and no significant effects would be expected when the cumulative effects of these projects and any of the considered alternatives are aggregated.

### **Cumulative Wetlands and Streams Impacts**

The considered alternatives are not expected to impact wetlands or streams, as none are located on or near the Project Site or Conservation Site. Thus, none of the past, current, or reasonably certain future projects are anticipated to generate significant impacts either singly or when considered cumulatively with any of the analyzed alternatives.

### **Cumulative Vegetation Impacts**

The considered alternatives are not expected to have a cumulatively significantly impact vegetation. Though native and non-native vegetation will be affected at the Project Site and Conservation Site under the Proposed Action alternative, none of the impacts will alter the plant composition at the scale of the affected environment. The Project site will lose pasture grassland and second-growth forest vegetation, but the Conservation site will preserve and enhance highly valued grassland prairie vegetation. One action offsets the other. Other past, current and reasonably foreseeable future projects described above in Section 6.1 will result in similar but varying vegetation impacts. The overall composition of the affected environment will continue to contain a mix of forests, grasslands, prairies, and developed areas. The proposed action contributes to ensuring prairies are maintained in that mosaic. These effects are not considered significant, and would not be expected to result in cumulative impacts that when combined with the effects of the analyzed alternatives would rise to a level considered significant.

### **Cumulative Fish and Wildlife Impacts**

Under the considered alternatives, minor impacts to common wildlife would be expected, but none of the impacts would be expected to generate significant impacts at the scale of the human environment considered. None of the past, present or foreseeable projects are anticipated to generate significant common wildlife impacts, and no cumulatively significant effects would be expected.

The Proposed Alternative and past, present and future projects are expected to generate impacts to listed wildlife species. Consideration of impacts to these species in an effects analysis must address the anticipated benefits of the proposed conservation actions as well as expected adverse effects of proposed actions. None of the analyzed alternatives or projects when viewed in concert with their respective conservation actions would independently or cumulatively generate effects considered significant to the status of Olympia pocket gopher. Both negative and positive effects on Olympia pocket gopher would be highly localized and limited in scope. Loss of wildlife and listed species habitat resulting from implementation of alternatives and other projects are expected to be offset by the permanent conservation actions resulting from each of these projects.

## **6.3 Aesthetic**

### **Cumulative Noise Impacts**

Noise level impacts of the Proposed Alternative and of the past, present or future projects would not be considered significant. The cumulative effects of these separate projects would also not be expected to exceed thresholds for significance under any applicable state or local statute, regulation, or code.

### **6.4 Cumulative Historic and Cultural Resources Impacts**

Based on USFWS Cultural Resources Team review described in CRT letter FWS/IR09/IR12 (May 28, 2020), no impacts to historic and cultural resources are expected from the Proposed Alternative, and could not therefore be considered significant individually or cumulatively. No significant impacts to cultural or historic resources are known or expected under past, present or future projects on the Project Site or Conservation Site, and no cumulatively significant impacts are anticipated.

## **6.5 Economic**

### **Cumulative Socioeconomic Impacts**

As described above, the anticipated socioeconomic effects of the Proposed Alternative would be expected to be generally positive, as would those of each of the other present and reasonably expected future projects when considered in the context of the analyzed human environment. No negative socioeconomic impacts would be expected, and no cumulatively significant effects of the considered alternatives when aggregated with other project effects would be anticipated.

### **Cumulative Land Use Impacts**

The Proposed Alternative would not result in significant changes in land use, as the proposed development meets standard and targets already defined and planned for in Tumwater Long-range Planning documents. Other present and future projects are in keeping with local land development and zoning regulations and therefore do not represent changes from existing long-range development goals. Land uses in accordance with community development goals established through public municipal and county processes would not be expected to generate cumulatively significant impacts.

## **6.6 Social**

### **Cumulative Environmental Justice Impacts**

Neither the Proposed Alternative, nor any of the other considered past, present, or expected future projects is expected to generate any direct, indirect or cumulative environmental justice impacts because the Project Site and the other projects proximate to the Project Site are not located in, or expected to disproportionately and/or negatively affect economically disadvantaged or minority communities.

### **Cumulative Air Quality Impacts**

Under the Proposed Alternative, direct and indirect effects on air quality are not considered significant under any local, state, or federal regulation. Similarly, the past, present and reasonably expected future projects would not be expected either independently or cumulatively when considered with the analyzed alternatives to generate significant air quality impacts.

## 7 REFERENCES

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## **Appendix A**

NHPA Section 106 Review: ITP and Habitat Conservation Plan for the threatened Olympia subspecies of the Mazama Pocket Gopher (*Thomomys mazama pugetensis*) in Thurston County, Washington at Tumwater East Distribution Center and Tumwater West Conservation Site

## Appendix A

NHPA Section 106 Review: ITP and Habitat Conservation Plan for the threatened Olympia subspecies of the Mazama Pocket Gopher (*Thomomys mazama pugetensis*) in Thurston County, Washington at Tumwater East Distribution Center and Tumwater West Conservation Site

# REQUEST FOR CULTURAL RESOURCE COMPLIANCE

U.S. Fish and Wildlife Service, Region 1 and Region 8

<b>Date of Request:</b>	<b>Proposed Start Date:</b>
12-06-2019	Early 2020?

<b>Project Name:</b>	Puget Western, Inc. Habitat Conservation Plan, Thurston County, WA				<b>FWS Program:</b> (ES, Refuges, Fisheries, Fire...)	ES		
					<b>Funding Source:</b> (Partners, Refuges, TEA-21, HCP, NAWCA...)	HCP		
<b>State:</b> CA, ID, HI, NV, OR, WA	WA	<b>EcoRegion:</b> CBE, IPE, KCE, NCE	I: Marine West Coast Forest II: Puget Lowland III: Southern Puget Prairies		<b>FWS Unit:</b>	Washington Fish and Wildlife Office		
					<b>Org Code:</b>			
<b>Project Location:</b>	<b>County</b>	<b>Township</b>	<b>Range</b>	<b>Section</b>	<b>FWS Contact:</b> Name, Tel#, Address	Marty Acker		
	Thurston	17N	2W	21		360-753-9073		
						510 Desmond Drive SE, Suite 102 Lacey, WA 98503		
<b>USGS Quad:</b>	Yelm, WA				<b>Date of Request:</b>	<b>Proposed Project Start Date:</b>		
<b>Total project acres/ linear ft/m:</b>		<b>APE Acres / linear ft/m (if different)</b>			<b>12/6/2019</b>	After 04/01/2020		
147.5 acres among 8 parcels on 2 sites		79 acres on 4 parcels						
Have you consulted with Tribe(s)?		Have you consulted with other interested parties?		<b>Is there another federal agency involved with this project?</b>		<input checked="" type="checkbox"/>	No	If yes, provide name:
Yes	No	X	Yes			No	X	
<b>MAPS Attached</b>		<b>Check below</b>		<b>Note: Contact the CRT before making FWS the Lead Agency. If yes, which agency is taking lead for Section 106 compliance?</b>		<input checked="" type="checkbox"/>	FWS	Other Agency
Copy of portion of USGS Quad with project area marked clearly <b>(required)</b>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Project (sketch) map showing Area of Potential Effect with locations of specific ground altering activities <b>(required)</b>				
Photocopy of aerial photo showing location <b>(if available)</b>		<input checked="" type="checkbox"/>		Any other project plans, photographs, or drawings that may help CRT in making determination <b>(if available)</b>				
<b>Directions to Project:</b> <small>(if not obvious)</small>	<p>The project has two sites, both with frontage on 93<sup>rd</sup> Ave SW, Tumwater, WA. Directions to each site follow:</p> <p><u>Commercial Development Site:</u> From I-5, take exit 99 to eastbound on 93<sup>rd</sup> Ave for 0.3 miles to south (right) onto Kimmie St SW. 0.25 miles on Kimmie to existing site access on west (right).</p> <p><u>Conservation Site:</u> From I-5, take exit 99 to westbound on 93<sup>rd</sup> Ave SW for 0.6 mile to south (left) onto Blomberg St SW to existing site access on east (left).</p>							
<b>Description of Undertaking:</b>	<p>Describe proposed project and means to facilitate (e.g., provide funds to revegetate 1 mile of riparian habitat, restore 250 acres of seasonal wetlands, and construct a 5-acre permanent pond). How is the project designed (e.g., install 2 miles of fence and create approximately 25' of 3' high check dam)?</p> <p>Subsidiaries of Puget Western, Inc., (the applicant(s)) propose a Habitat Conservation Plan to cover impacts from commercial warehouse development on property they own on four parcels (12721130000, 12721140100, 12721110400, and 12721110200) located east of I-5 and south of 93<sup>rd</sup> Avenue SW in the City of Tumwater, Washington. The entire site will be excavated or filled, graded, and developed, including stormwater ponds, impervious cover, and landscaping, resulting in site-wide ground disturbance. The site is located in the City of Tumwater, and the proposed development is consistent with the City's development plans and zoning. The site was previously used for residential and</p>							

agricultural land uses, and is currently vacant and has no buildings.

The Habitat Conservation Plan includes mitigation for Mazama pocket gopher on the Conservation Site bounded on the north by 93<sup>rd</sup> Avenue SW; on the west by Blomberg Street SW and a Washington Department of Natural Resources (WDNR) tree nursery; on the south by undeveloped land; and on the east by Lathrop Industrial Drive SW. The entire 67.5-acre Tumwater West site will be dedicated in perpetuity to the conservation of the Olympia pocket gopher. Trees will be removed from the southern-most 4 acres of the Conservation Site. If stump removal occur, the methods creating the least ground disturbance will be implemented. A vacant residence and shed will be removed from the northern portion of the conservation site. The site will be maintained in grassland cover, with management prescriptions to transition toward native prairie cover during the 20-year proposed permit term. Native prairie cover is a high-performance goal, not a compliance threshold for conservation site management. The federally-threatened gopher lives in upper layers of the soil, so minimizing ground disturbance while maintaining herbaceous cover is the compliance threshold for the conservation site.

The Service's decision would be whether to issue an incidental take permit to cover take of the Olympia subspecies of Mazama pocket gopher consistent with the Applicant's Habitat Conservation Plan. Construction activities would be permitted by the local municipality.

**Area of Potential Effects (APE):**

Describe where disturbance of the ground will occur. What are the dimensions of the area to be disturbed? How deep will you excavate? How far apart are fenceposts? What method are you using to plant vegetation? Where will fill be obtained? Where will soil be dumped? What tools or equipment will be used? Are you replacing or repairing a structure? Will you be moving dirt in a relatively undisturbed area? Will the project reach below or beyond the limits of prior land disturbance? Differentiate between areas slated for earth movement vs. areas to be inundated only. Is the area to be inundated different from the area inundated today, in the recent past, or under natural conditions? Provide acres and/or linear ft/m for all elements of the project.

Ground-disturbing actions would occur throughout the 79-acre development site located east of the interstate highway, and along the existing road shoulders on 93<sup>rd</sup> Ave SW and Kimmie St SW between the project site and the interstate highway. Development would be completed within 20 years of permit issuance, likely sooner. All vegetation and surface soils may be excavated, compacted, filled, and/or covered. Full development would result in multiple warehouses (1-4 buildings?) with parking lots, and stormwater ponds. Fencing may be installed within, or at the perimeter, of the development site.

The Applicant would permanently maintain grassland conditions on the 67.5-acre site west of the interstate highway. Development rights would be extinguished through a conservation easement. The entire conservation site would be managed to maintain grassland conditions as habitat for the Olympia subspecies of Mazama pocket gopher in perpetuity. A vacant residence and some trees would be removed with measures to avoid ground disturbance outside the footprint of the existing building (e.g., work done by hand, or weight-distributing mats where equipment crosses native soils). Other management may include mowing, seeding, prescribed fire, and other measures to promote native prairie restoration.

**Environmental and Cultural Setting:**

Briefly describe the environmental setting of the APE. **A)** What was the natural habitat prior to modifications, reclamation, agriculture, settlement? **B)** What is land-use history? When was it first settled, modified? How deep has it been cultivated, grazed, etc.? **C)** What is land use and habitat today? What natural agents (e.g., sedimentation, vegetation, inundation) or cultural agents (e.g., cultivation) might affect the ability to discover cultural resources? **D)** Do you (or does anybody else) know of cultural resources in or near the project area?

A) The project is in the South Puget Lowlands, an area with extensive forest lands and

historically-expansive prairies and oak savannahs. When the Vashon Glacier began to melt and recede approximately 10,000 to 15,000 years ago, the glacially scoured parts of Puget Sound experienced huge floods as ice-dammed glacial lakes drained and left behind sandy-gravelly, glacial outwash soils across broad floodplains. Flora and fauna unique to the area settled on the glacial outwash plains, which slowly developed into prairie ecosystems maintained by natural and anthropogenic fire. Where fire did not occur, native forests grew. Prior to European settlement, the project site likely consisted of open-canopy prairie or prairie-savanna maintained by natural or anthropogenic fire, or it was covered by forest in the absence of fire.

B) Native Americans periodically burned the prairies to reinvigorate the grasses and forbs, which were important food sources, and to prevent the growth and expansion of coniferous trees. These areas were managed and burned repeatedly for thousands of years, which created prairies in the South Puget Lowlands and supported some endemic plants and animals. We do not know how these specific sites were used in that period.

Non-indigenous people began arriving in the early- to mid-1800s and transformed many of the prairies into cultivated fields and livestock pastures. As of the early 2000's, only about 8% of the original prairie areas still support grassland vegetation and about 2-3% of the historical prairie is still characterized by native prairie vegetation.

The project site is in the general vicinity of (approx. 3 miles from) the homestead of Bush Prairie's namesake settler, George W. Bush, who arrived in the area in November, 1845. Subsequent land uses in the vicinity have consisted primarily of agricultural production, with more recent development of residential uses and commercial or light-industrial enterprises.

C) Over recent decades, tree and shrub density has varied across the proposed Development Site with more woody cover indicating less intensive management. A residence on the northern portion of the Development Site backed up to a few acres of dense trees with a grassland extending north from the home. The residence was documented as Property #720265 in Washington DAHP's WISAARD. The Service understands the home to be no longer present, though information on WISAARD indicates it may still be standing. Vegetation cover types are generally consistent with that recent residential land-use.

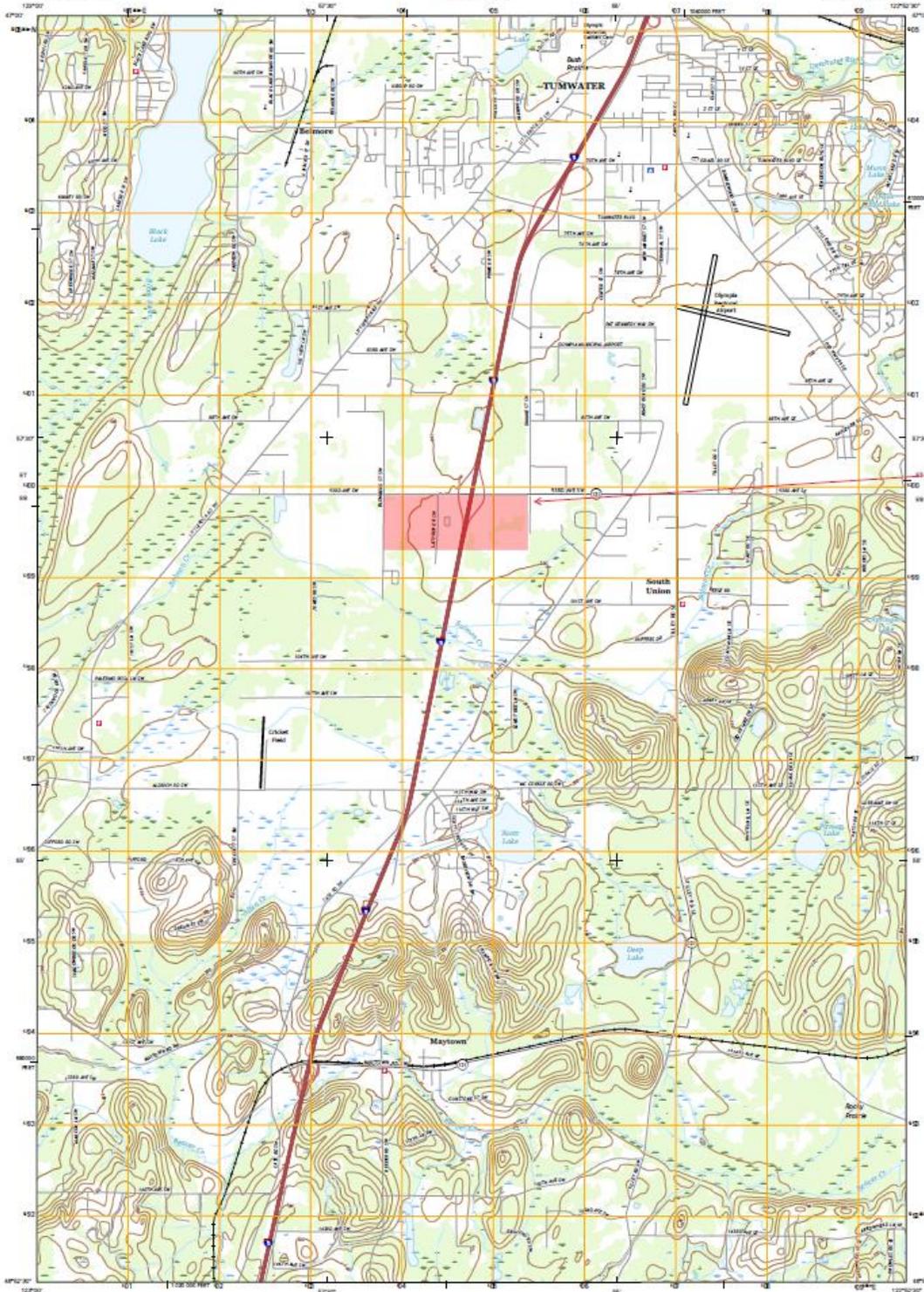
On the southwestern portion of the development site, young-forest cover is present. In the southeastern portion of the development site, prior soil disturbance resulted in creation of a berm approximately 10-15 feet high, as shown in the figure below titled "Tumwater East Existing Conditions."

The site has been vacant for a decade or more. All vegetation would likely be cleared from the site prior to excavation or grading of the entire site. Local procedures for detection and treatment of cultural resources would be implemented before and during construction. Current conditions include grasslands occupied by federally-threatened Olympia pocket gopher, grasslands suitable for and not occupied by the pocket gopher, shrub-covered patches, and young forest. Soils are excessively well-drained with minimal compaction except where the figure below shows that prior activities disturbed soils to create the berm and in the limited areas where historical roads or two-track equipment paths exist. No specific impediments to discovery of cultural resources are expected.

D) A review of the publicly-available information on the Washington Information System for Architectural and Archaeological Records Data (<https://fortress.wa.gov/dahp/wisaardp3/>) identified some information about the prior residence and potentially a barn. The review did not identify any properties listed on the National Register of Historic Places, the Heritage Barn

Register, or the Washington Heritage Register on the project site. Because there are no known historic properties on the site, none are expected to be affected by the proposed federal action of issuing a permit for incidental take of listed species at this location. We are unaware of cultural resources in or near the project area.

Please return this RCRC and map showing APE digitally, if possible, to [virginia\\_parks@fws.gov](mailto:virginia_parks@fws.gov). Questions, call 503-625-4377



USGS Quad: Maytown  
Quadrangle, Washington-  
Thurston Co.

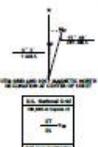
Project Area includes 2 sites, one  
on each side of the highway.

APE is the Commercial  
Development Site east of the  
highway where the entire site will  
be developed, along with road  
edge improvements along 93<sup>rd</sup>  
Ave east of the interstate  
highway, and along Kimmie Rd  
south of 93<sup>rd</sup> Ave.

The Conservation Site west of the  
highway will be permanently  
maintained in grassland cover.

Produced by the United States Geological Survey  
North American Datum of 1983 (NAD83)  
World Geodetic System of 1984 (WGS84) Projection used  
1:250,000 scale GDA (Geographic Data Administration) Data set  
1:250,000 scale USGS Washington-Quadrangle Series of 1:250,000 scale  
This map is not a legal document. Responsibility may be  
assumed for this map scale. Please check with the government  
agencies for legal documents. Check private land  
owning private lands.

Source: NADP, November 2016  
Base: U.S. Census Bureau, 2016  
Bathymetry: National Hydrography Dataset, 2016  
Contour: National Hydrography Dataset, 2016  
Cultural: National Hydrography Dataset, 2016  
Public Land Survey System: BLM, 2016  
Water: NHD, National Hydrography Dataset, 2016



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FOOT METERS

COPYRIGHT BY THE UNITED STATES OF AMERICA  
NORTH AMERICAN DATUM OF 1983  
This map was produced in conformance with the  
National Map Accuracy Standards (NMAS) of 1965.  
A reference to the manual with this product is at  
http://www.fgdl.gov

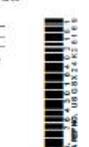
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ROAD CLASSIFICATION

Interstate  
Primary Road  
Secondary Road  
Minor Road

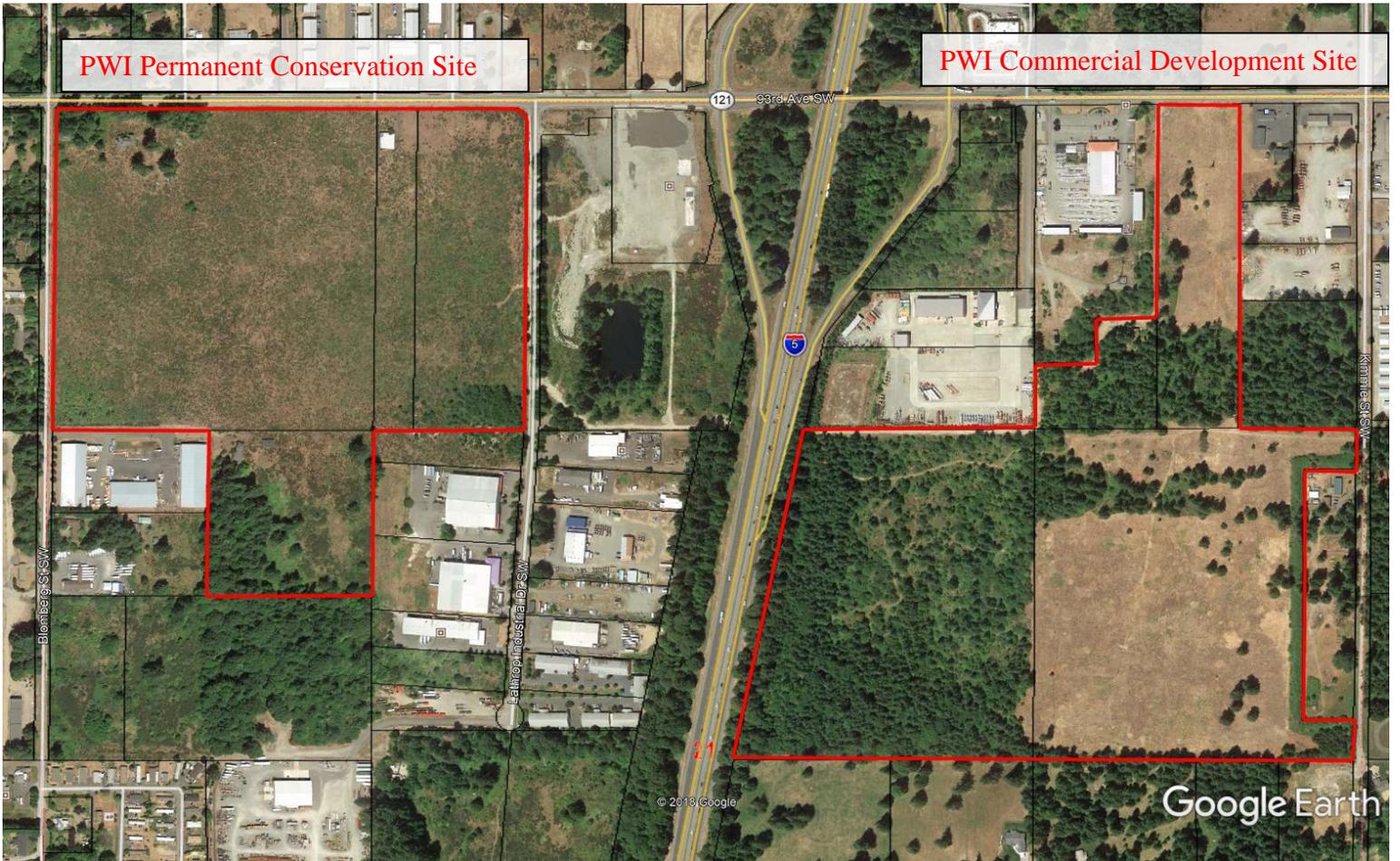
Local Connector  
Local Road  
Road

US Route  
State Route



1 Shaded Relief  
2 Contour  
3 Water  
4 Cultural  
5 Road  
6 Boundary  
7 Place Name  
8 Boundary

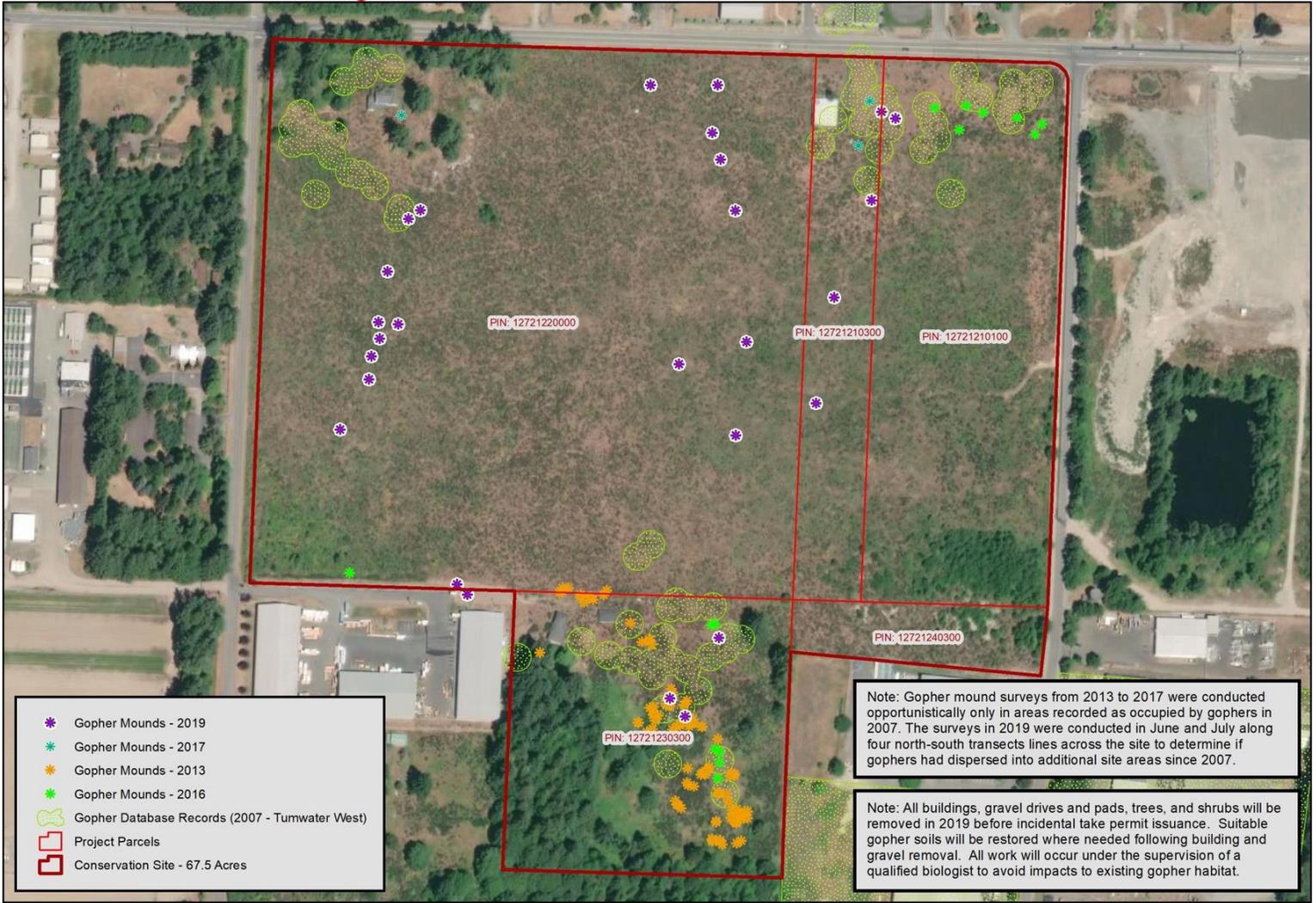
MAYTOWN, WA  
2017



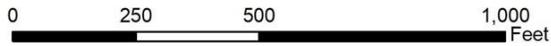
# Cover Types & Parcel #s on Development Site



# Existing conditions & Parcel #s on Conservation Site



## Tumwater West - Existing Conditions



Sources: Project Site: Thurston Co. GIS, 2018  
 Gopher Database Records: WDFW, 2016  
 Gopher Mounds: Krippner Consulting, LLC, 2013, 2016, 2017, 2019  
 Basemap: ESRI, 2019  
 Mapping: S. Krippner, 9/4/2019



## Appendix B

Cultural Resource Assessment of the Tumwater East I-5  
Distribution Center Project, Tumwater, Thurston County,  
Washington

# CULTURAL RESOURCES REPORT COVER SHEET

Author: Nathaniel Perhay and Sarah J. Amell

Title of Report: Cultural Resource Assessment of the Tumwater East I-5 Distribution Center Project, Tumwater, Thurston County, Washington

Date of Report: January 30, 2020

County(ies): Thurston Section: 21 Township: 17N Range: 02W

Quad: Maytown

PDF of report submitted (REQUIRED)  Yes

Historic Property Inventory Forms to be Approved Online?  Yes  No

Archaeological Site(s)/Isolate(s) Found or Amended?  Yes  No

TCP(s) found?  Yes  No

Replace a draft?  Yes  No

Satisfy a DAHP Archaeological Excavation Permit requirement?  Yes #  No

Were Human Remains Found?  Yes, DAHP Case #  No

DAHP Archaeological Site #:

\_\_\_\_\_  
\_\_\_\_\_  
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- Submission of PDFs is required.
- Please be sure that any PDF submitted to DAHP has its cover sheet, figures, graphics, appendices, attachments, correspondence, etc., compiled into one single PDF file.
- Please check that the PDF displays correctly when opened.

**Cultural Resource Assessment of the Tumwater East I-5  
Distribution Center Project, Tumwater, Thurston County,  
Washington**



**Prepared for:**  
Joel Molander  
Puget Western, Inc.  
(425) 487-6550

**Prepared by:**  
Nathaniel Perhay, Project Archaeologist  
Sarah J. Amell, Principal Investigator, RPA



Aqua Terra Cultural Resource  
Consultants  
8525 Stoney Creek Lane SW  
Olympia, WA  
98512 [www.AquaTerraCRC.com](http://www.AquaTerraCRC.com)

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# **Cultural Resource Assessment of the Tumwater East I-5 Distribution Center Project, Tumwater, Thurston County, Washington**

## **Executive Summary**

Aqua Terra Cultural Resource Consultants (ATCRC) was contracted by Puget Western, Inc to conduct a cultural resource assessment in Tumwater, Thurston County, Washington. Puget Western, Inc. is proposing new construction, conservation, and future planning on four (4) Thurston County tax parcels in Tumwater, WA. The project consists of the construction of one high cube warehouse distribution building that will include associated grading activities, paved parking and truck maneuvering areas; landscaping, stormwater facilities, water and sewer extensions, frontage road improvements, and franchise utility extensions. The construction of the main building, parking, and stormwater facilities is proposed on Thurston County Tax Parcels No. 12721140100 and 12721130000. The proposed excavations for these improvements will remove the top 6-7 feet of soil from the site. With the exception of construction of an access road on tax parcel 12721110200 as described later in this report, the remaining two Thurston County Tax Parcels No. 12721110400 and 12721110200 will be developed for commercial purposes under a separate SEPA application at a future date.

The property is privately owned, and the project is being privately funded, and is permitted by the City of Tumwater located in Thurston County, thereby falling under the auspices of the State Environmental Policy Act. Puget Western, Inc. has been advised by the City of Tumwater of the need for a cultural resource assessment pursuant to the SEPA process.

Background research indicates that no previous cultural resource assessments have been completed within the project area, although several others have occurred within ~1-mile to the project area related to water management projects. The project is largely within a “High-Moderate Risk” environmental resource area according to the Department of Archaeology and Historic Preservation (DAHP) predictive model. There are no known archaeological sites or historic properties within 1-mile of the proposed project area.

ATCRC’s cultural resources assessment for the Tumwater East I-5 Distribution Center project included background research, field investigation, and preparation of this report. Background review determined the project area to be in an area considered moderate risk for cultural resources. Field investigations consisted of pedestrian and subsurface survey; no cultural resources were encountered, and one historic structure was observed and documented but was considered non-eligible for the National Register of Historic Places. As such, ATCRC has determined it unlikely that any cultural materials or features will be impacted during the proposed project and that construction should proceed as planned. ATCRC recommends that an Inadvertent Discovery Plan (IDP) be adopted prior to further ground disturbing activities if archaeological resources or human remains are discovered during site development.

## **Regulatory Compliance**

This project was conducted, in part, to satisfy regulatory requirements of the Washington State Environmental Policy Act (SEPA). SEPA requires that impacts to cultural resources be considered during the public environmental review process. Under SEPA, the Washington State DAHP is the sole agency with technical expertise regarding cultural resources and provides formal opinions to other state agencies and local governments regarding a property's significance and the potential impact of proposed projects upon such properties.

A property's significance is assessed on a series of criteria based on the category that it falls into, i.e. building, structure, archaeological site (Part E). That categorization is then provided depth through the assignment of broad historical contexts through which the property is significant (Part F). The property's significance within these contexts is then advocated for through statements of description, which includes its condition and integrity, and of significance prior to an assessment of significance by the DAHP (DAHP 2017).

In addition, the State of Washington requires compliance with the cultural resources management laws and regulations under the Revised Code of Washington (RCW) 27.53 Archaeological Sites and Resources, RCW 27.44 Indian Graves and Records, and RCW 68.50.645 Skeletal Human Remains—Duty to Notify. The latter regulation provides a strict process for notification of law enforcement and other interested parties in the event of the discovery of any human remains, regardless of inferred cultural affiliation. ATCRC has assisted the property owner with complying with these various state and federal legal requirements by identifying the presence of historic resources within the Area of Potential Impact (API).

## **Consultation**

On August 18, 2019 the Nisqually Indian Tribe Cultural Resource Department was contacted by phone regarding the project, to request technical cultural information relevant to the project area and provide details regarding the field survey schedule. Brad Beach, Cultural Resource Specialist for the Nisqually Tribe, had no concerns and asked to be informed regarding the results of the field survey.

In January 2020, the Squaxin Island Tribe Cultural Resource Department provided comments to the City of Tumwater regarding the draft cultural resource assessment. These comments were incorporated by ATCRC accordingly and are reflected through the following revised draft.

## **Project Area and Description**

Puget Western, Inc. proposes to construct one high cube warehouse distribution building that will include associated grading activities, paved parking and truck maneuvering areas, landscaping, stormwater facilities, water and sewer extensions, frontage road improvements, and franchise utility extensions. The construction of the main building, parking, and stormwater facilities is proposed on Thurston County Tax Parcels No. 12721140100 and 12721130000. The project area is located within the northeast quadrant of Section 21 of Township 17 North, Range 02 West (Figure 1 & 2), within Thurston County Tax Parcels No. 12721140100, 12721130000, 12721110400 and 12721110200 (Figure 3). The proposed excavation in tax parcels #12721140100 and 12721130000 will remove the top 6-7 feet of soil from the site. The three structures on tax

parcel No. 12721110400 are proposed for demolition. On tax parcel No. 12721110200 an access road is proposed along with installation of utilities to service the planned structure.

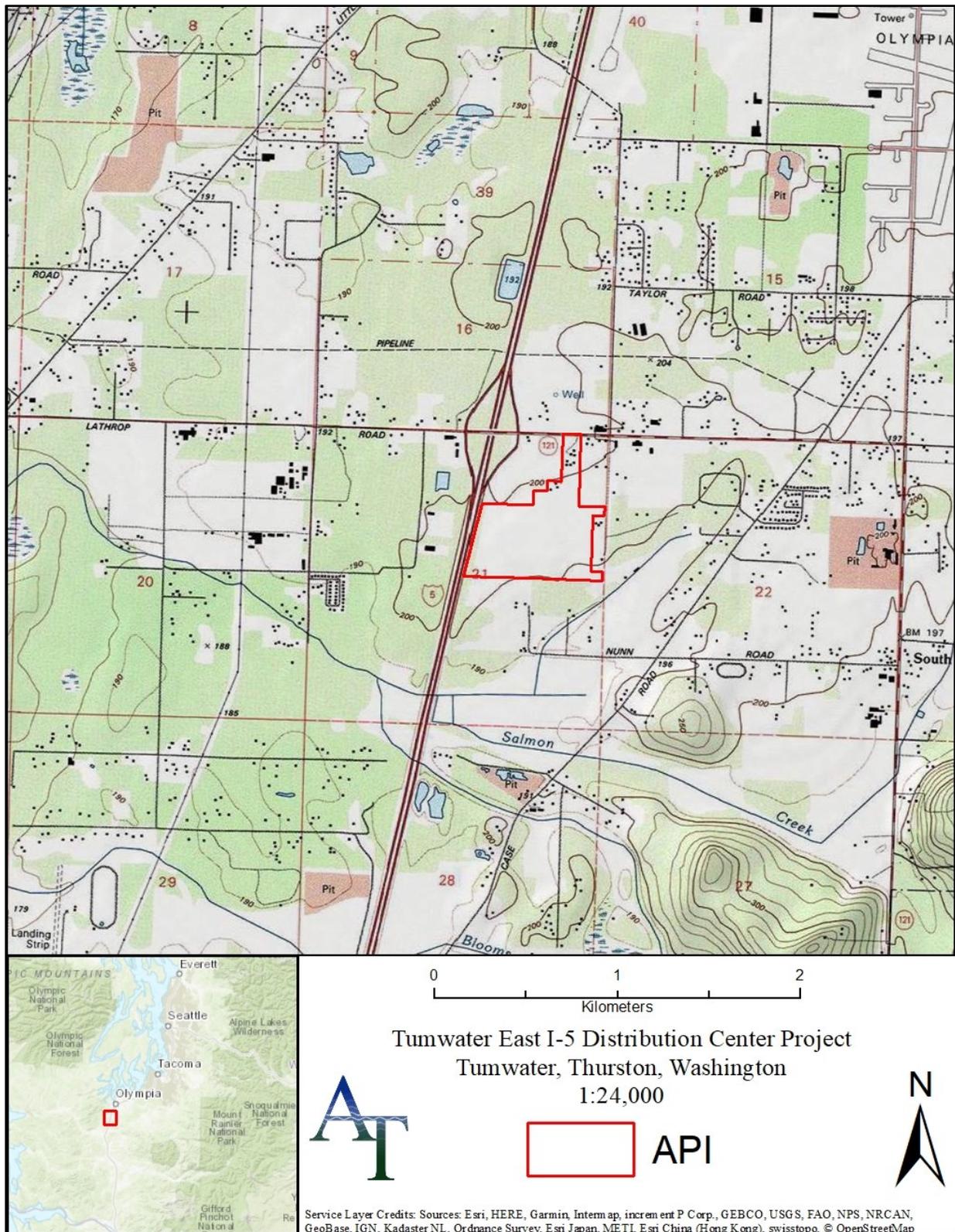


Figure 1. Tumwater East I-5 Distribution Center API, USGS Topo.

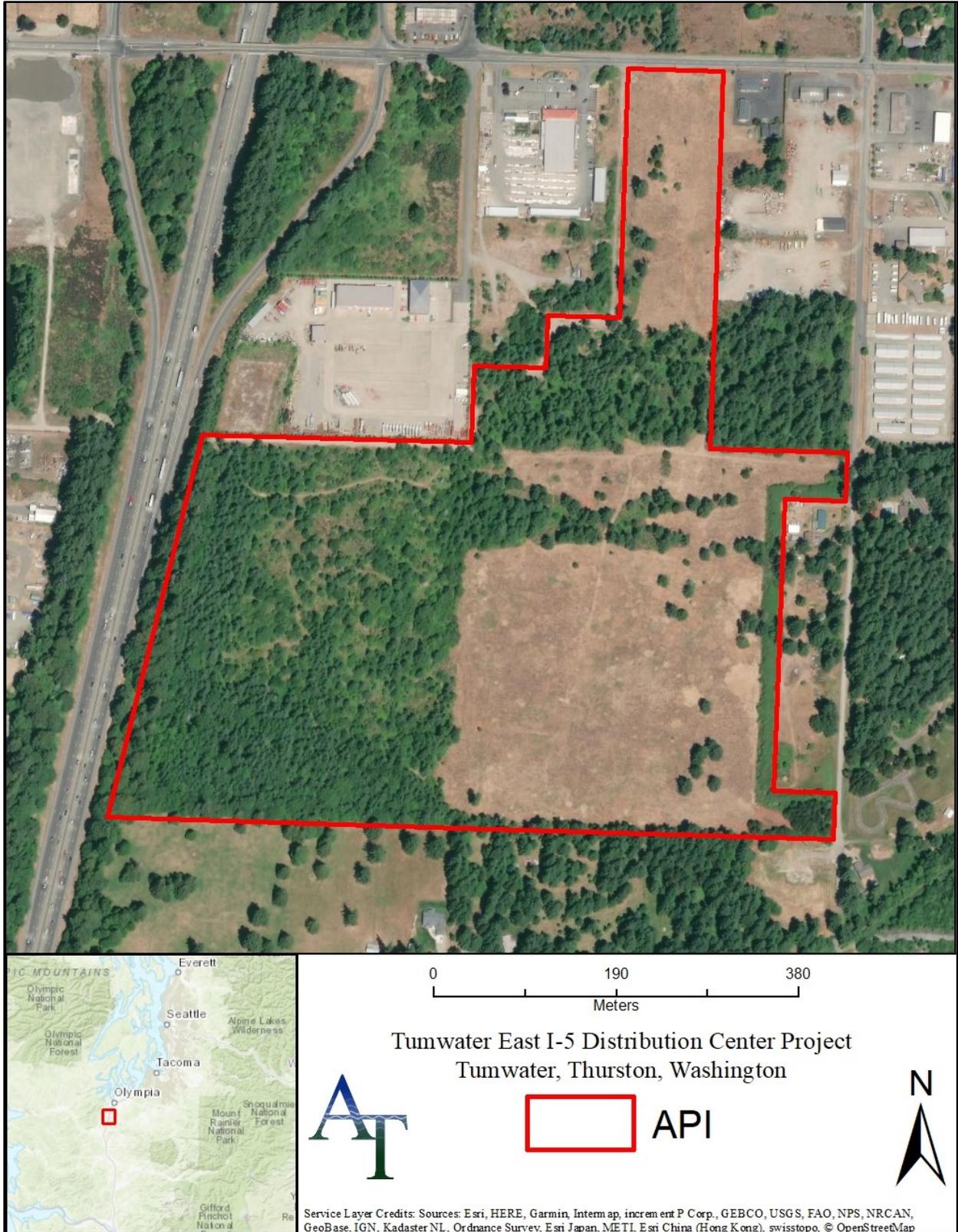


Figure 2. Tumwater East I-5 Distribution Center API, Aerial.

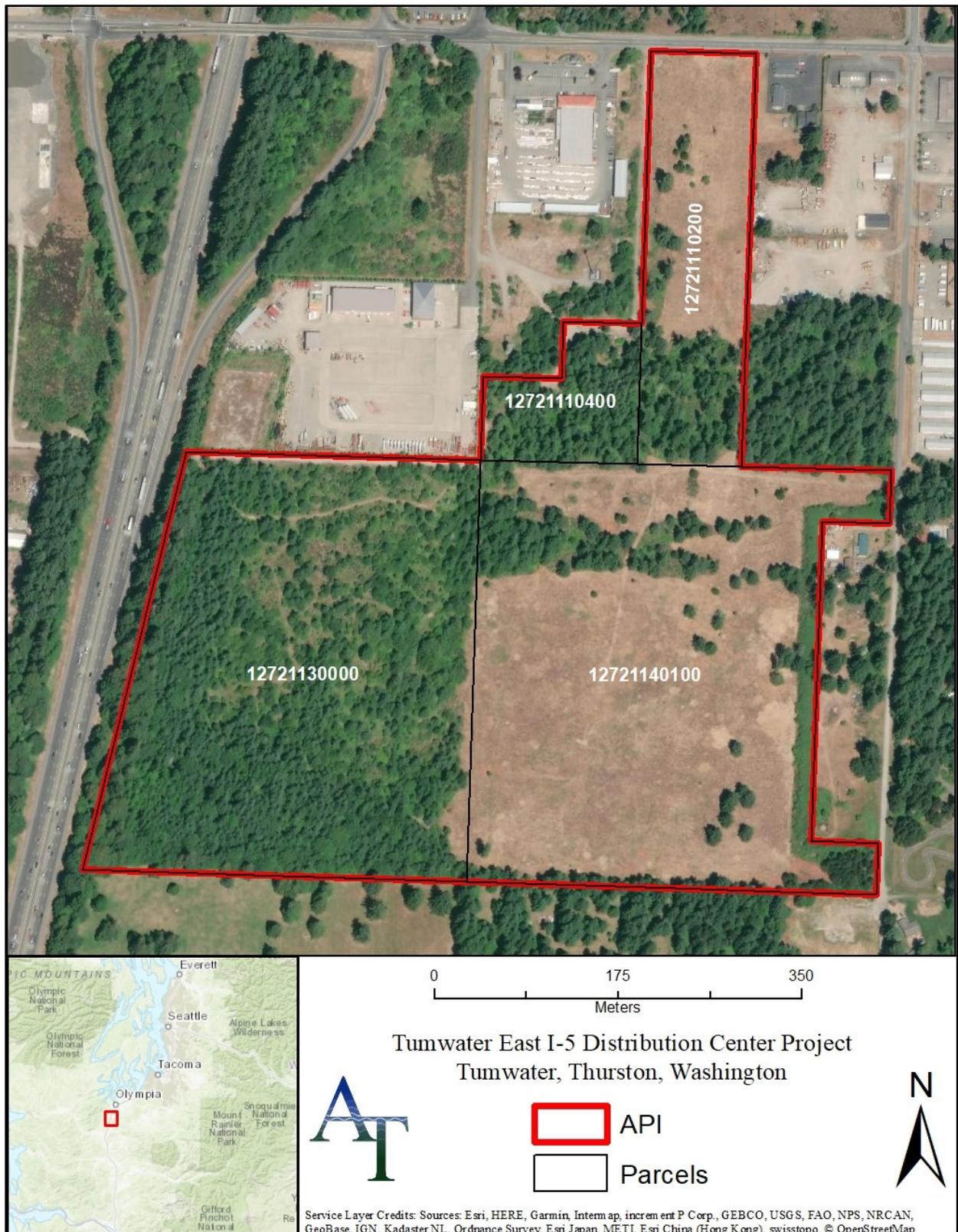


Figure 3. Tumwater East I-5 Distribution Center Parcel Map, Aerial.

## Background Review

Assessing the probability for cultural resources within the project area is based on a review of environmental and cultural settings, and previous cultural resource studies and sites in the immediate area. ATCRC's background research included review of project files, local geologic data, and cultural resources records available on DAHP's Washington Information System for Architectural and Archaeological Records Data (WISAARD) database.

## Environmental Setting

The API is in Tumwater, Washington on a Pleistocene continental outwash. The project area is just south of the Puget Sound. The average summer temperatures are 16°C (61°F) with an average daytime high of 24.5°C (76°F). The average temperature in winter is 5°C (41°F) with average highs around 8°C (46°F) and average lows around 2°C (35°F) (Hawes 2018).

The southern Puget Sound region is composed of inlets that begin in the northwestern portion of the state approximately 80 kilometers inland from the Pacific Ocean, and flow southward, forming a large inland sea in the northwestern quarter of the State. This inland sea is flanked on its western side by the Olympic Mountain range and on its eastern side by the Cascade Mountain range. The extensive inland waterways of the Puget Sound's interior lowlands were created by momentous geologic events in ancient history, from huge glacial processes and massive earthquakes, to gradual and abrupt changes in sea and land levels.

The Vashon Stade of the Fraser Glaciation began around 18,000 BP with an advance of the Cordilleran ice sheet into the lowlands (Porter and Swanson 1998). During the last Ice Age (the Pleistocene Epoch) the Puget Sound was covered by the thick Cordilleran ice sheet. In the last interval, known as the Fraser Glaciation, the Puget Lobe covered Puget Sound with up to 1,250 meters of ice (Thorson 1980). The Puget Lobe blocked north-flowing streams and created a system of proglacial lakes that were fed by ice-marginal and sub-glacial meltwater systems. About 15,000 years ago, the Puget Lobe started to retreat northward toward Port Townsend, later retreating from what is now the Strait of Juan de Fuca. Remains of the glacial outwash plain, glacial moraines, kettle ponds, and old river terraces are still visible today and represent ground surfaces as old as 11,000 to 15,000 years. Glaciomarine drift deposits were released from the melting glacial ice and deposited on the sea floor across the northern and central Puget Lowland causing the land to rebound and relative sea levels to fall and expose glacial outwash deposits (Clague and James 2002).

About 11,600 to 10,000 BP, the Cordilleran ice sheet advanced once again leaving glacial till and outwash deposits in much of northwestern Washington (Easterbrook 2003). Following the rising temperatures, the glacier retreated rapidly to the north and left the regional landscape ice-free and suitable for inhabitants by approximately 11,000 years ago (Kruckeberg 1991:22).

Soils within the API are made up of Cagey loamy sand and Everett Very Gravelly sandy loam according to the USDA NRCS (n.d.). Cagey loamy sand consists of 0 to 4% slopes on terraces deposited by sandy glacial drift deposits. Typical stratigraphy includes two strata of loamy sand from 0 to 28 inches and 28 to 60 inches of fine sand. Everett Very Gravelly sandy loam occurs on 0 to 8% slopes and is deposited by sandy and gravelly glacial outwash deposits on eskers, kames, and moraines. Typical stratigraphy includes two strata of very gravelly sandy loam from 1 to 24

**Table 1. Soil types within API.**

Name	Slope %	Typical Profile
Cagey Loamy Sand	0 to 4	H1 - 0 to 6 inches: loamy sand H2 - 6 to 28 inches: loamy sand H3 - 28 to 60 inches: fine sand
Everett Very Gravelly Sandy Loam	0 to 8	Oi - 0 to 1 inches: slightly decomposed plant material A - 1 to 3 inches: very gravelly sandy loam Bw - 3 to 24 inches: very gravelly sandy loam C1 - 24 to 35 inches: very gravelly loamy sand C2 - 35 to 60 inches: extremely cobbly coarse sand

inches, a stratum of very gravelly loamy sand from 24 to 35 inches and 35 to 60 inches of extremely cobbly coarse sand. (Table 1).

## Cultural Setting

### *Precontact*

Puget Sound lowland archaeology can be subdivided into three phases that include early (end of the last ice age to 5,000 years before present (BP), middle (5,000 to 1,000 BP) and late stages of development (1,000 to 250 BP).

The early period is characterized by an emphasis on the use of flaked stone tools included fluted projectile points, leaf-shaped points and cobble-derived tools. Camps were frequently established along river terraces or outwash channels and exist today as near surface scatters or shallow buried sites.

The middle period coincides with a stabilization of the environment to something similar to today. The broad cultural patterns include a larger suite of tools including smaller notched points and groundstone, bone or antler implements used for working with wood. Shell midden sites first appear during this period indicating a transition to a more maritime-based subsistence pattern.

The late period is dominated by settlement pattern along the coastline and along streams and rivers and far greater specialization of technology. Trade goods also appear indicating extensive trade networks up and down the coast as well as with inland plateau neighbors. Salmon became a primary food source at this time as sea levels had risen and riparian environments supported large runs of salmon and provided plentiful food.

### *Ethnohistorical*

The API is located in the traditional territory of the Nisqually, Squaxin, Chehalis and Cowlitz Tribes. The Nisqually traditional territory is documented as extending along both sides of the Nisqually River from its delta at the southern end of the Puget Sound to nearly 30-miles upstream (Ruby and Brown 1986:150; Suttles and Lane 1990:486). The Squaxin Island Tribe traditional territory is described as follows (Squaxin Island Cultural Resource Department (2020) as follows-

*The Squaxin kin/band are one of seven autonomous groups who once occupied the seven-inlet region of the southern Puget Sound inlets and surrounding watersheds of Lower Puget Sound, including North Bay of Case Inlet. Other local native groups included the Sa-He-Wa-Mish of Hammersley Inlet, the Noo-She-Chatl of Henderson Inlet, the Squi-Aitl of Eld Inlet, the Sawamish/T'Peeksin of Totten Inlet, and the S'Hotl-Ma-Mish of Carr Inlet.*

*Following the Medicine Creek Treaty of 1854, these groups were combined and collectively referred to as the Squaxin Island Tribe. Pre-contact Squaxin Island Tribe settlements, like other Coast Salish groups, were often located along major waterways and at heads of bays or inlets, where abundant resources of coastal and estuarine environments supported a relatively rich, diverse, and reliable subsistence base (Ames 1994). During the winter months, these groups lived in large villages of cedar plank houses at permanent settlements. During the spring and summer, they lived in seasonal encampments often constructed of reed mats while fishing, hunting, and plant and berry collecting.*

The traditional territory of the Chehalis was located on the Lower Chehalis River, especially on the south side of Grays Bay and in modern times they occupied the region around Willapa Bay (Swanton 1956:18). The traditional territories of the Cowlitz Indian Tribes were located at the lower and middle course of the Cowlitz River and later divided between the Chehalis and Puyallup Reservations (Swanton 1956:25)

Pre-contact Coast Salish groups were often located along major waterways and at heads of bays or inlets, where abundant resources of coastal and estuarine environments supported a relatively rich, diverse, and reliable subsistence base (Kopperl 2005). Coastal Salish groups typically maintained strong social ties to neighboring groups in the pre-contact period. Ethnographic and archaeological information indicates that local bands established permanent villages near the convergence of protective marine shoreline and freshwater drainage outlets, while temporary camps were established during the warmer months during seasonal food source gathering times.

Non-native settlement of the Puget Sound was prompted following the establishment of Hudson Bay Company (HBC) fur trading posts. The HBC capitalized on the high demand for beaver pelts and enlisted the services of local Native American trappers. Two HBC forts and one associated village were stationed on the Nisqually delta. Fort Nisqually was a pastoral and agricultural branch of the Puget Sound Agricultural Company (a subsidiary of the Hudson Bay Company) and shipped supplies to England and other fort establishments (Stilson 2003). Further regional non-native settlement was encouraged by the Treaty of Washington in 1846, the Donation Land Claim Act of 1850, and the creation of the Territory of Washington in 1853.

The influx of non-native people to the Puget Sound drastically affected Indian people and their traditions. In 1854, following negotiations between the Nisqually and the United States government during the Medicine Creek Treaty, three reservations were to be established. Chief Leschi and Quiemuth refused to sign the treaty after learning that the Nisqually reserve was to be established west of the delta, and not on the river where people could fish (Carpenter et al 2008). This initiated the Treaty War of 1855.

During this period internment camps were established on Fox Island and Squaxin Island. The war ended when territorial Governor Isaac Stevens agreed to establish reservation lands along the rivers of both the Nisqually and Puyallup and requested that Indian warriors return to the area which resulted in the hanging of Chief Leschi and murder of Quiemuth. Soon after, a large portion of the reservation was condemned by the US Army for development of military installations (later to become Fort Lewis), and many displaced Nisqually were forced to relocate to foreign lands on the Quinault River and the Puyallup, Skokomish and Chehalis reservations, as much of the reservation land remaining had already been divided and allotted into family units (Carpenter et al 2008).

## *Historic*

In 1792, Captain George Vancouver first explored and mapped Puget Sound, under the auspices of the British Royal Navy. Vancouver surveyed much of the Sound, but the exploration did not extend inland and failed to recognize several waterways including the Columbia, Puyallup, Nisqually and Fraser rivers (Morgan 1979:16). In 1841, the Wilkes Expedition produced the first detailed map of the area and promoted the region's potential for economic development in an attempt to increase non-native settlement.

In 1845, the first non-native settlement in the region was established at Tumwater. The settlement was called "New Market" and the economy was based on lumber, with a mill located on the west bank of the lower falls of the Deschutes River. Further regional non-native settlement was encouraged by the Oregon Donation Land Act.

The first non-native settlers to arrive in Olympia were Edmund Sylvester and Levi Lathrop Smith, platting the town site of Olympia in 1850. Olympia was named the capitol of the Washington Territory in 1853, and the local economy relied on timber, maritime trade and agriculture.

By the early 20th century the advent of the automobile drastically changed the development of Olympia. Following the Highway Act and Interstate Freeway system, Olympia became the hub of two major roadways: The Pacific and Olympic State Highways. These main state corridors, north-south and east-west, met in downtown Olympia at Fourth and Main (now Capitol Way). As dependency on the automobile grew, many businesses along 4th Avenue were rebuilt into auto-related operations until 1958 when the Old Highway 99 corridor was rerouted away and, in turn, many of the auto-related operations disappeared.

By the 1970s Olympia underwent substantial growth and change. New modern buildings were constructed for commercial institutions. Improvements to infrastructure as dependency on the automobile grew.

## **Previously Recorded Cultural Resources Studies and Sites**

The DAHP WISAARD database was accessed (August 2019) to determine if the project area had been previously surveyed and if any archaeological sites, historic register sites, historic properties, or cemeteries/burials have been previously recorded in, or in the vicinity of, the project area.

The project area lies within a "High Risk" zone area as indicated by the DAHP statewide Archeological Predictive Model. The property has not been surveyed. Additionally, within 1-mile of the API seven (7) previous cultural resource surveys had been completed. Neither of these surveys had any significant findings. (Table 2).

No archaeological sites have been recorded within a 1-mile radius of the project API. There are 92 potential historic properties within 1-mile of the API, none of which have been evaluated for the NRHP and only one will be affected by the proposed undertaking (Table 3) which a Historic Property Inventory (HPI) survey will occur.

**Table 2. Previously conducted cultural surveys within a one-mile radius of the API.**

Author	Title (Date)	Findings	Distance from API
Schumacher, James	Cultural Resources Assessment for the Tumwater Readiness Center (2015)	No further action required.	0.95 miles
Stipe, Frank	OLY Millersylvania Cellular Facility Project Cultural Resources Review (2013)	No further action required.	0.25 miles
Schumacher, James	Cultural Resources Assessment for the 93rd Ave and Lathrop Industrial Drive Intersection Improvement Project (2009)	No further action required.	0.54 miles
Schumacher, James	Memo to Bob Wolpert RE: Cultural Resources Survey for Thurston County Tilley Road Campus (2009)	No further action required.	0.98 miles
Robinson, Joan M.	Letter to Ken Stone RE: SR 5: Maytown Interchange to 93rd Avenue Interchange Project (1998)	No further action required.	0.25 miles
Parvey, Michele E.	Cultural Resources Inventory for the Olympia Regional Airport 2003/2004 Improvement Project (2002)	No further action required.	1.25 miles
Weed, Carol	Phase I Cultural Resource Investigations of the Proposed Northwest Pipeline Corporation- Grays Harbor Lateral Project in Thurston and Grays Harbor Counties, Washington (2002)	No further action required.	0.69 miles

**Table 3. Potential historic property within the API.**

Parcel No.	Property ID	Address	Building Type	Built
12721110400	493775	2321 SW 93RD AVE (493775)	Single family-Residence	1940

## Cultural Resources Expectations

If cultural resources were to be present in the project area, they would be expected to be representative of either historic-era cultural resources or precontact-era cultural resources. If precontact sites were encountered in the project area types of precontact era archaeology may include diffuse remains of shell midden, lithic scatters or similar features representing a range of domestic, subsistence activities. Numerous nearby archaeological sites reflect domestic and industrial use, including historic scatters, a railroad, bottles and glass fragments, iron frames, and ceramic pipes.

Many types of archaeological materials may be encountered during survey and subsequent construction activities. These may include, but are not limited to:

- Prehistoric archaeological materials and features (ethnographic-period materials would include artifacts or features the same as those for prehistoric timeframes with the inclusion of some historic-period items).
  - Stone tools and flaking debris.
  - Antler or non-sawed bone fragments.
  - Charcoal concentrations and darkened earth.
  - Fire-modified rock.
  - Food and technological materials from plants and animals.

- Historic-period archaeological materials.
  - Low-fired and bisque ceramics with subdued colors, or blue/pink willow-like design; thick-bodied pieces indicating crockery.
  - Non-tempered glass; violet-colored glass; stopper-topped glass jars or bottles; press-capped (cork gasket liner) heavy-walled soda or liquor bottles (not twist-top, thin-walled); zinc and vitreous glass-lidded glass canning jars with colored body.
  - Miscellaneous fragments of metal (or plated) clothing closures (hooks and eyes, and suspender fittings, but not zippers), shell buttons, fragments of Bakelite houseware, celluloid.
  - Sawed animal bone and fruit pits.
  - Enameled ironware.
  - Punch-opened and solder-sealed beverage cans; solder-sealed food tins; (not thin-walled aluminum and welded-steel cans).
  - Older automotive parts.
  - Knob-and-tube electrical insulators.
  - Construction materials such as concrete, milled lumber, brick, and metal rebar, hardware, and implements.

## Field Investigations

Field investigations within the API were conducted on September 9<sup>th</sup> through 19<sup>th</sup>, 2019 by Project Archaeologist Nathaniel Perhay and Andrew Viloudaki, and Archeological Technicians Lindsey Holdener, Jori Hurst, and Nicholas de Vry. Weather conditions were days of heavy rain, hot and sunny, or overcast. The project API consists of four parcels of undeveloped land. The conditions observed during the pedestrian survey and subsurface testing within the API matched expectations derived from background research and conditions reported by the project proponents. The API is generally characterized Pleistocene continental outwash surrounded by rural development.

The API consists of a partly open grass land and low scrub and a dense young forest with thick understory. A small abandoned house in poor condition and associated shed outbuildings were inventoried.

The field investigation included pedestrian survey, completed at 15-meter intervals across the project API, and subsurface testing. Subsurface testing was consisted of shovel probes (SPs) and strategically placed augur probes (APs) where deeper construction is proposed. Forested areas were very thickly overgrown, and probes were placed closely or within the planned transects as feasible.

### *Historic Property Inventory*

One abandoned single-family home structure in disrepair was identified and recorded, along with two associated sheds. The single-family dwelling was constructed in 1940, and is classified as a domestic single-family house, the “Allen Reid Residence”. A DAHP Historic Property Inventory form detailing the specific architectural characteristics of the structure was prepared

for the project, uploaded electronically to DAHP, and a copy of the form is provided in Appendix C.

### *Shovel and Auger Testing*

Subsurface testing consisted of 327 hand excavated SP and AP's (Figure 4 & 5). Excavations were completed in order to characterize the subsurface depositional context and identify possible subsurface archaeological deposits. Each SP was hand excavated at ~28-meter intervals across the site, to a minimum depth of 20cm below the expected development disturbance or terminating at the presence of glacial till consisting of hard compacted sandy loam and thick gravel or glacial outwash consisting of light grey fine sand. The SPs were strategically placed in higher probability direct impact areas and excavated to unweathered glacial (Holocene) deposits, 1-meter, or an impasse. APs were placed where deeper excavations are planned and were excavated to unweathered glacial (Holocene) deposits, 2-meters or refusal. All excavations exceeded the minimum depth of 30cm. The soil stratigraphy throughout the API was largely identical throughout all 327 completed probes.

All sediments were screened through ¼" inch mesh hardware cloth. All probe locations were recorded with a Global Positioning System (GPS) device and backfilled immediately. The SP & AP probe log results are presented in Appendix A. No prehistoric or historic cultural material was observed during the subsurface testing.



**Photo 1. View of semi open area in the forested half of the properties.**



**Photo 2. View of a shovel probe with augering at the bottom.**



**Photo 3. View of shovel probe with glacial till visible at bottom.**



**Photo 4. View of shovel probe with glacial outwash at base.**

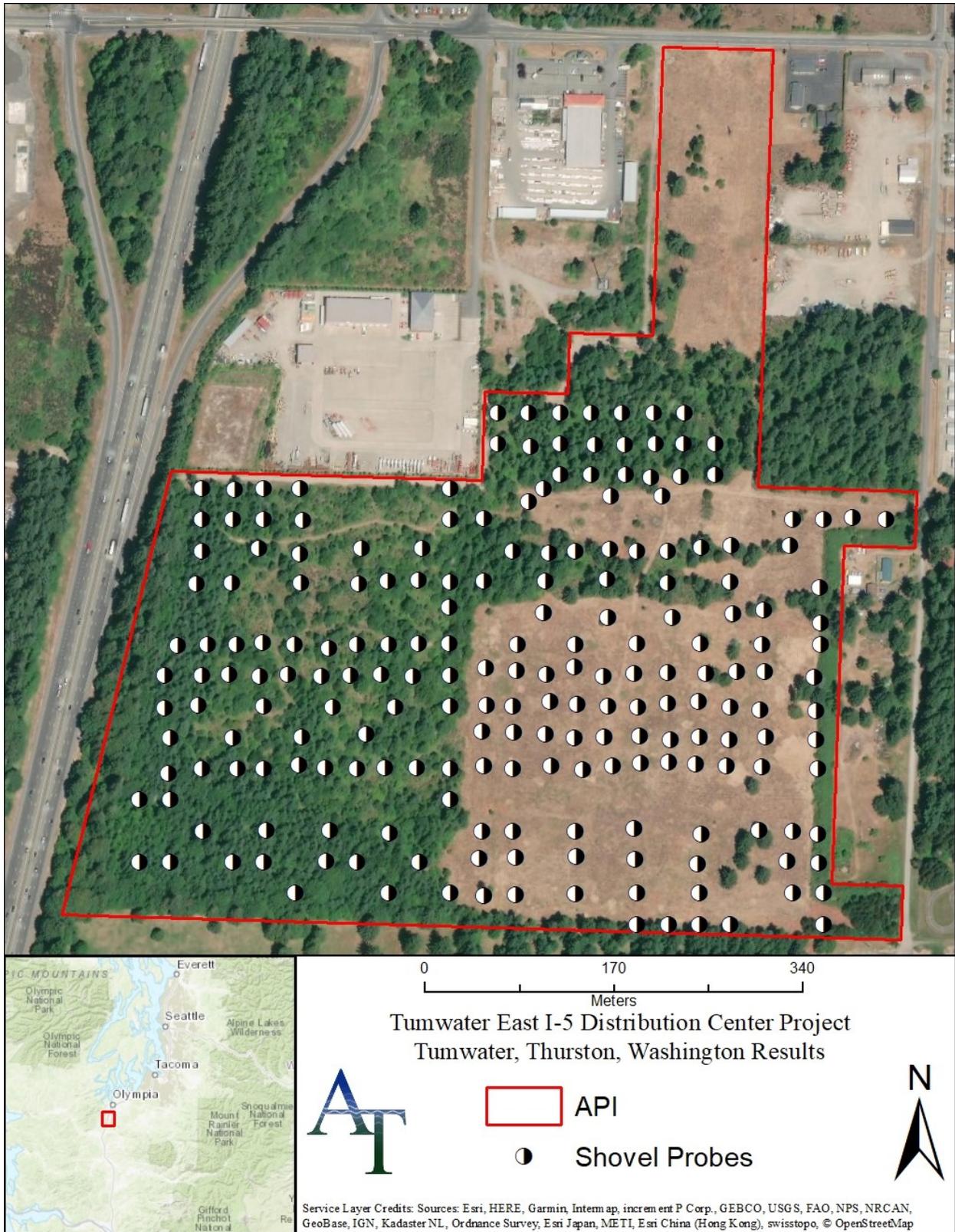


Figure 4. Shovel probe results.

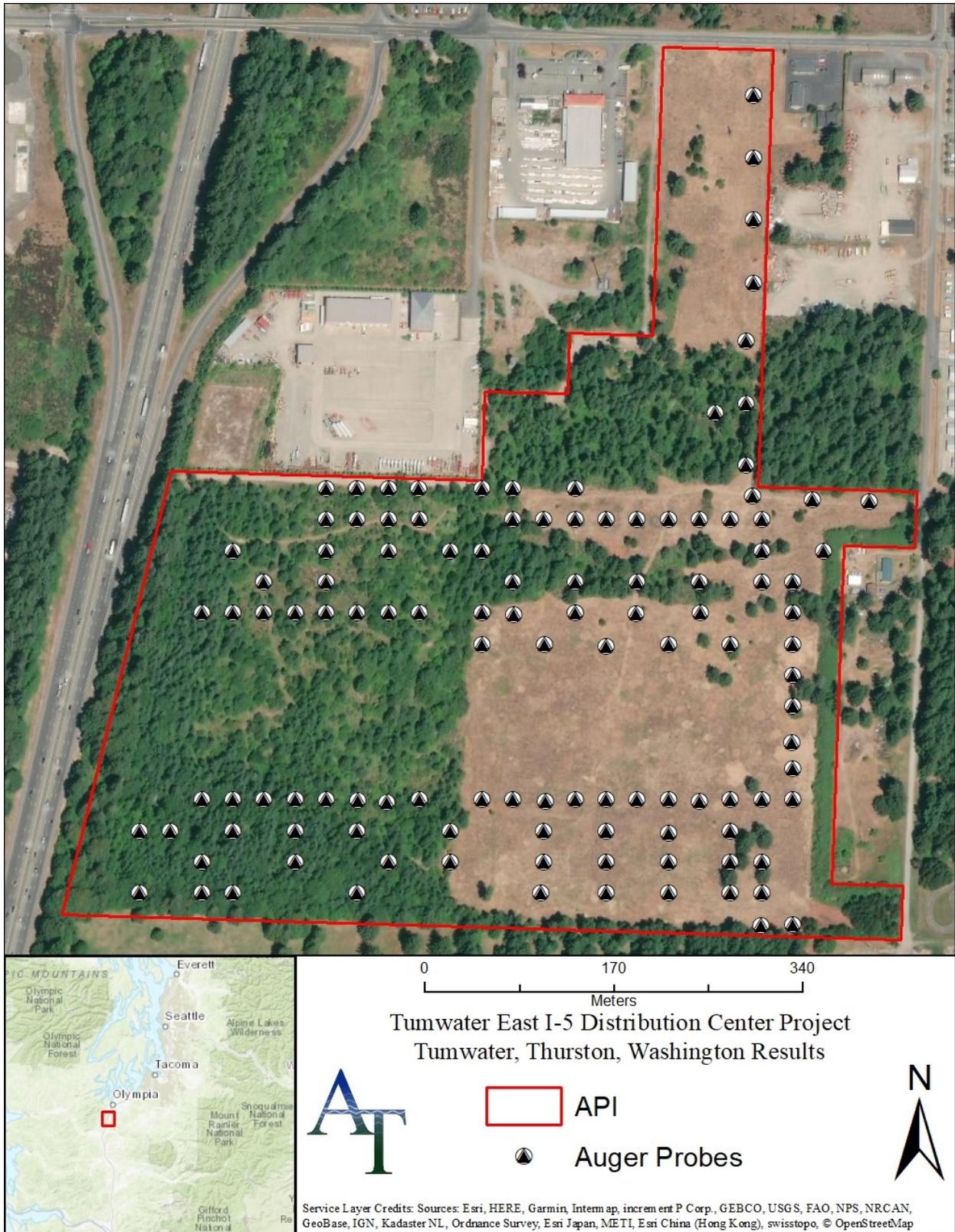


Figure 5. Auger probe results.

## Results and Recommendations

ATCRC's cultural resources assessment for the Tumwater East I-5 Distribution Center project included background research, field investigation, and preparation of this report. Background review determined the project area to be in an area considered moderate risk for cultural resources. Field investigations consisted of pedestrian and subsurface survey; one historic structure was documented but is not recommended as significant. As such, ATCRC has determined it unlikely that any cultural materials or features will be impacted during the proposed project as designed and that construction should proceed as planned. ATCRC recommends that an Inadvertent Discovery Plan (IDP) be adopted prior to further ground disturbing activities in the event that archaeological resources or human remains are discovered during site development. An IDP is attached Appendix B.

*No cultural resources study can wholly eliminate uncertainty regarding the potential for prehistoric sites, historic properties or TCPs associated with a project. The information presented in this report is based on professional opinions derived from our analysis and interpretation of available documents, records, literature and information identified in this report, and on our reconnaissance-level field investigation and observations as described herein. Conclusions and recommendations presented apply to project conditions existing at the time of our study and those reasonably foreseeable. The data, conclusions and interpretations in this report should not be construed as a warranty of subsurface conditions described in this report. They cannot necessarily apply to site changes of which ATCRC is not aware and has not had the opportunity to evaluate.*

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## **Appendix A: Shovel Probe Log**

SP	Field Number	Lat (°N)	Long (°W)	Description (cm below surface)	Cultural Materials
1	NP1	46.949012	-122.930335	0-15 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 15-100 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 20%. Terminated: Impasse Glacial	No
2	NP2	46.948989	-122.931451	0-9 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 9-37 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 37-50 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Root burns throughout SP Terminated: Impasse Glacial	No
3	NP3	46.948968	-122.932537	0-18 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 10-25 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 25-38 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Terminated: Impasse Glacial	No
4	NP4	46.949044	-122.93369	0-5 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 5-20 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 20-50 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Terminated: Impasse Glacial	No
5	NP5	46.949257	-122.933722	0-4 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 4-40 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 35%. Terminated: Impasse Rock	No

6	NP6	46.948649	-122.931725	0-3 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 3-20 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 20-52 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 25%. Root burns throughout SP Terminated: Impasse roots and rocks	No
7	NP7	46.948649	-122.933607	0-19 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 19-34 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 20%. Root burns throughout SP Terminated: Impasse Glacial	No
8	NP8	46.948433	-122.932089	0-6 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 6-38 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 15%. Root burns throughout SP Terminated: Impasse Glacial	No
9	NP9	46.947885	-122.930979	0-7 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 7-68 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 68-110 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 6%. Root burns throughout SP Terminated: Impasse Glacial	No
10	NP10	46.947661	-122.930936	0-5 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 5-38 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 38-140 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. Terminated: Refusal	No

11	NP11	46.947614	-122.932473	0-5 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 5-35 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 15%. Terminated: Impasse Glacial	No
12	NP12	46.947652	-122.933187	0-3 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 3-20 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 15%. 20-35 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 30%. Terminated: Impasse Glacial	No
13	NP13	46.947626	-122.934232	0-3 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 3-32 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 32-105 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 7%. Terminated: Impasse Glacial	No
14	NP14	46.94737	-122.933461	0-6 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 6-38 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 25%. 38-56 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 50%. Terminated: Impasse Glacial	No
15	NP15	46.947342	-122.932415	0-4 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 4-30 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 25%. 30-50 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 50%. Root burns throughout SP Terminated: Impasse Glacial	No

16	NP16	46.947383	-122.932069	0-3 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 3-30 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 30-62 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Terminated: Impasse Glacial	No
17	NP17	46.947353	-122.930978	0-3 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 3-63 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 7%. 63-84 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 25%. Terminated: Impasse Glacial	No
18	NP18	46.947116	-122.931682	0-2 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 2-35 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 35-120 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. Terminated: Reached required depth	No
19	NP19	46.947092	-122.932808	0-2 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 2-56 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 56-76 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 25%. Terminated: Impasse Glacial	No
20	NP20	46.947102	-122.933497	0-4 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 4-56 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 56-63 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Terminated: Impasse Glacial	No

21	NP21	46.94685	-122.93342	0-36 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 36-60 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. Terminated: Impasse Glacial	No
22	NP22	46.946822	-122.933045	0-20 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 20-100 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 15%. Terminated: Impasse Glacial	No
23	NP23	46.946892	-122.931346	0-9 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 9-62 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 62-92 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Terminated: Reached required depth	No
24	NP24	46.946694	-122.930257	0-3 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 3-36 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 36-72 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. Root burns throughout SP Terminated: Impasse Rocks	No
25	NP25	46.946376	-122.930937	0-56 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 56-100 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. Terminated: Reached required depth	No
26	NP26	46.946359	-122.932421	0-34 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 34-105 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. Terminated: Reached required depth	No

27	NP27	46.946341	-122.933194	0-2 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 2-76 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 76-100 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. Terminated: Reached required depth	No
28	NP28	46.946117	-122.933094	0-28 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 28-60 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 50%. Terminated: Impasse Glacial	No
29	NP29	46.946109	-122.9324	0-26 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 26-100 Loose dry non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. Terminated: Reached required depth	No
30	NP30	46.945872	-122.932377	0-20 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 20-100 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. Terminated: Reached required depth	No
31	NP31	46.945833	-122.930207	0-25 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 25-100 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. Terminated: Reached required depth	No
32	NP32	46.945866	-122.933742	0-9 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 9-58 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. Large amount of charcoal and burned soil between 25-35. Terminated: Impasse Glacial	No
33*	NP33	46.946188	-122.930926	0-20 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 20-102 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. Terminated: Impasse Rocks	No

34*	NP34	46.945866	-122.933742	0-67 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 67-115 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. Terminated: Impasse Glacial	No
35*	NP35	46.946157	-122.931263	0-38 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 38-120 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. Terminated: To loose of soil for auger	No
36*	NP36	46.945904	-122.930893	0-29 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 29-107 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. Terminated: To loose of soil for auger	No
37*	NP37	46.945608	-122.93089	0-37 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 37-117 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. Terminated: Impasse Glacial	No
38*	NP38	46.945622	-122.930566	0-20 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 20-65 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. Terminated: Impasse Roots	No
39*	NP39	46.946371	-122.931259	0-21 Loose dry non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 21-155 Loose dry non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 155-163 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: To loose of soil for auger	No
40*	NP40	46.946334	-122.932011	0-16 Loose dry non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 16-110 Loose dry non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 1%. 110-153 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: To loose of soil for auger	No

41*	NP41	46.946121	-122.932035	0-23 Loose dry non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Heavy charcoal and root burns. 23-77 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Impasse Rocks	No
42*	NP42	46.945884	-122.931977	0-17 Loose dry non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 17-113 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Too loose of soil for auger	No
43*	NP43	46.945959	-122.932678	0-23 Loose dry non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 23-126 Loose dry non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 1%. 126-166 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Impasse Glacial	No
44*	NP44	46.946214	-122.932687	0-30 Loose dry non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 5%. Heavy charcoal and root burns. 30-56 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule and pebble sized gravel 30%. Terminated: Impasse Rocks	No
45*	NP45	46.949292	-122.931092	0-26 Loose dry non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 26-54 Loose dry non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 54-66 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Impasse Glacial	No
46*	NP46	46.949714	-122.931058	0-17 Loose dry non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 17-113 Loose dry non-plas reddish brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Impasse Rocks	No

47*	NP47	46.949714	-122.931407	0-22 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 22-50 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 50-59 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 45%. Terminated: Impasse Glacial	No
48*	NP48	46.950326	-122.931142	0-17 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 22-50 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 50-59 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 45%. Terminated: Impasse Glacial	No
49*	NP49	46.950801	-122.931139	0-17 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 17-35 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 35-49 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 50%. Terminated: Impasse Glacial	No
50*	NP50	46.951322	-122.931161	0-19 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 19-56 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 12%. 56-72 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 45%. Terminated: Impasse Glacial	No
51*	NP51	46.951833	-122.931073	0-20 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. 20-50 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 7%. 50-55 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 40%. Terminated: Impasse Glacial	No

52*	NP52	46.95235	-122.931085	0-17 Loose dry non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 4%. 17-50 Loose dry non-plas brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. 50-54 Loose dry non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 45%. Terminated: Impasse Glacial	No
53*	NP53	46.949055	-122.935089	0-26 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 26-57 Moist loos non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 57-82 Moist loos non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Impasse Glacial	No
54*	NP54	46.949077	-122.935472	0-15 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 15-110 Moist loos non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 110-116 Moist loos non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: To loose of soil for auger	No
55*	NP55	46.949104	-122.935826	0-20 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 20-25 Moist loos non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Impasse buried log.	No
56*	NP56	46.949092	-122.936204	0-10 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 10-30 Moist loos non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 30-120 Moist loos non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: To loose of soil for auger	No

57*	NP57	46.948829	-122.936176	0-19 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 19-63 Moist loos non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 63-76 Moist loos non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Glacial	No
58*	NP58	46.948833	-122.935823	0-27 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 27-54 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 5%. 54-68 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 15%. Terminated: Impasse Glacial Located on old forest road.	No
59*	NP59	46.948844	-122.935428	0-17 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 17-56 Moist loos non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 5%. 56-72 Moist loos non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 20%. Terminated: Impasse Glacial	No
60*	NP60	46.948861	-122.935065	0-6 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 6-39 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 5%. 39-62 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 20%. Terminated: Impasse Glacial	No
61*	NP61	46.948713	-122.9347	0-12 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 3%. 12-65 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Rock	No

62*	NP62	46.948574	-122.935342	0-21 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 21-56 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 5%. 56-69 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Rock	No
63*	NP63	46.948587	-122.936105	0-10 Moist loose non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 1%. 10-55 Moist loose non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 3%. 55-63 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. Terminated: Impasse Rock	No
64*	NP64	46.948584	-122.937211	0-33 Moist loose non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 33-110 Moist loose non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 110-135 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 10%. Terminated: Impasse Glacial	No
65*	NP65	46.948273	-122.936723	0-22 Moist loose non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 22-85 Moist loose non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 85-110 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 7%. Terminated: Impasse Glacial	No
66*	NP66	46.948349	-122.935957	0-9 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 9-76 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 76-82 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 5%. Terminated: Impasse Glacial	No

67*	NP67	46.948038	-122.936301	0-14 Moist loose non-plas dark brown sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 14-63 Moist loose non-plas tan sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 2%. 63-88 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule, pebble, and cobble sized gravel 5%. Terminated: Impasse Glacial	No
68*	NP68	46.94803	-122.936681	0-30 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 30-62 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 1%. 62-93 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Glacial	No
69*	NP69	46.948044	-122.937127	0-26 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 26-86 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 1%. 86-105 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Glacial	No
70*	NP70	46.948043	-122.937599	0-17 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 17-60 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 1%. 60-76 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 7%. Terminated: Impasse Glacial	No
71*	NP71	46.946118	-122.9346	0-34 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 34-77 Moist loose non-plas tan sandy loam with incursions of roots and granule and pebble sized gravel 2%. 77-105 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 12%. Terminated: Impasse Glacial	No

72*	NP72	46.946397	-122.934678	0-45 Moist loose non-plas dark brown sandy loam with incursions of roots and granule, pebble and cobble sized gravel 5%. 45-57 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule, pebble and cobble sized gravel 15%. Terminated: Impasse Glacial	No
73*	NP73	46.946665	-122.935052	0-8 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 8-46 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 46-142 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Impasse Rock	No
74*	NP74	46.946665	-122.935052	0-17 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 17-52 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 5%. 52-113 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: To loose of soil for auger	No
75*	NP75	46.946633	-122.935405	0-33 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 33-81 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 3%. 81-105 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 7%. Root burn throughout SP. Terminated: Impasse Rock	No
76*	NP76	46.946638	-122.935738	0-19 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 19-84 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 84-111 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Rock	No
77*	NP77	46.946657	-122.936098	0-22 Moist loose non-plas dark brown sandy loam with incursions of roots and granule, pebble and cobble sized gravel 2%. 22-56 Moist loose non-plas brown sandy loam with incursions of roots and granule, pebble and cobble sized gravel 10%. Terminated: Impasse Glacial	No

78*	NP78	46.946591	-122.93648	0-7 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 7-38 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 38-87 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 10%. Terminated: Impasse Glacial	No
79*	NP79	46.946638	-122.936822	0-9 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 9-67 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 67-116 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Impasse Rock	No
80*	NP80	46.946591	-122.937185	0-21 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 21-50 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 50-112 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: To loose of soil for auger	No
81*	NP81	46.946539	-122.937585	0-31 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 31-80 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 80-102 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Glacial	No
82*	NP82	46.946937	-122.938306	0-31 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 31-76 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 76-139 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 5%. Terminated: Glacial	No

83*	NP83	46.946391	-122.938484	0-22 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 22-77 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 77-131 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Rock	No
84*	NP84	46.94633	-122.93809	0-13 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 13-94 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 94-112 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Glacial Located on old service road.	No
85*	NP85	46.946356	-122.937259	0-20 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 20-97 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 97-138 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Rock	No
86*	NP86	46.946386	-122.936449	0-10 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 10-59 Moist loose non-plas tan/brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Glacial Located on old service road.	No
87*	NP87	46.946399	-122.935769	0-36 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 36-69 Moist loose non-plas tan/brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Glacial Located on old service road.	No

88*	NP88	46.946152	-122.935375	0-25 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 25-99 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 99-115 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Rocks	No
89*	NP89	46.946115	-122.936492	0-33 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 3%. 33-84 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 3%. 84-124 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 3%. Terminated: Rocks	No
90*	NP90	46.946033	-122.937643	0-40 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 40-140 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 140-156 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Glacial	No
91*	NP91	46.94578	-122.938314	0-28 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 28-94 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 2%. 94-117 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 2%. Terminated: Glacial	No
92*	NP92	46.94584	-122.937532	0-25 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 25-110 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 110-137 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Glacial	No

93*	NP93	46.945828	-122.937135	0-28 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 28-109 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 109-118 Moist loose non-plas tan/grey sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Glacial	No
94*	NP94	46.94579	-122.935939	0-13 Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. 13-59 Moist loose non-plas brown sandy loam with incursions of roots and granule and pebble sized gravel 1%. Terminated: Root	No
95	LH1	46.948922	-122.929553	0-40 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 40-65 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
96	LH2	46.94895	-122.930642	0-15 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 15-40 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
97	LH3	46.949005	-122.931839	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-40 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
98	LH4	46.948985	-122.933288	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-40 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
99	LH5	46.94923	-122.933316	0-10 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 10-60 Glacial Outwash variant, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 3%. Terminated: Impasse Glacial	No
100	LH6	46.94928	-122.934036	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-50 Glacial Outwash variant, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 3%. Terminated: Impasse Glacial	No

101	LH7	46.948674	-122.931372	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-35 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
102	LH8	46.948589	-122.932507	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Burned Root at 50cm non cultural. Terminated: Impasse Glacial	No
103	LH9	46.948652	-122.933969	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
104	LH10	46.948451	-122.934001	0-90 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 90-100 Glacial Outwash variant, loose dry yellow brown grey sandy silt. Terminated: Impasse Glacial	No
105	LH11	46.948429	-122.932827	0-50 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 50-70 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
106	LH12	46.948312	-122.930664	0-40 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. Burned root at 20cm non cultural. 40-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
107	LH13	46.948073	-122.930292	0-50 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 50-80 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 10%. Terminated: Impasse Glacial	No
108	LH14	46.948123	-122.931328	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-40 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
109	LH15	46.948066	-122.932804	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and	No

				granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	
110	LH16	46.948033	-122.933574	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
111	LH17	46.947827	-122.933546	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-47 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
112	LH18	46.947903	-122.933232	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
113	LH19	46.947877	-122.931709	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-40 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
114	LH20	46.94763	-122.930341	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-40 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
115	LH21	46.947655	-122.931261	0-60 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 60-80 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule, pebble, sized gravel 5%. Terminated: Impasse Glacial	No
116	LH22	46.947629	-122.932081	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-58 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
117	LH23	46.947587	-122.933513	0-40 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 40-55 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No

118	LH24	46.947381	-122.93421	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-60 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
119	LH25	46.947344	-122.932771	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
120	LH26	46.947367	-122.931324	0-60 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 60-100 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule sized gravel 10%. Terminated: Impasse Glacial	No
121	LH27	46.947362	-122.930307	0-20 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 20-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
122	LH28	46.947102	-122.931323	0-60 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 60-80 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
123	LH29	46.94711	-122.932393	0-40 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 40-50 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
124	LH30	46.947113	-122.933876	0-26 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 26-46 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
125	LH31	46.946868	-122.933804	0-25 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 25-37 Glacial Outwash, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
126	LH32	46.946862	-122.932701	0-50 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 50-85 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule sized gravel 10%. Terminated: Impasse Glacial	No

127	LH33	46.946906	-122.932031	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-70 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule sized gravel 10%. Terminated: Impasse Glacial	No
128	LH34	46.946891	-122.930932	0-55 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 55-70 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule sized gravel 10%. Terminated: Impasse Glacial	No
129	LH35	46.946379	-122.930622	0-30 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 30-90 Glacial Outwash, loose dry yellow brown grey sandy silt with incursions of roots and granule sized gravel 10%. Terminated: Impasse Glacial	No
130	LH36	46.946337	-122.93162	0-60 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 60-100 Glacial Outwash variant, dense dry yellow brown grey sandy silt Terminated: Impasse Glacial	No
131	LH37	46.946321	-122.934369	0-55 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 55-80 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule sized gravel 10%. Terminated: Impasse Glacial	No
132	LH38	46.946083	-122.934237	0-45 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 45-80 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule, pebble sized gravel 90%. Terminated: Impasse Glacial	No
133	LH39	46.945847	-122.931722	0-60 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 60-80 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and granule, pebble sized gravel 10%. Terminated: Impasse Glacial	No
134	LH40	46.945618	-122.931203	0-47 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 47-60 Glacial Outwash variant, dense dry yellow brown grey sandy silt with incursions of roots and granule, pebble and cobble sized gravel 30%. Terminated: Impasse Glacial	No
135	LH41	46.945633	-122.931954	0-34 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 34-55 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots. Terminated: Impasse large root	No

136	LH42	46.945851	-122.934117	0-40 Silt Loam; Loose dry brown sandy silt loam with light incursions of roots. 40-60 Glacial Outwash variant, loose dry yellow brown grey sandy silt with incursions of roots and decaying wood. Terminated: Impasse termites	No
137	LH43	46.945621	-122.930176	0-5 Silt Loam; dense moist black sandy silt loam with light incursions of roots. 5-30 Glacial Outwash variant, dense dry yellow brown with orange inclusions silt clay. Terminated: Impasse Glacial	No
138	LH44	46.946137	-122.930319	0-20 Silt Loam; Loose dry dark brown sandy silt loam with light incursions of roots. 20-25 Glacial Outwash, compact dry yellow brown grey sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
139	JC1	46.949264	-122.931519	0-24 Organic Layer, Moist loose non-plas dark brown sandy loam with incursions of roots and granule and pebble sized gravel. 24-100 Moist loose non-plas light brown sandy loam. Terminated: Reached required depth	No
140	JC2	46.949218	-122.931995	0-27 Loose dry dark brown sandy silt loam with light incursions of roots. Root burns present. 27-39 Moist loose non-plas light brown sandy loam. 39-50 Glacial till Terminated: Glacial	No
141	JC3	46.949206	-122.932352	0-20 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots and granule pebble, cobble sized gravel. 20-27 Moist loose non-plas light brown sandy loam with incursions of granule and pebble sized gravel. 27-47 Glacial till Terminated: Glacial	No
142	JC4	46.949222	-122.932646	0-23 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 23-48 Moist loose non-plas light brown sandy loam with incursions of granule and pebble sized gravel. 48-60 Glacial till Terminated: Glacial	No
143	JC5	46.94919	-122.933115	0-13 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 13-50 Moist loose non-plas light brown sandy loam with incursions of granule and pebble sized gravel. 50-60 Glacial till Terminated: Glacial	No
144	JC6	46.949208	-122.933394	0-22 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots 22-62 Moist loose non-plas light brown sandy loam with incursions of granule pebble, cobble	No

				sized gravel. 62-64 Glacial outwash, light grey sandy loam Terminated: Glacial	
145	JC7	46.949639	-122.934131	0-13 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots 13-26 Moist loose non-plas light brown sandy loam with incursions of granule pebble, cobble sized gravel. 26-80 Glacial outwash, light grey sandy loam Terminated: Glacial	No
146	JC8	46.949632	-122.933788	0-12 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots and granule pebble, cobble sized gravel. 12-36 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 36-60 Glacial outwash, light grey sandy loam Terminated: Glacial	No
147	JC9	46.949778	-122.93264	0-18 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots and granule pebble, cobble sized gravel. 18-35 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 35-69 Glacial outwash, light grey sandy loam Terminated: Glacial	No
148	JC10	46.949724	-122.931903	0-13 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots and granule pebble, cobble sized gravel. 13-35 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 35-69 Glacial outwash, light grey sandy loam Terminated: Glacial	No
149	JC11	46.949101	-122.934645	0-12 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 12-64 Moist loose non-plas reddish brown sandy loam with incursions of granule pebble, cobble sized gravel. 64-70 Glacial outwash, light grey sandy loam Terminated: Glacial	No
150	JC12	46.949095	-122.937223	0-12 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 12-57 Moist loose non-plas reddish brown sandy loam with incursions of granule pebble, cobble sized gravel. 57-74 Glacial outwash, light grey sandy loam Terminated: Glacial	No

151	JC13	46.949112	-122.937499	0-14 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 14-59 Moist loose non-plas reddish brown sandy loam with incursions of granule pebble, cobble sized gravel. 59-69 Glacial outwash, light grey sandy loam Terminated: Glacial	No
152	JC14	46.9487	-122.937109	0-15 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 15-50 Moist loose non-plas reddish brown sandy loam. 50-62 Glacial outwash, light grey sandy loam Terminated: Glacial	No
153	JC15	46.948531	-122.936958	0-11 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 11-47 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 47-61 Glacial outwash, light grey sandy loam Terminated: Glacial	No
154	JC16	46.948655	-122.93772	0-13 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 13-60 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 60-75 Glacial outwash, light grey sandy loam Terminated: Glacial	No
155	JC17	46.948363	-122.937899	0-10 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 10-57 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. Charcoal from root burns around 55cm. 57-66 Glacial outwash, light grey sandy loam Terminated: Glacial	No
156	JC18	46.948831	-122.934636	0-16 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 16-47 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 47-65 Glacial outwash, light grey sandy loam Terminated: Glacial	No
157	JC19	46.948577	-122.935028	0-9 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 9-51 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 51-62 Glacial outwash, light grey sandy loam Terminated: Glacial	No
158	JC20	46.947938	-122.934643	0-15 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 15-55 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized	No

				gravel. 55-72 Glacial outwash, light grey sandy loam Terminated: Glacial	
159	JC21	46.947743	-122.936095	0-14 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 14-53 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 53-63 Glacial outwash, light grey sandy loam Terminated: Glacial	No
160	JC22	46.947718	-122.937467	0-16 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 16-39 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 39-50 Glacial outwash, light grey sandy loam Terminated: Glacial	No
161	JC23	46.947586	-122.938261	0-11 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 11-45 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 45-54 Glacial outwash, light grey sandy loam Terminated: Glacial	No
162	JC24	46.947542	-122.937759	0-16 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 16-67 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 67-76 Glacial outwash, light grey sandy loam Terminated: Glacial	No
163	JC25	46.947595	-122.936594	0-10 Organic Layer, Loose dry dark brown sandy silt loam with light incursions of roots. 10-49 Moist loose non-plas reddish brown sandy loam with incursions of granule and pebble sized gravel. 49-60 Glacial outwash, light grey sandy loam Terminated: Glacial	No
164	JH1	46.948932	-122.929957	0-30 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 30-65 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
165	JH2	46.94895	-122.931015	0-13 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 13-42 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No

166	JH3	46.949003	-122.932189	0-17 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 17-36 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
167	JH4	46.949017	-122.932953	0-15 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 15-30 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
168	JH5	46.949028	-122.934029	0-30 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 30-50 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
169	JH6	46.949034	-122.934381	0-45 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 45-56 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, pebble, and cobble sized gravel 60%. Terminated: Impasse Glacial	No
170	JH7	46.949321	-122.934366	0-40 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 40-55 Glacial Outwash variant, dense dry yellow brown sandy silt with incursions of roots and granule, 1% gravels. Terminated: High Compaction, Impasse Glacial	No
171	JH8	46.948692	-122.93068	0-12 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 12-30 Glacial Outwash variant, dense dry yellow brown sandy silt with incursions of roots and granule, 1% gravels. Terminated: High Compaction, Impasse Glacial	No
172	JH9	46.948617	-122.932119	0-24 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 24-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
173	JH10	46.94865	-122.933238	0-15 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 15-25 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
174	JH11	46.948423	-122.934355	0-110 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. Reached Glacial Outwash at 110cmbs. Terminated: Impasse Glacial	No

175	JH12	46.948434	-122.93361	0-10 Silt Loam; Loose dry dark brown sandy silt loam with small roots throughout. 10-30 Glacial Outwash variant, dense dry yellow brown sandy silt with incursions of roots and granule, 1% gravels. Terminated: High Compaction, Impasse Glacial	No
176	JH13	46.948446	-122.931399	0-20 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 20-25 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
177	JH14	46.948333	-122.931023	0-30 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 30-35 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
178	JH15	46.948358	-122.93031	0-26 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 26-35 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
179	JH16	46.948159	-122.93097	0-40 Silt Loam; Loose dry dark brown sandy silt loam with small roots throughout. Some charcoal flecks. 40-50 Glacial Outwash variant, dense dry yellow brown sandy silt with incursions of roots and granule, 1% gravels. Terminated: High Compaction, Impasse Glacial	No
180	JH17	46.948078	-122.932044	0-25 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 25-35 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
181	JH18	46.948059	-122.933923	0-25 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 25-35 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
182	JH19	46.947824	-122.933864	0-50 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 50-55 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
183	JH20	46.947857	-122.932459	0-25 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 25-35 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No

184	JH21	46.947883	-122.931372	0-30 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 30-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
185	JH22	46.947893	-122.93028	0-25 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 25-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
186	JH23	46.947353	-122.933141	0-20 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 20-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
187	JH24	46.947407	-122.931705	0-60 Silt Loam; Loose dry light brown sandy silt loam with small roots throughout. 20-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 1% gravels. Highly Compact. Terminated: Impasse Glacial	No
188	JH25	46.947123	-122.9303	0-20 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 20-36 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
189	JH26	46.947138	-122.930901	0-55 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 55-66 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
190	JH27	46.947087	-122.932022	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Terminated: Reached required depth	No
191	JH28	46.947082	-122.93316	0-26 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 26-50 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
192	JH29	46.947109	-122.934253	0-20 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 20-30 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No

193	JH30	46.946829	-122.934214	0-20 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 20-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
194	JH31	46.946891	-122.932366	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Terminated: Reached required depth	No
195	JH32	46.946897	-122.931717	0-60 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Terminated: Large cobble impasse	No
196	JH33	46.946894	-122.93027	0-12 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 12-25 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
197	JH34	46.946361	-122.930244	0-15 Silt loam; loose dry brown sandy silt loam with small roots throughout. Charcoal flecks observed. 15-60 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Highly compact. Terminated: High compaction	No
198	JH35	46.946369	-122.934	0-64 Silt Loam; Loose dry brown sandy silt loam with small roots throughout. 64-70 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
199	JH36	46.946101	-122.933815	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Some large charcoal chunks throughout Terminated: Reached required depth	No
200	JH37	46.946087	-122.931661	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Some large charcoal chunks throughout Terminated: Reached required depth	No
201	JH38	46.945626	-122.931562	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots. Terminated: Reached required depth	No
202	JH39	46.945601	-122.932306	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Some charcoal flecks 25-50cm. Terminated: Reached required depth	No
203	JH40	46.945889	-122.933029	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Terminated: Reached required depth	No

204	JH41	46.945832	-122.930601	0-70 Silt Loam variant; Loose dry reddish-brown sandy silt loam with small roots throughout. Charcoal flecks throughout layer Terminated: Large cobble impasse	No
205	JH42	46.946194	-122.930633	0-100 Silt Loam variant; Loose dry light brown sandy silt loam with small roots throughout. Terminated: Reached required depth	No
206	JH43			0-15 Silt Loam; Loose dark brown sandy silt loam with small to medium roots throughout. 15-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
207	JH44			0-13 Silt Loam; Loose dark brown sandy silt loam with small to medium roots throughout. 13-50 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
208	JH45			0-15 Silt Loam; Loose dark brown sandy silt loam with small to medium roots throughout. 15-40 Silt Loam; Loose dark reddish brown sandy silt loam with small to medium roots throughout. 40-50 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
209	JH46			0-60 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 60-70 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
210	JH47			0-20 Silt Loam; Loose brown sandy silt loam with small, medium and large roots throughout. Terminated: Large root impasse	No
211	JH48			0-40 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 40-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Large Cobble Obstruction	No
212	JH49			0-20 Silt Loam; Loose brown sandy silt loam with small, medium and large roots throughout. Terminated: Large wood impasse	No

213	JH50			0-50 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 50-60 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
214	JH51			0-15 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 15-35 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
215	JH52			0-16 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 16-30 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
216	JH53			0-10 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 10-20 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
217	JH54	46.946595	-122.937947	0-10 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 10-20 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
218	JH55	46.94663	-122.938419	0-60 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 60-65 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
219	JH56	46.946339	-122.937618	0-50 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 50-60 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
220	JH57	46.946378	-122.93684	0-18 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 18-50 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
221	JH58	46.946393	-122.936086	0-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No

222	JH59	46.946386	-122.935382	0-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 60% gravels. Terminated: Impasse Glacial	No
223	JH60	46.946407	-122.935003	0-35 Silt Loam; Compact dark brown sandy silt loam with small to medium roots throughout. Terminated: High compaction and large root obstruction	No
224	JH61	46.946175	-122.934971	0-20 Silt Loam Variant; Loose reddish-brown sandy silt loam with small to medium roots throughout. Some charcoal and root burn. 20-40 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
225	JH62	46.946176	-122.935716	0-30 Silt Loam; Compact dark brown sandy silt loam with small to medium roots throughout. Terminated: Large root obstruction	No
226	JH63	46.946135	-122.936066	0-60 Silt Loam; Loose brown sandy silt loam with small to medium roots throughout. 60-70 Glacial Outwash, dense dry yellow brown sandy silt with incursions of roots and granule, 5-10% gravels. Terminated: Impasse Glacial	No
227	NV1	46.949	-122.9297	0-5 Humic dark brown loose loam. 5-30 Grey brown loose sandy loam with 5% cobbles. 30-60 Glacial Outwash Grey brown loose dry loamy sand with 10% cobbles.	No
228	NV2	46.949	-122.9297	0-20 Humic dark brown loose loam. 20-30 Grey brown loose sandy loam with 5% cobbles. 30-48 Glacial Outwash, grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
229	NV3	46.949	-122.9303	0-5 Humic dark brown loose loam. 5-30 Grey brown loose sandy loam with 5% cobbles. 30-50 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
230	NV4	46.94867	-122.930309	0-5 Humic dark brown loose loam. 5-30 Glacial Outwash - Grey brown loose dry loamy sand. 30-60 Glacial till -Orange brown coarse sand with 20%gravels and cobbles. Terminated: Impasse Glacial	No

231	NV5	46.948682	-122.930995	0-5 Humic dark brown loose loam. 5-10 Glacial Outwash - Grey brown loose dry loamy sand. 10-30 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
232	NV6	46.948598	-122.932828	0-5 Humic dark brown loose loam. 5-20 Glacial Outwash - Grey brown loose dry loamy sand. 20-50 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
233	NV7	46.948682	-122.934293	0-30 Brown loose fine sand with >3% gravels and roots. 30-100 Glacial Outwash - Grey brown loose dry loamy sand. 100+ Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
234	NV8	46.948437	-122.933238	0-5 Humic dark brown loose loam. 5-40 Glacial Outwash - Grey brown loose dry loamy sand. 40-60 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
235	NV9	46.948438	-122.93246	0-10 Humic dark brown loose loam. 10- 30 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
236	NV10	46.948	-122.9317	0-5 Humic dark brown loose loam. 5-10 Glacial Outwash - Grey brown loose dry loamy sand. 10-30 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
237	NV11	46.948	-122.9306	0-10 Humic dark brown loose loam. 10-80 Brown loose fine sand with >3% gravels and roots. 80-100 Glacial Outwash - Grey brown loose dry loamy sand. 100+ Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No

238	NV12	46.948	-122.9317	0-5 Humic dark brown loose loam. 5-30 Brown loose loam with 10% gravels and cobbles. 30-50 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
239	NV13	46.948	-122.9324	0-5 Humic dark brown loose loam. 5-30 Brown loose loam with 10% gravels and cobbles. 30-50 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
240	NV14	46.948	-122.9331	0-8 Humic dark brown loose loam. 8-25 Brown loose loam with 10% gravels and cobbles. 25-50 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
241	NV15	46.948	-122.9343	Hornet's nest around probe location.	No
242	NV16	46.948	-122.9342	0-10 Humic dark brown loose loam. 10-80 Brown loose fine sand with >3% gravels and roots. 80-110 Glacial Outwash - Grey brown loose dry loamy sand. 110-120 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
243	NV17	46.948	-122.9328	0-40 Humic dark brown loose loam. 40-60 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
244	NV18	46.947877	-122.932132	0-20 Humic dark brown loose loam. 20-30 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
245	NV19	46.947848	-122.930641	0-80 Glacial Outwash - Grey brown loose dry loamy sand. 80-110 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
246	NV20	46.947671	-122.930671	0-60 Glacial Outwash - Grey brown loose dry loamy sand. 60-80 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No

247	NV21	46.947631	-122.931624	0-25 Mix of brown loose humic loam with large charcoal and metal fragments. Likely from a stump burn. 25-30 Dark brown sandy loam with >3% gravel. 50-80 Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
248	NV22	46.947588	-122.932843	0-20 Humic dark brown loose loam. 20-30 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
249	NV23	46.947608	-122.933864	0-30 Humic dark brown loose loam. 30-40 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
250	NV24	46.94739	-122.933868	0-60 Humic dark brown loose loam. 60-80 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
251	NV25	46.947	-122.9306	0-10 Humic dark brown loose sandy loam with 5% gravel. 10-50 Brown loose sandy loam with 15% gravel and cobble. 50-70 Brown loose sandy loam with 15% cobble and gravel. Terminated: Impasse Glacial	No
252	NV26	46.947	-122.9306	0-7 Humic dark brown loose sandy loam with 5% gravel. 7-50 Loose fine brown sand with 10% gravels. 50-70 Brown loose sandy loam with 15% cobble and gravel. Terminated: Impasse Glacial	No
253	NV27	46.947	-122.9306	0-7 Humic dark brown loose sandy loam with 5% gravel. 7-50 Brown loose sandy loam with 15% gravel and cobble. 50-60 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
254	NV28	46.947	-122.9306	0-7 Humic dark brown loose loam. 7-90 Orange brown loose sandy loam with 5% cobbles. 110-130 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. 130+ Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No

255	NV29	46.947	-122.9309	0-15 Humic dark brown loose loam. 15-100 Orange brown loose sandy loam with 5% cobbles. 100-140 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
256	NV30	46.947	-122.9312	0-15 Humic dark brown loose loam. 15-70 Orange brown loose sandy loam with 5% cobbles. 70-110 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. 110+ Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
257	NV31	46.947	-122.9317	0-7 Humic dark brown loose loam. 7-80 Orange brown loose sandy loam with 5% cobbles. 80-90 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. 90-100 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
258	NV32	46.947	-122.932	0-17 Humic dark brown loose loam. 17-40 Brown loose sandy loam with 5% cobbles. 40-57 Glacial Outwash – Grey brown loose dry loamy sand with 10% cobbles. 57-65 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
259	NV33	46.947	-122.9324	0-15 Humic dark brown loose loam. 15-50 Brown loose sandy loam with 5% cobbles. 50-90 Glacial Outwash – Grey brown loose dry loamy sand with 10% cobbles. 90-100 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
260	NV34	46.947	-122.9328	0-15 Humic dark brown loose loam. 15-130 Brown loose sandy loam with 5% cobbles. 130-190 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. 190-200 Glacial till - Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
261	NV35	46.947	-122.9332	0-10 Humic dark brown loose loam. 10-70 Grey brown loose sandy loam with 5% cobbles. 70-90 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

262	NV36	46.947	-122.9335	0-15 Humic dark brown loose loam. 15-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
263	NV37	46.947	-122.9338	0-15 Humic dark brown loose loam. 15-150 Grey brown loose sandy loam with 5% cobbles. 150-170 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. 170+ Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
264	NV38	46.947	-122.9343	0-15 Humic dark brown loose loam. 15-80 Grey brown loose sandy loam with 5% cobbles. 80-90 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. 90+ Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
265	NV39	46.946	-122.9335	0-15 Humic dark brown loose loam. 15-70 Grey brown loose sandy loam with 5% cobbles. Terminated: Cobbles	No
266	NV40	46.946	-122.9334	0-10 Humic dark brown loose loam. 10-60 Brown sandy loam with 10% cobble. 60-70 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
267	NV41	46.946	-122.9334	0-5 Humic dark brown loose loam. 5-120 Grey brown loose sandy loam with 5% cobbles. 120-140 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
268	NV42	46.946	-122.9328	0-5 Humic dark brown loose loam. 5-100 Grey brown loose sandy loam with 5% cobbles. 100-140 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
269	NV43	46.949	-122.9316	0-5 Humic dark brown loose loam. 5-70 Grey brown loose sandy loam with 5% cobbles. 70-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

270	NV44	46.949	-122.9319	0-5 Humic dark brown loose loam. 5-60 Grey brown loose sandy loam with 5% cobbles. 60-70 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
271	NV45	46.949	-122.9322	0-5 Humic dark brown loose loam. 5-50 Grey brown loose sandy loam with 5% cobbles. 50-90 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
272	NV46	46.949	-122.9327	0-5 Humic dark brown loose loam. 5-50 Grey brown loose sandy loam with 5% cobbles. 50-70 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles.	No
273	NV47	46.949	-122.933	0-10 Humic dark brown loose loam. 10-30 Grey brown loose sandy loam with 5% cobbles. 30-40 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
274	NV48	46.949	-122.9334	0-20 Humic dark brown loose loam. 20-40 Grey brown loose sandy loam with 5% cobbles. 40-60 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
275	NV49	46.949	-122.9338	0-10 Humic dark brown loose loam. 10-50 Grey brown loose sandy loam with 5% cobbles. 50-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
276	NV50	46.949	-122.9341	0-10 Humic dark brown loose loam. 10-40 Grey brown loose sandy loam with 5% cobbles. 40-50 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
277	NV51	46.95	-122.9334	0-15 Humic dark brown loose loam. 15-40 Grey brown loose sandy loam with 5% cobbles. 40-60 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

278	NV52	46.95	-122.9365	0-5 Humic dark brown loose loam. 5-40 Grey brown loose sandy loam with 5% cobbles. 40-60 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
279	NV53	46.95	-122.9321	0-20 Humic dark brown loose loam. 20-40 Grey brown loose sandy loam with 5% cobbles. 40-60 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
280	NV54	46.949	-122.9365	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
281	NV55	46.949	-122.9365	0-50 Grey brown loose sandy loam with 5% cobbles. 50-65 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
282	NV56	46.949	-122.9365	0-40 Grey brown loose sandy loam with 5% cobbles. 40-65 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
283	NV57	46.949	-122.938	0-55 Grey brown loose sandy loam with 5% cobbles. 55-78 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles.	No
284	NV58	46.949	-122.9368	0-45 Grey brown loose sandy loam with 5% cobbles. 45-68 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
285	NV59	46.949	-122.9364	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
286	NV60	46.948	-122.9365	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

287	NV61	46.948	-122.9375	0-20 Humic dark brown loam. 20-58 Grey brown loose sandy loam with 5% cobbles. 58-70 Glacial Outwash – Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
288	NV62	46.948	-122.9364	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
289	NV63	46.949	-122.9357	0-60 Cedar log. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
290	NV64	46.948	-122.9358	0-40 Grey brown loose sandy loam with 5% cobbles. 40-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
291	NV65	46.948	-122.9354	0-65 Grey brown loose sandy loam with 5% cobbles. 65-88 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
292	NV66	46.948	-122.9351	0-65 Grey brown loose sandy loam with 5% cobbles. 65-88 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
293	NV67	46.948	-122.9346	0-55 Grey brown loose sandy loam with 5% cobbles. 55-60 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
294	NV68	46.948	-122.9347	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
295	NV69	46.948	-122.9357	0-10 Humic dark brown loose loam. 10-50 Red brown loose sandy loam with 5% cobbles. 50-60 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. 60-70 Glacial till -Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No

296	NV70	46.948	-122.9357	0-30 Humic dark brown loose sandy loam. 30-80 Grey brown loose sandy loam with 5% cobbles. 80-90 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
297	NV71	46.948	-122.9361	0-30 Humic dark brown loose sandy loam. 30-80 Grey brown loose sandy loam with 5% cobbles. 80-90 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
298	NV72	46.948	-122.9372	0-70 Grey brown loose sandy loam with 5% cobbles. 70-90 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
299	NV73	46.948	-122.9382	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
300	NV74	46.948	-122.937	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	On surface a scatter of bottles and electric parts.
301	NV75	46.948	-122.9359	0-65 Grey brown loose sandy loam with 5% cobbles. 65-78 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
302	NV76	46.947	-122.9352	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
303	NV77	46.947	-122.9352	0-10 Humic dark brown loose loam. 10-70 Grey brown loose sandy loam with 5% cobbles. 70-90 Glacial till – Orange brown coarse sand with 20% gravels and cobbles. Terminated: Impasse Glacial	No
304	NV78	46.947	-122.9359	0-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

305	NV79	46.947	-122.9369	0-20 Humic dark brown loose loam. 20-40 Grey brown loose sandy loam with 5% cobbles. 40-72 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
306	NV80	46.947	-122.9378	0-12 Humic dark brown loose loam. 12-50 Grey brown loose sandy loam with 5% cobbles. 50-61 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
307	NV81	46.947	-122.938	0-10 Humic dark brown loose loam. 10-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
308	NV82	46.947	-122.9373	0-30 Humic dark brown loose loam. 30-50 Grey brown loose sandy loam with 5% cobbles. 50-62 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
309	NV83	46.947	-122.9368	0-12 Humic dark brown loose loam. 12-38 Grey brown loose sandy loam with 5% cobbles. 38-50 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
310	NV84	46.947	-122.9379	0-30 Humic dark brown loose loam. 30-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
311	NV85	46.947	-122.9375	0-10 Humic dark brown loose loam. 10-30 Grey brown loose sandy loam with 5% cobbles. 30-45 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
312	NV86	46.947	-122.9371	0-10 Humic dark brown loose loam. 10-30 Grey brown loose sandy loam with 5% cobbles. 30-45 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

313	NV87	46.947	-122.9367	0-10 Humic dark brown loose loam. 10-30 Grey brown loose sandy loam with 5% cobbles. 30-40 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
314	NV88	46.947	-122.9364	0-20 Humic dark brown loose loam. 20-70 Grey brown loose sandy loam with 5% cobbles. 70-84 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
315	NV89	46.947	-122.9361	0-20 Humic dark brown loose loam. 20-53 Grey brown loose sandy loam with 5% cobbles. 53-64 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
316	NV90	46.947	-122.9357	0-45 Dark brown red sandy loam. 45- 58 Glacial till - Orange brown coarse loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
317	NV91	46.947	-122.9354	0-30 Humic dark brown loose loam. 30-72 Grey brown loose sandy loam with 5% cobbles. 72-85 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
318	NV92	46.947	-122.935	0-20 Humic dark brown loose loam. 20-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
319	NV93	46.947	-122.9346	0-25 Dark brown red loose sandy loam with 10% gravel. 25-45 Glacial till -orange brown coarse loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
320	NV94	46.947	-122.9345	0-60 Dark brown red loose sandy loam with 10% gravel. 60-75 Glacial till -orange brown coarse loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

321	NV95	46.946087	-122.936846	0-12 Humic dark brown loose loam. 12-75 Grey brown loose sandy loam with 5% cobbles. 75-85 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
322	NV96	46.946057	-122.937281	0-60 Grey brown loose sandy loam with 5% cobbles. 60-90 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
323	NV97	46.946	-122.938	0-8 Humic dark brown loose loam. 8-60 Grey brown loose sandy loam with 5% cobbles. 60-70 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
324	NV98	46.946	-122.9384	0-20 Humic dark brown loose loam. 20-70 Grey brown loose sandy loam with 5% cobbles. 70-90 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
325	NV99	46.946	-122.9364	0-20 Humic dark brown loose loam. 20-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
326	NV100	46.946	-122.9352	0-20 Humic dark brown loose loam. 20-60 Grey brown loose sandy loam with 5% cobbles. 60-80 Glacial Outwash -Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No
327	NV101	46.946	-122.9345	0-7 Humic dark brown loose loam. 7-20 Grey brown loose sandy loam with 5% cobbles. 20-30 Glacial Outwash - Grey brown loose dry loamy sand with 10% cobbles. Terminated: Impasse Glacial	No

## **Appendix B: Inadvertent Discovery Plan (IDP)**

# Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Skeletal Remains

## 1. Introduction

The following Inadvertent Discovery Plan (IDP) outlines the procedures to be implemented if cultural resource materials are identified or suspected during construction activities. The separate protocol for discovery of human skeletal remains is described below, in Section 4.

## 2. Recognizing Cultural Resources

A cultural resource is an item of historical, traditional, or cultural importance. The item could be prehistoric or historic. Examples include:

- A multi-species accumulation of shell (shell-midden) with associated bone, stone, antler or wood artifacts, burned rocks or charcoal.
- Bones that appear to be human or animal bones associated with a shell-midden (i.e. with associated artifacts or cooking features).
- An area of charcoal or very dark stained soil with associated artifacts,
- Artifacts made of chipped or ground stone (i.e. an arrowhead, adze or maul) or an accumulation (more than one) of cryptocrystalline stone flakes (lithic debitage),
- Basketry, cedar garments, fish weir stakes or items made of botanical materials,
- Clusters of tin cans or bottles, logging or agricultural equipment that appear to be older than 50 years,
- Buried railroad tracks, decking, or other industrial materials.

## 3. On-Site Responsibilities

### Step 1: Stop Work

If any contractor or subcontractor believes that he or she has uncovered any cultural resource during construction of the project, all work adjacent to the discovery must stop. The discovery location should not be left unsecured at any time. Cultural resources encountered during an archaeological survey are intentional discoveries and are not covered under this plan.

### Step 2: Notify DAHP

Contact the DAHP Cultural Resource staff-

Local Government Archaeologist  
**Stephanie.Jolivette@dahp.wa.gov**  
(360) 586-3088  
(360) 628-2755 (cell)

The DAHP will make a recommendation as to the artifact or deposits potential significance and will proceed with agency and tribal notifications.

After consultation with the agency and tribes, DAHP will complete a written plan of action describing the disposition of cultural resources pursuant to RCW 27.53.

#### **4. Inadvertent Discovery of Human Skeletal Remains on Non-Federal and Non-Tribal Land in the State of Washington (RCWs 68.50.645, 27.44.055, and 68.60.055)**

"If ground disturbing activities encounter human skeletal remains during construction, then all activity will cease that may cause further disturbance to those remains. The area of the find will be secured and protected from further disturbance until the State provides notice to proceed. The finding of human skeletal remains will be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The remains will not be touched, moved, or further disturbed. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner/coroner determines the remains are non-forensic, then they will report that finding to the Department of Archaeology and Historic Preservation (DAHP) who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains." (<https://dahp.wa.gov/archaeology/human-remains/recommended-inadvertent-human-remains-discovery-language>, accessed January 29, 2020).<sup>1</sup>

Gary Warnock, Coroner Thurston County Coroner's Office 2925 37 <sup>th</sup> Ave SW Tumwater, WA 98512 360-586-2091
Guy Tasa, State Physical Anthropologist Department of Archaeology and Historic Preservation PO Box 48343 Olympia, WA 98504-8343 360-586-3534

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<sup>1</sup> Please note, after review of the draft assessment report dated August 13, 2019, the Squaxin Island Tribe Cultural Resource Department provided the following additional protocol, "The Inadvertent Discovery Plan Human Remains section should include the Coroner and the Archaeologist to wearing cloth gloves before touching the human remains" (email correspondence provided to Chris Carlson, City of Tumwater Permit Manager, January 28, 2020).

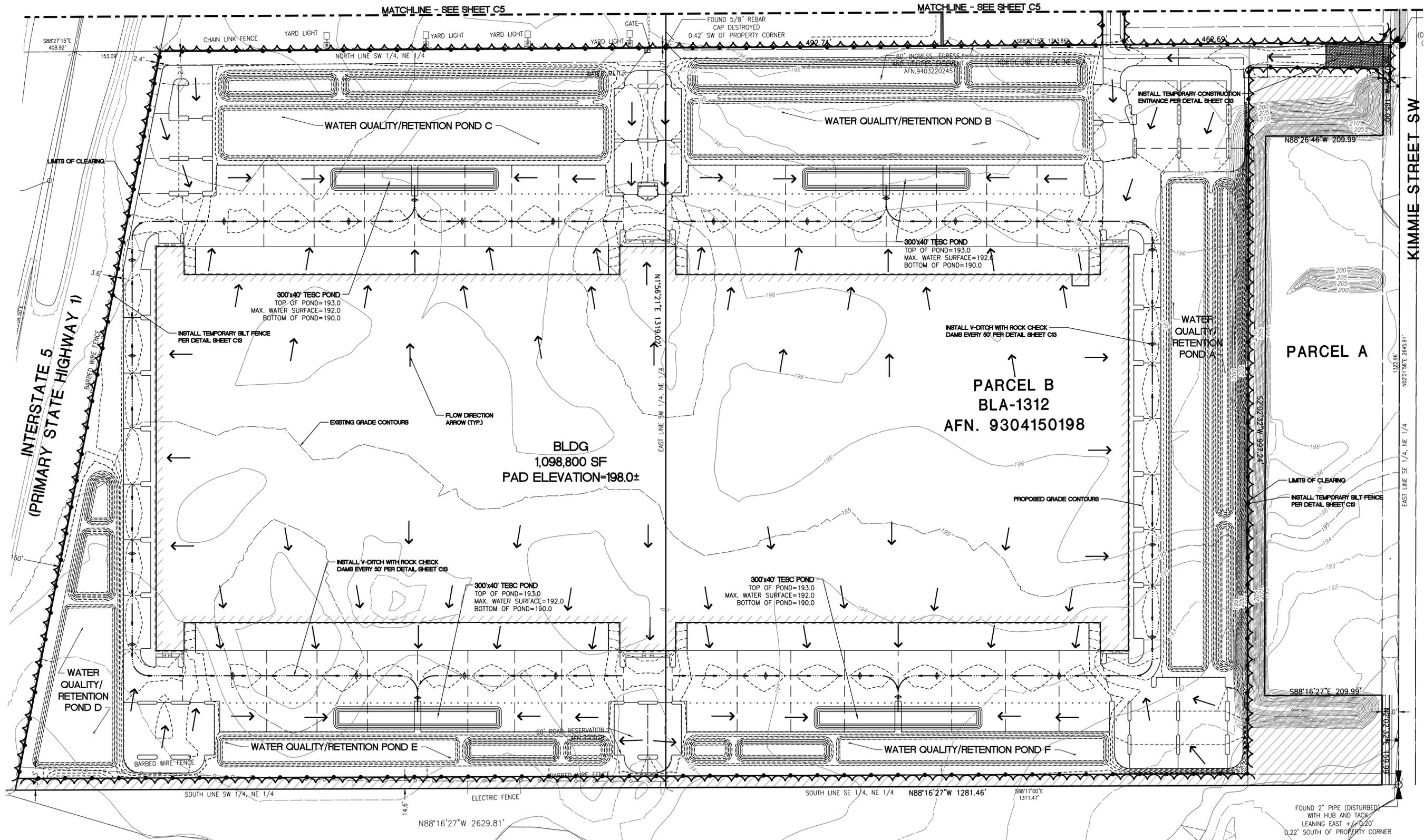
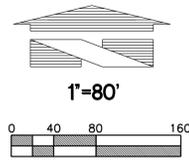
# Appendix C

## Preliminary Sediment and Erosion Control Plan

# TUMWATER EAST I-5 DISTRIBUTION CENTER

NE 1/4, SECTION 21, TOWNSHIP 17 N., RANGE 2 WEST, W.M.

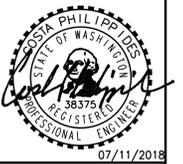
## PRELIMINARY TESC PLAN



Revision  
No. Date By Ckd. Appr.

Title:  
TUMWATER EAST I-5  
DISTRIBUTION CENTER  
PRELIMINARY TESC PLAN

For:  
PUGET WESTERN  
P.O. BOX 1529  
BOTHELL, WA 98041



Scale:  
Horizontal 1"=80'  
Vertical N/A

Designed CP  
Drawn WD  
Checked CP  
Approved CP  
Date 03/19/18

18215 72ND AVENUE SOUTH  
KENT, WA 98032  
(425)251-6222  
(425)251-8782 FAX

CIVIL ENGINEERING, LAND PLANNING,  
SURVEYING, ENVIRONMENTAL SERVICES



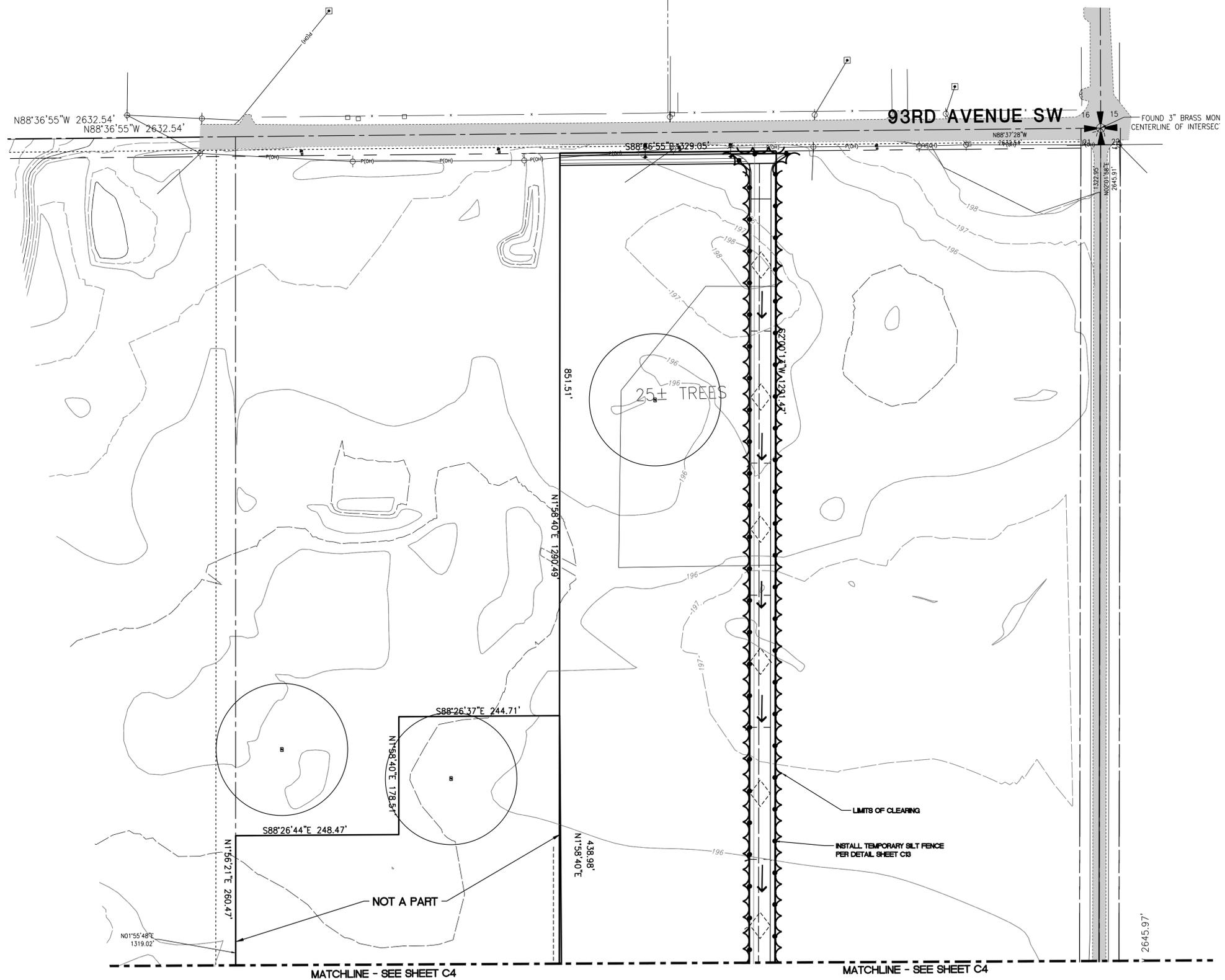
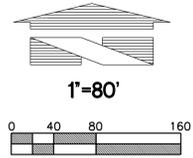
Job Number  
14253

Sheet  
C4 of 16

# TUMWATER EAST I-5 DISTRIBUTION CENTER

NE 1/4, SECTION 21, TOWNSHIP 17 N., RANGE 2 WEST, W.M.

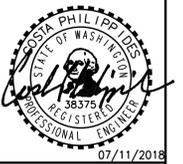
## PRELIMINARY TESC PLAN



No.	Date	By	Chd.	Appr.	Revision

Title:  
**TUMWATER EAST I-5  
 DISTRIBUTION CENTER  
 PRELIMINARY TESC PLAN**

For:  
**PUGET WESTERN  
 P.O. BOX 1529  
 BOTHELL, WA 98041**



Scale:	Horizontal	Vertical
	1"=80'	N/A
Designed	CP	
Drawn	WD	
Checked	CP	
Approved	CP	
Date	03/19/18	

18215 72ND AVENUE SOUTH  
 KENT, WA 98032  
 (425)251-6222  
 (425)251-8782 FAX  
 CIVIL ENGINEERING, LAND PLANNING,  
 SURVEYING, ENVIRONMENTAL SERVICES



## Appendix D

### Traffic Impact Analysis, Tumwater East I-5 Distribution Center, 2016

# Traffic Impact Analysis

Tumwater East I-5 Distribution Center

Tumwater, WA  
April 2020



**SCJ ALLIANCE**  
CONSULTING SERVICES

# Traffic Impact Analysis

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## Project Information

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**Project:** Tumwater East I-5 Distribution Center

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**Prepared for:** Puget Western Inc.  
**Joel Molander**  
**20000 N Creek Pkwy**  
**Bothell, WA 98041**  
**425.487.6565**  
**joel.molander@pse.com**

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## Reviewing Agency

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**Jurisdiction:** City of Tumwater  
**555 Israel Road SW**  
**Tumwater, WA 98501**

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## Project Representative

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**Prepared by:** SCJ Alliance  
**8730 Tallon Lane NE, Suite 200**  
**Lacey, WA 98516**  
**360.352.1465**  
[www.scjalliance.com](http://www.scjalliance.com)

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**Contact:** Eric Johnston, PE Principal  
**Ryan Shea, PTP, Senior Transportation Planner**

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**Project Reference:** **SCJ# 0580.07**  
N:\Projects\0580 Puget Western Inc\0580.07 Kenosha East Addition  
Traffic Impact Analysis\Phase 40 - 2019 TIA Update\Report\2020-0213  
Tumwater East I-5 Industrial Development TIA.docx

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### CERTIFICATION

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

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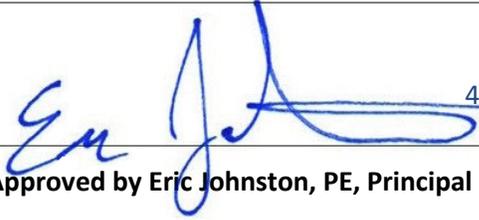


**Prepared by Ryan Shea, PTP, Senior Transportation Planner**

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4/1/2020

**Approved by Eric Johnston, PE, Principal**

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## 1. INTRODUCTION

### 1.1 Project Overview

Puget Western Inc. is proposing construction of the *Tumwater East I-5 Distribution Center* on approximately 68 acres located on the south side of 93<sup>rd</sup> Avenue SW, west of the Kimmie Street SW intersection. Puget Western Inc. previously submitted a TIA for this project to the City of Tumwater in 2016. Due to recent network changes in the project vicinity the City has requested an update to the TIA. **Figure 1** illustrates the site vicinity and the transportation network serving the project area.

### 1.2 Study Context

This report documents the results of a Traffic Impact Analysis (TIA) of existing and future traffic conditions. The study was prepared according to City of Tumwater TIA guidelines as part of the required environmental review submittal for the proposed project. The following intersections in the study area were analyzed:

- Site accesses
- I-5 SB Ramps/93<sup>rd</sup> Avenue SW (SR 121)
- I-5 NB Ramps/93<sup>rd</sup> Avenue SW (SR 121)
- Kimmie St. SW/93<sup>rd</sup> Avenue SW (SR 121)
- Case Road SW/93<sup>rd</sup> Avenue SW (SR 121)

## 2. PROJECT DESCRIPTION

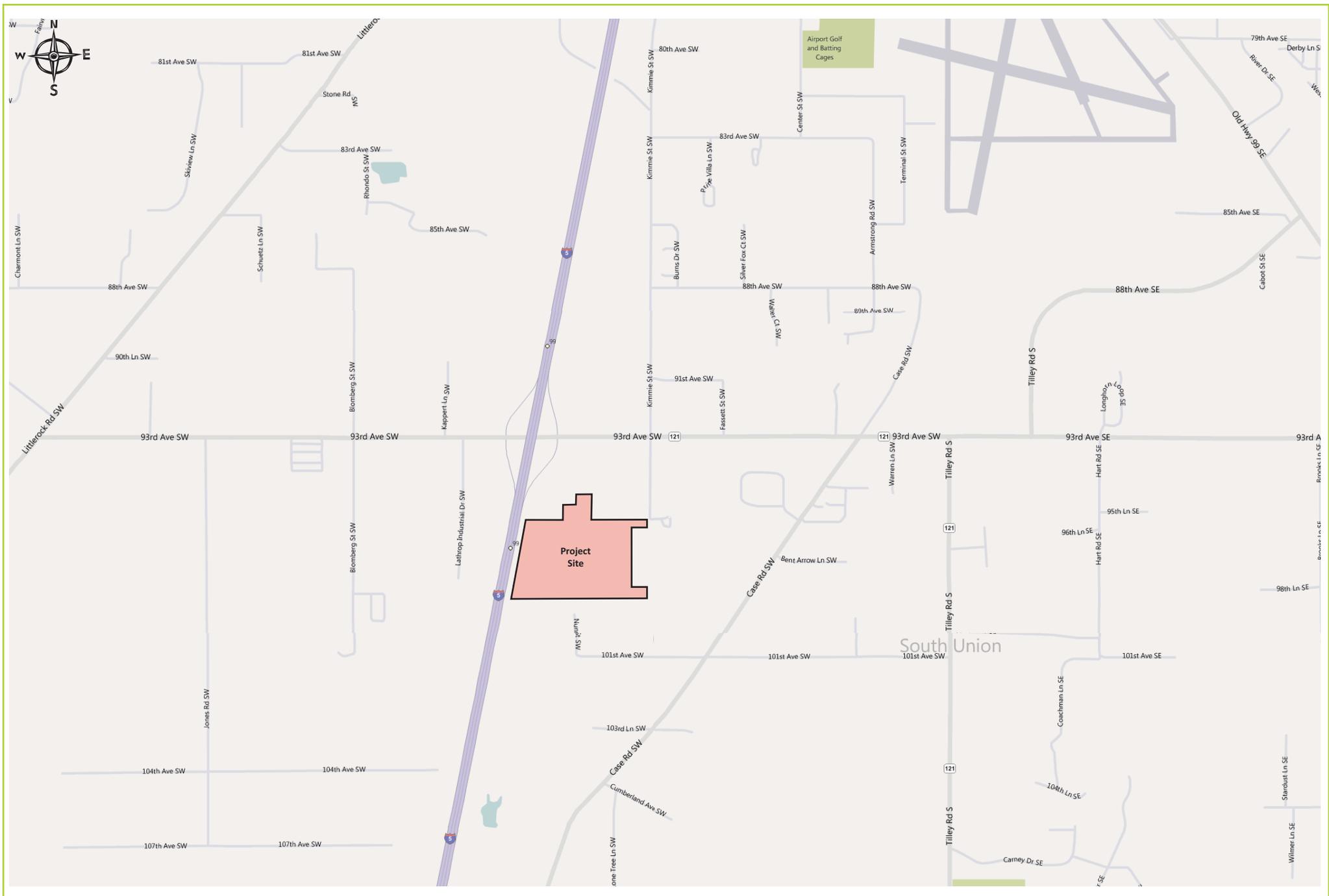
### 2.1 Development Proposal

The *Tumwater East I-5 Distribution Center* will consist of one warehouse building. The warehouse building will be 1,098,800 square feet (sf) and will be located on the southern portion of the site.

The anticipated warehouse use for this project is more similar to a high-cube warehouse than a standard warehouse as defined in the *Trip Generation Manual* by the Institute of Transportation Engineers (ITE). ITE describes a high-cube warehouse as “used primarily for the storage and/or consolidation of manufactured goods prior to their distribution to retail outlets or other warehouses”. These facilities consist of large shells of steel buildings and large halls, often subdivided for individual tenants, with a typical ceiling height of 24 feet or more. The high-cube warehouse facilities are much larger and generate trips at a lower rate than standard warehouses.

### 2.2 Site Access

The proposed *Tumwater East I-5 Distribution Center* will have a driveway access on 93<sup>rd</sup> Avenue approximately 500 feet west of Kimmie Street and a driveway access on Kimmie Street south of 93<sup>rd</sup> Avenue SW (SR 121). The proposed development is located in an area of other existing and proposed industrial and commercial developments. 93<sup>rd</sup> Ave SW and Kimmie Street are the primary roadways serving the *Tumwater East I-5 Distribution Center* site and other developments in the area. Based on existing commute traffic and future development traffic in the area, WSDOT and the City of Tumwater anticipate widening SR 121 to provide two lanes in each direction and a center turn lane, however there is currently no plan in place to construct these improvements. It is anticipated that improvements to Kimmie Street will also be required to accommodate the growth in commercial/industrial traffic. **Figure 2** represents the preliminary site plan.



**Figure 1**  
**Site Vicinity Map**



### 3. BACKGROUND INFORMATION

#### 3.1 Area Land Uses

Lincoln Creek Lumber/Ace Hardware is located just northwest of the site. A number of utility and equipment storage yards are in the project vicinity, and storage units are located on the east side of Kimmie Street from the site. Other surrounding properties are vacant or developed with single family homes on acreage. The Pilot Travel Center is located to the northwest, adjacent to I-5.

#### 3.2 Roadway Inventory

A comprehensive roadway survey was conducted to identify pre-existing conditions of the primary traffic facilities serving the proposed *Tumwater East I-5 Distribution Center*.

##### 3.2.1 Interstate 5 (I-5)

Interstate 5 is a north-south divided highway with posted speed limit of 70 mph at the 93rd Avenue SW interchange (Exit 99). In the project area the roadway provides three lanes in each direction. Interstate 5 is classified an Urban Interstate and is a highway of statewide significance (HSS).

##### 3.2.2 93<sup>rd</sup> Avenue SW (SR 121)

93rd Avenue is an east-west arterial roadway through the study area that provides access to I-5 via a diamond interchange. East of I-5, the roadway is two/three lanes with a posted speed limit of 40 mph. West of I-5, the roadway has three-lanes with a two-way center turn lane and a posted speed limit of 50 mph. East of the I-5 interchange, 93rd Avenue is also designated State Route (SR) 121. Both segments of 93rd Avenue SW in the project area have paved shoulders. The I-5/93rd Avenue interchange and ramp terminal intersections are under WSDOT control.

##### 3.2.3 Kimmie Street SW

Kimmie Street SW is a north-south local access road that extends from 76<sup>th</sup> Avenue SW in the City of Tumwater to 101<sup>st</sup> Avenue SW in Thurston County. In the project vicinity, the roadway has a single lane in each direction.

##### 3.2.4 Case Road SW

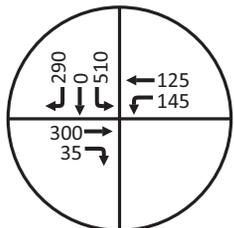
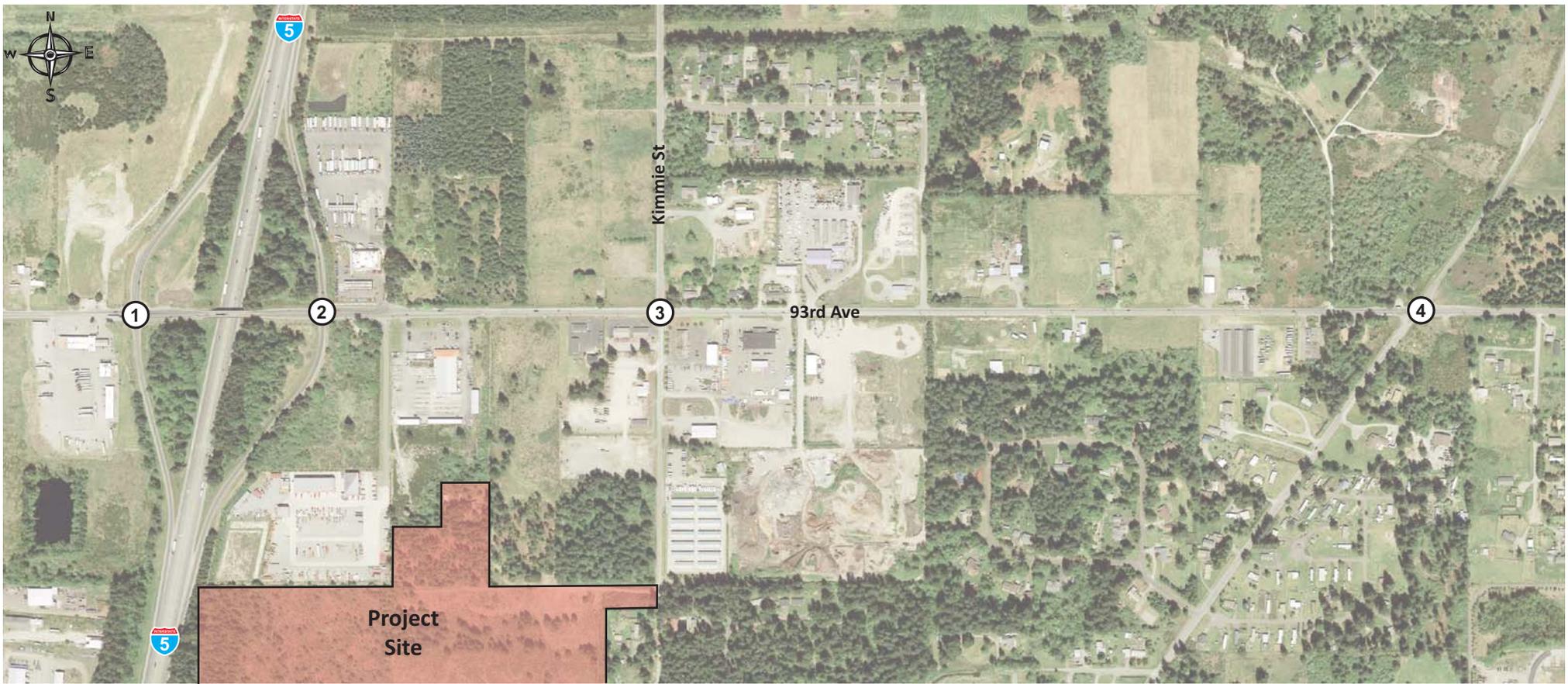
Case Road SW is a two-lane County Collector with a speed limit of 50 mph. It generally runs in a southwest to northeast direction between 183<sup>rd</sup> Avenue SW in Rochester to 88<sup>th</sup> Avenue SW in the City of Tumwater.

#### 3.3 Traffic Volume Data

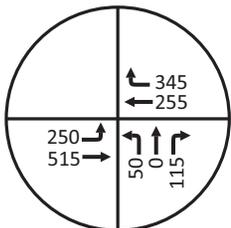
Traffic Count Consultants, Inc. a traffic data collection firm, provided evening peak period turning movement counts for the study intersections. The counts were conducted between 4:00 PM and 6:00 PM on October 29<sup>th</sup>, 2019 at the following locations:

- I-5 SB Ramps, 93<sup>rd</sup> Avenue SW
- I-5 NB Ramps, 93<sup>rd</sup> Avenue SW
- Kimmie Street SW/93<sup>rd</sup> Avenue SW
- Case Road SW/93<sup>rd</sup> Avenue SW

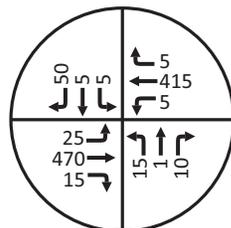
These 2019 traffic volumes were grown by 2% to represent 2023 volumes and used for base year operations analysis and as the basis for future year traffic volume projections. **Figure 3** shows the existing 2019 traffic volumes for the study intersections. The turning movement count diagrams are provided in **Appendix A**.



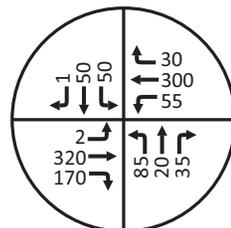
1) 93rd Ave at SB I-5 Ramps



2) 93rd Ave at NB I-5 Ramps



3) 93rd Ave at Kimmie St



4) 93rd Ave at Case Rd



Figure 3  
Existing 2016 Traffic Volumes

### 3.4 Public Transportation

The site is not served by public transit. The closest public transportation is Intercity Transit Routes 12 and 13, which provide service on weekdays between the Olympia Transit Center and the Labor & Industries Building in Tumwater.

## 4. PROJECT TRAFFIC CHARACTERISTICS

The two project-related characteristics having the greatest effect on area traffic conditions are peak hour trip generation and the directional distribution of traffic volumes on the surrounding roadway network.

### 4.1 Site-Generated Traffic Volumes

PM peak hour trip generation for *Tumwater East I-5 Distribution Center* was developed using the 10<sup>th</sup> Edition of the *ITE Trip Generation Manual*. Trip estimates were generated using ITE Land Use Code 154 – High-Cube Transload and Short-Term Storage Warehouse. The 9<sup>th</sup> edition of the *Trip Generation Manual* provides trip rates for total traffic (all vehicle types) and for truck trips only. The data indicates that trucks comprise 1/3 of the total PM peak hour vehicle traffic. Trip generation estimates used to calculate total project traffic generation are shown in **Table 1** below.

**Table 1. Trip Generation Characteristics – PM Peak Hour Trip Rates**

High-Cube Transload and Short-Term Storage Warehouse (LU 154)	Unit	Basic Trip Rate	Pass-By	% Enter	% Exit
Total Traffic	1,000 sf	0.10	0%	28%	72%
Truck Traffic	1,000 sf	0.10	0%	50%	50%

The total trip generation expected from this project is calculated by applying the unit measure for each land-use category to the appropriate trip generation rate. The total project trip generation for the PM peak hour is shown below in **Table 2**.

**Table 2. Project Trip Generation – New PM Peak Hour Trips**

Land Use (LU)	Total	Enter	Exit
Warehouse (all vehicles) (1,098,800 sf)	110	39	71
<i>Passenger vehicles (67%)</i>	<i>74</i>	<i>21</i>	<i>53</i>
<i>Trucks (33%)</i>	<i>36</i>	<i>18</i>	<i>18</i>

## 4.2 Site Traffic Distribution

The vehicle directional trip distribution to and from the site will be based primarily on:

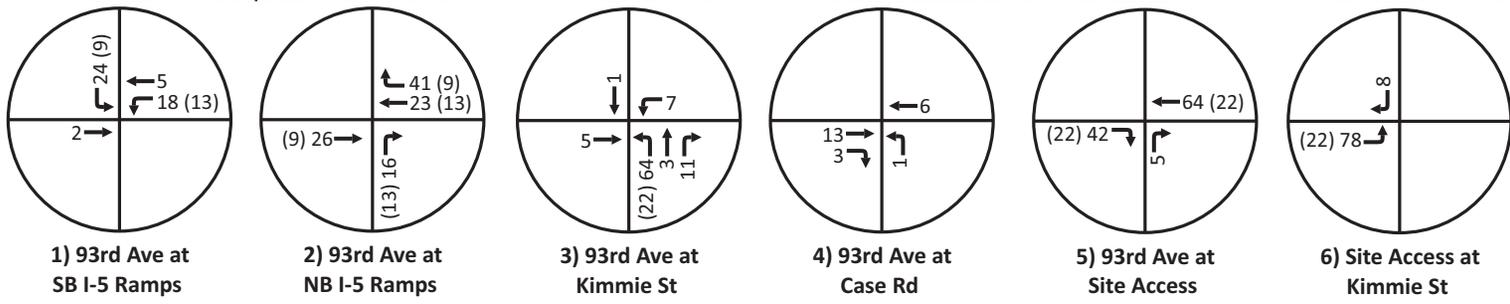
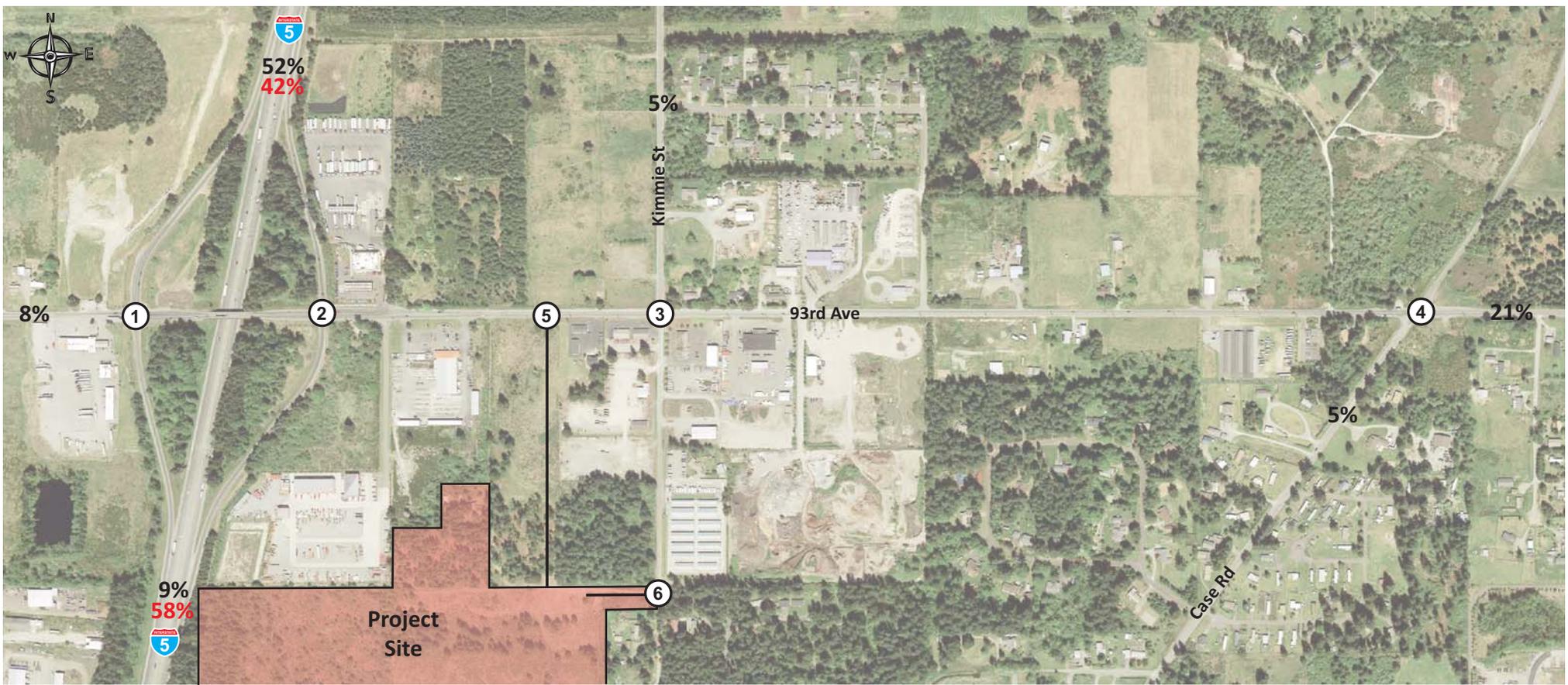
- the area street system characteristics,
- current travel patterns on the area roadways,
- the proposed access system for the project, and
- locations of residential areas, employment bases, and shopping/commercial centers

For this study, the regional distribution of traffic to and from the proposed project was estimated using the regional transportation model, current traffic counts, and recent traffic studies prepared for the Tumwater Corporate Park, which is proposed at the northwest corner of the 93<sup>rd</sup> Avenue/Kimmie Street SW intersection, and Blomberg Industrial Park at the southeast corner of the 93<sup>rd</sup> Avenue/Blomberg Road intersection.

The Thurston Regional Planning Council (TRPC) created the area-wide transportation model with cooperation from the local jurisdictions within the County. The model, developed using the Emme/4 software package, has been calibrated to accurately represent the existing vehicle travel patterns throughout the entire county.

In the transportation model the county-wide transportation network is divided into hundreds of “Traffic Analysis Zones” (TAZ’s). A Select Zone Analysis (SZA) was conducted for the TAZ containing the proposed site. This feature of the Emme/4 software package allows all of the traffic into and out of a particular zone to be isolated and shown separately from the rest of the traffic on the network. This graphically shows the percentage of vehicles currently using each of the available routes into and out of the area (I-5, 93<sup>rd</sup> Avenue SW, Kimmie Street SW, etc.). From this information, regional distribution percentages were calculated for future traffic from the proposed *Tumwater East I-5 Distribution Center* project.

Truck traffic from the project will be exclusively to and from Interstate 5. The directional percentage split of truck trips on I-5 was provided by WSDOT. The regional traffic distribution percentages and site traffic distribution for passenger vehicle trips (non-truck trips), truck trips, and total project-generated trips with the current roadway configuration are shown on **Figure 4**.



1) 93rd Ave at SB I-5 Ramps

2) 93rd Ave at NB I-5 Ramps

3) 93rd Ave at Kimmie St

4) 93rd Ave at Case Rd

5) 93rd Ave at Site Access

6) Site Access at Kimmie St

LEGEND	
XX →	PM PEAK HOUR TOTAL TRAFFIC VOLUMES
(XX) →	PM PEAK HOUR TRUCK TRAFFIC VOLUMES
XX%	DISTRIBUTION PERCENTAGE
XX%	TRUCK DISTRIBUTION PERCENTAGE

Project Trips		
PM PEAK HOUR		
PASSENGER NEW-TO-NETWORK		
INBOUND	OUTBOUND	TOTAL
28	61	89
TRUCK NEW-TO-NETWORK		
INBOUND	OUTBOUND	TOTAL
22	22	44

Figure 4  
Site-Generated Traffic Volumes

## 5. FUTURE TRAFFIC CONDITIONS

### 5.1 Planned Roadway Improvements

The City of Tumwater Transportation Master Plan has identified six roadway or intersection projects in the project vicinity. The planned improvements are listed below, with the Master Plan identification number:

- **R21)** SR 121 (93<sup>rd</sup> Avenue) – I-5 NB Ramps to Kimmie St; Widen to 5 lanes, including intersection improvements at Kimmie.
- **R22)** SR 121 (93<sup>rd</sup> Avenue) – Kimmie St to Tilley Rd (South); Widen to 3 lanes.
- **R24)** SR 121 (93<sup>rd</sup> Avenue) – I-5 Interchange; Widen bridge to five lanes. The plan notes that this will become a WSDOT project.
- **I20)** 93<sup>rd</sup> Ave at I-5 NB ramps; Install traffic signal. This improvement is currently under construction and will be completed prior to completion of the *Tumwater East I-5 Distribution Center* project.
- **I21)** 93<sup>rd</sup> Ave at Kimmie St; Install traffic signal.
- **I22)** 93<sup>rd</sup> Ave at Case Rd; Install Roundabout.

### 5.2 Future Traffic Volumes

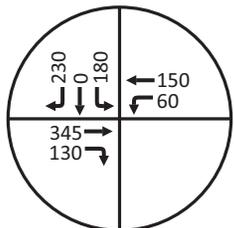
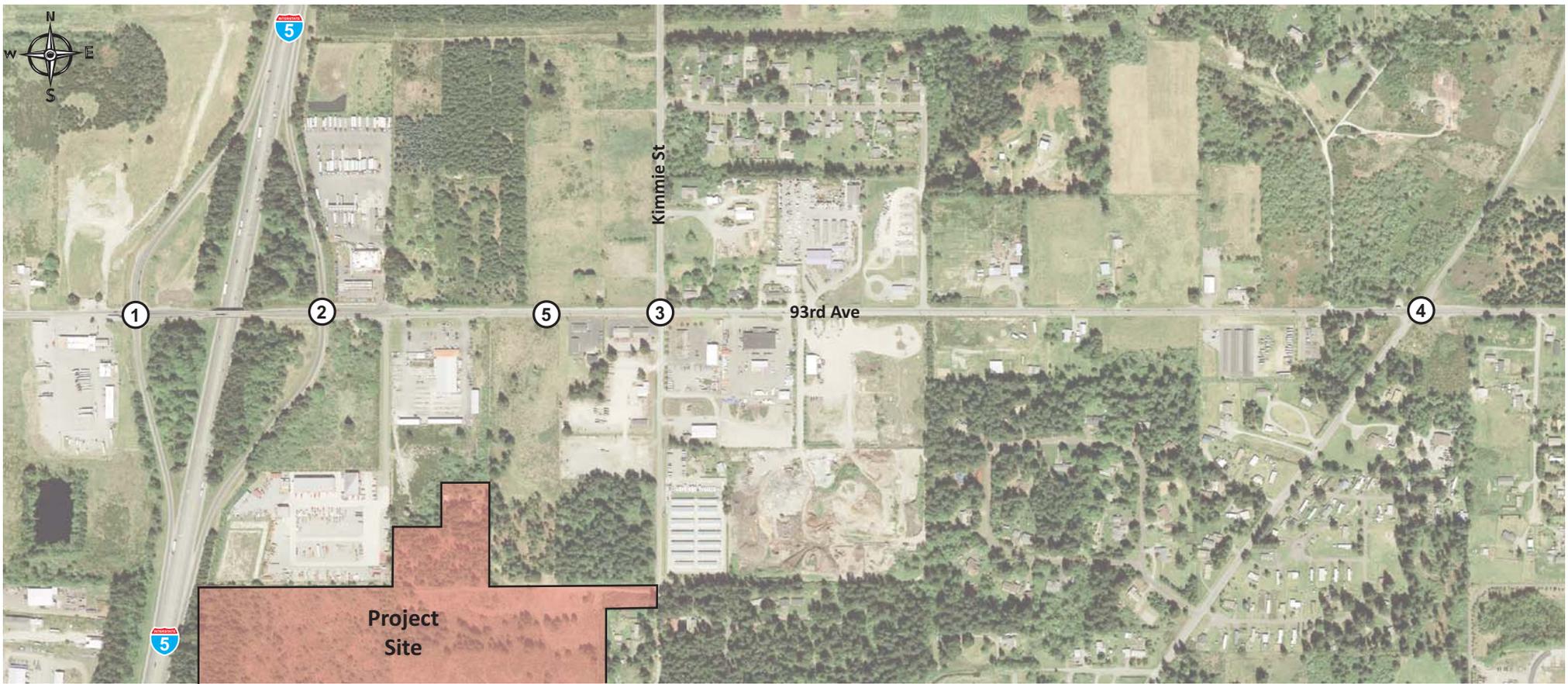
Future traffic volume projections for the study area include traffic generated by pipeline developments and background growth.

### 5.3 Pipeline Development Projects

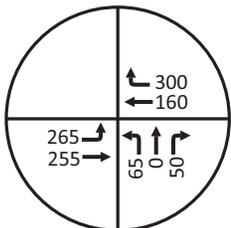
A pipeline development project is defined as a development in the project area that is either under construction, approved for construction, or in the permitting process. For this study nine projects were identified by the City of Tumwater that may add traffic to the study intersections and were considered in the future year traffic volume scenarios. The following pipeline projects were identified:

- National Guard Readiness Center
- Restover Truck Stop
- The Preserve Subdivision (Divisions 3 and 4)
- Bradbury Estates
- Kimmie Street Plat
- I-5 Commerce
- Tumwater Corporate Park
- Tilley Industrial
- Tumwater Commerce

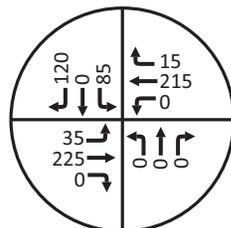
The traffic potential of these projects was calculated and assigned to the area roadway network using data presented in the Traffic Impact Analyses for each of the projects or estimated based on available details of the project. The total pipeline development traffic volumes are shown on **Figure 5**.



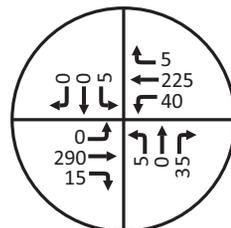
1) 93rd Ave at SB I-5 Ramps



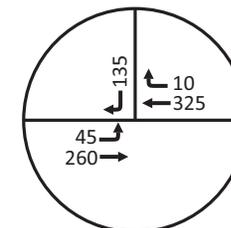
2) 93rd Ave at NB I-5 Ramps



3) 93rd Ave at Kimmie St



4) 93rd Ave at Case Rd



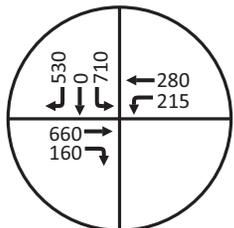
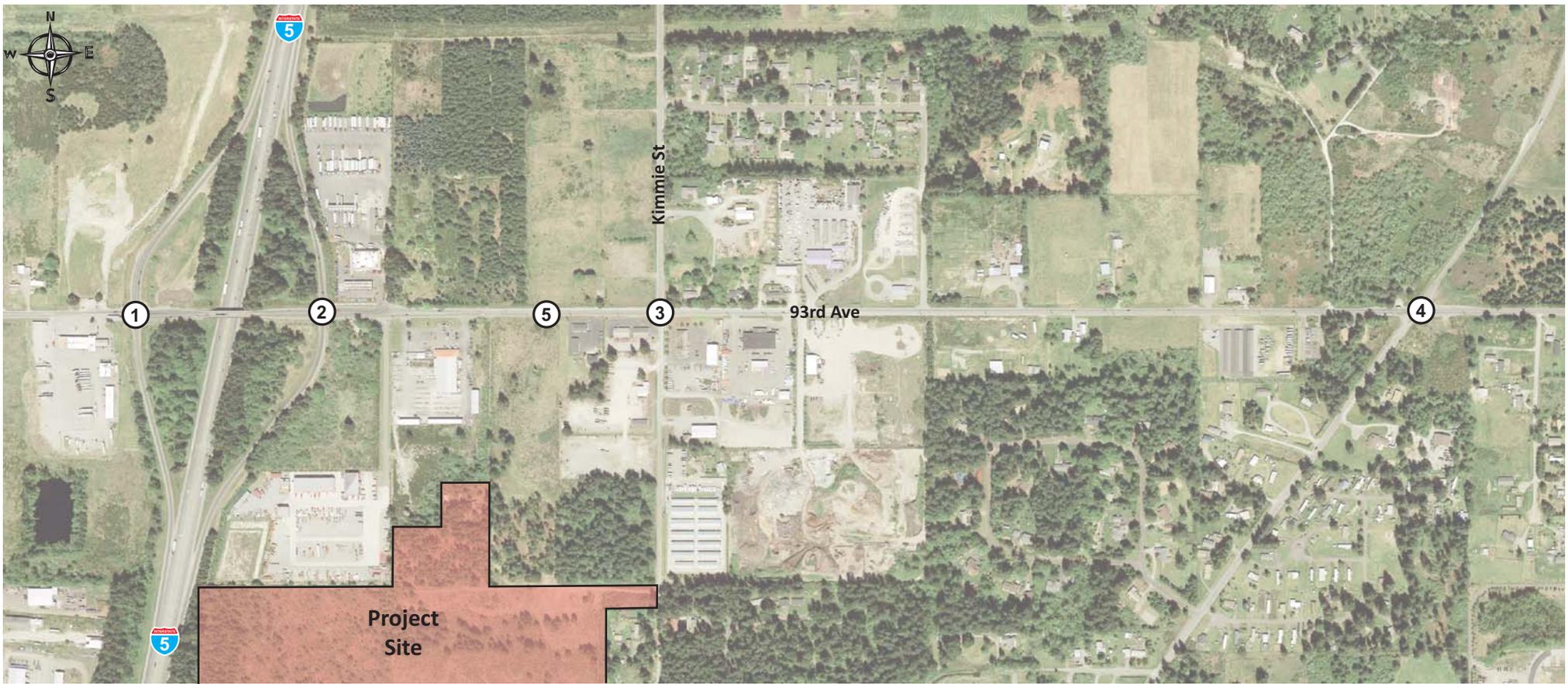
5) 93rd Ave at Site Access

LEGEND	
XX →	PM PEAK HOUR PASSENGER CAR TRAFFIC VOLUMES

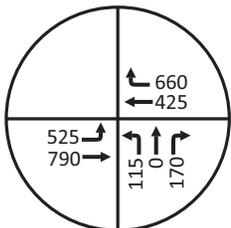
#### 5.4 Background Traffic Growth

In addition to traffic from the identified pipeline developments, it is anticipated that background growth will occur within the study area and affect traffic volumes. To estimate the non-specific traffic growth that will occur at the study intersections, an annual growth rate of 2% was applied to the base year traffic volumes.

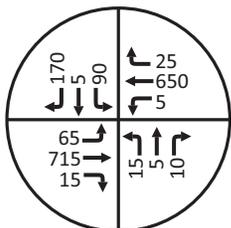
The projected 2023 traffic volumes with background growth and pipeline development traffic, without the *Tumwater East I-5 Distribution Center*, are shown on **Figure 6**. The projected 2023 traffic volumes with the *Tumwater East I-5 Distribution Center* are shown on **Figure 7**. The traffic volume calculations for the study intersections are shown in **Appendix B**.



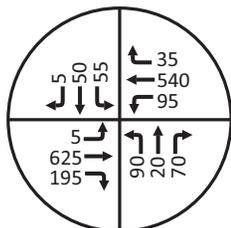
1) 93rd Ave at SB I-5 Ramps



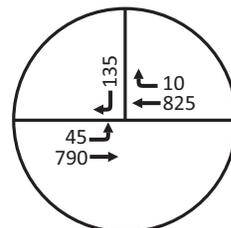
2) 93rd Ave at NB I-5 Ramps



3) 93rd Ave at Kimmie St

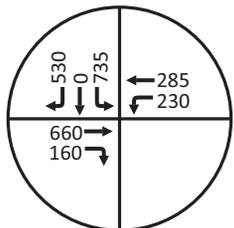
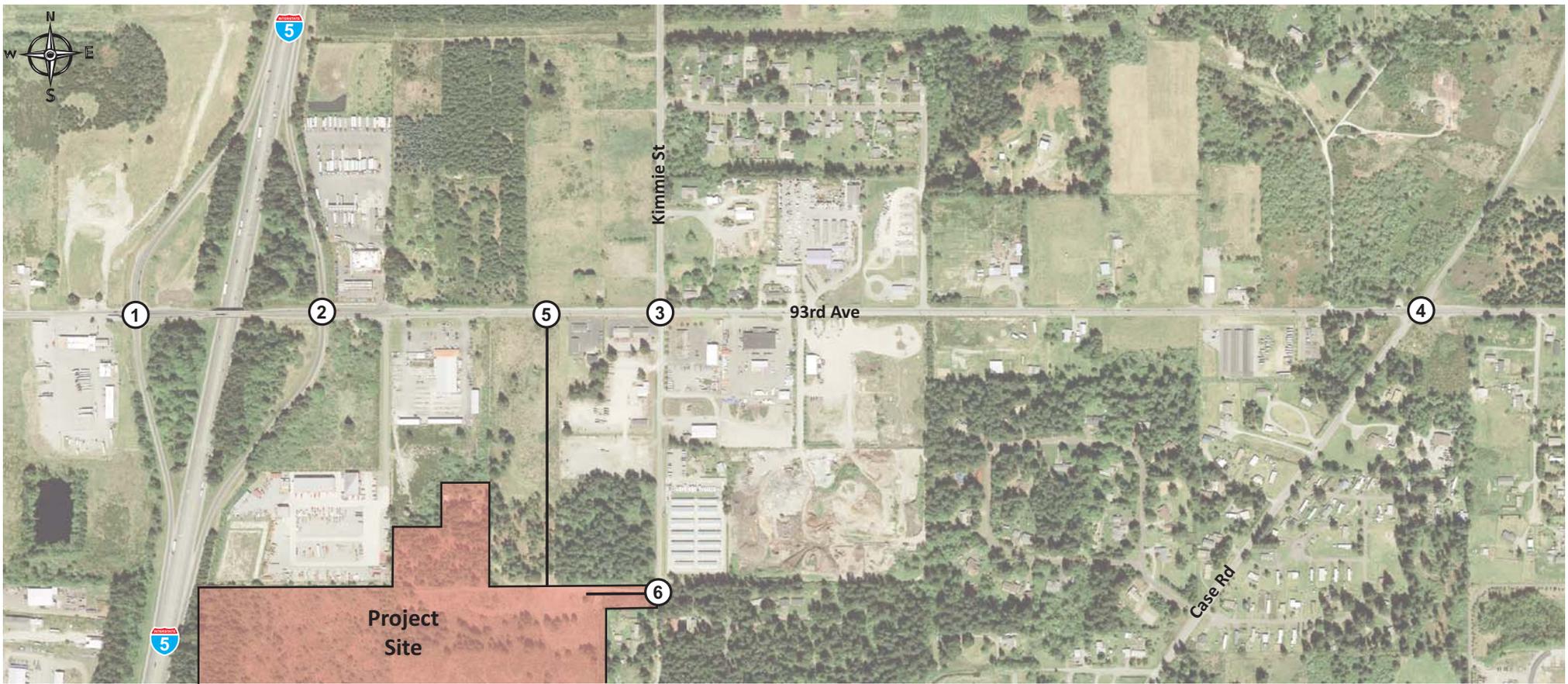


4) 93rd Ave at Case Rd

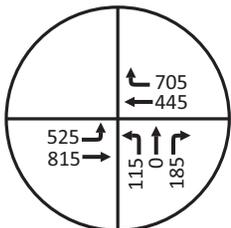


5) 93rd Ave at Site Access

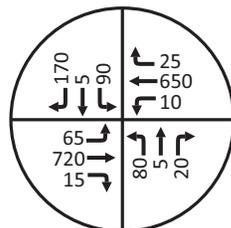




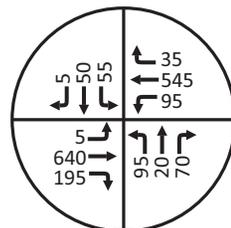
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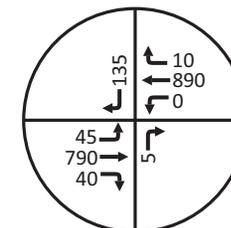
2) 93rd Ave at NB I-5 Ramps



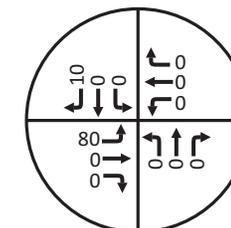
3) 93rd Ave at Kimmie St



4) 93rd Ave at Case Rd



5) 93rd Ave at Site Access



6) Site Access at Kimmie St



## 6. TRAFFIC OPERATIONS ANALYSIS

Traffic analyses were conducted to identify any existing deficiencies within the study area for the 2019 base year and 2023 project completion horizon year.

### 6.1 Intersection Operations Criteria

The acknowledged source for determining overall capacity for arterial segments and independent intersections is the current edition of the Highway Capacity Manual (HCM). Capacity analyses were completed for the base year and projected 2023 PM peak hour traffic volume scenarios for all off-site intersections.

Intersection analysis was performed using the Synchro software package. This software implements the methods of the HCM 6<sup>th</sup> edition. Capacity analysis results are described in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). Level of Service D is the concurrency standard adopted by the City of Tumwater for the study area.

Level of Service calculations for intersections determine the amount of “control delay” (in seconds) that drivers will experience while proceeding through an intersection. Control delay includes all deceleration delay, stopped delay and acceleration delay caused by the traffic control device. The Level of Service is directly related to the amount of delay experienced. For signalized intersections, the overall LOS grade represents the weighted average of all movements at the intersection.

For intersections under minor street stop-sign control, the LOS of the most difficult movement (typically the minor street left-turn) represents the intersection level of service. The LOS/delay criteria for stop sign-controlled intersections are different than for signalized intersections because driver expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay. The following table shows the Level of Service criteria for signalized and stop sign-controlled intersections.

**Table 3. Level of Service Criteria**

Level of Service	Stop-Controlled Intersection Average Control Delay (seconds/vehicle)	Signalized Intersection Average Control Delay (seconds/vehicle)
A	≤ 10	≤ 10
B	>10-15	>10-20
C	>15-25	>20-35
D	>25-35	>35-55
E	>35-50	>55-80
F	>50	>80

Another measure of the function of a signalized intersection is the “degree of saturation” which is typically presented as the “volume to capacity” (v/c) ratio. Many factors affect the volume of traffic an intersection can accommodate during a specific time interval. These factors include the number of lanes, lane widths, the type of signal phasing, the number of parking maneuvers on the adjacent street,

etc. Based on these factors, the intersection (or individual lane group) is determined to have a total vehicle carrying capacity “c” for the analysis period. The analysis period volume “v” is compared to the calculated carrying capacity and presented as a ratio. If the v/c ratio is below 1.0, the demand volume is less than the maximum capacity. If the v/c ratio is over 1.0, the demand volume is exceeding the available capacity.

The analysis was conducted for the following three traffic volume scenarios.

- Existing 2019 traffic volumes
- Projected 2023 traffic volumes without *Tumwater East I-5 Distribution Center*
- Projected 2023 traffic volumes with *Tumwater East I-5 Distribution Center*

The capacity analysis worksheets are provided in **Appendix C**. Following is a description of the Level of Service Analysis for the study intersections for the scenarios listed above.

## 6.2 I-5 SB Ramps/93rd Avenue

This is a signalized four-way intersection, with the north and south approaches providing access to SB I-5. The eastbound approach provides a single lane. The westbound approach provides a left-turn lane and a through lane. The southbound approach has a left-turn lane and a right-turn lane. The northbound approach is the on-ramp to SB I-5. The intersection currently operates at LOS B.

One of the pipeline projects, the Restover Truck Stop, includes construction of an eastbound right-turn pocket at this intersection. This improvement was incorporated into the intersection analysis for both 2023 horizon scenarios. In 2023, the intersection is projected to operate at LOS D without and with *Tumwater East I-5 Distribution Center*.

## 6.3 I-5 NB Ramps/93rd Avenue

The I-5 northbound ramps intersect 93rd Avenue with stop control for the northbound off-ramp approach. The eastbound approach has a left-turn lane and a through lane. The westbound approach provides a through lane and a right-turn lane. The northbound on and off ramps both provide one travel lane. Intersection improvements are currently under construction at this location that includes installing a signal and changing the geometrics. Upon completion of these improvements, the northbound off-ramp will provide a shared through-left lane and a right-turn lane and the on ramp will provide a through-lane and right merge lane, allowing the eastbound left-turn and westbound right-turn movements to operate at the same time. The intersection currently operates at LOS B. In 2023, the intersection is projected to operate at LOS B without and with *Tumwater East I-5 Distribution Center*.

## 6.4 Kimmie Street SW/93rd Avenue SW

The Kimmie Street SW/93rd Avenue SW intersection operates under stop sign control for the north and south approaches on Kimmie Street. All approaches are single lane. The intersection currently operates at LOS D. In 2023, the intersection is projected to operate at LOS F without and with *Tumwater East I-5 Distribution Center*.

Construction of intersection improvements and a traffic signal system at this location is warranted with the projected traffic volumes associated with area development including the *Tumwater East I-5 Distribution Center*. The Tumwater Corporate Park property is currently developing plans for the 93rd Avenue corridor and 93rd Avenue/Kimmie Street intersection. These plans include installing traffic signal

control, adding left-turn pockets for both 93<sup>rd</sup> Avenue approaches, and adding a southbound right-turn pocket. With these improvements the intersection is projected to operate at LOS B with the completed *Tumwater East I-5 Distribution Center*.

### **6.5 Case Road SW/93<sup>rd</sup> Avenue SW**

The Case Road SW/93<sup>rd</sup> Avenue SW intersection operates under all-way stop sign control. The eastbound, northbound and southbound approaches all provide a single lane. The westbound approach provides a through-left lane and a right turn lane. The intersection currently operates at LOS D. In 2023, the intersection is projected to operate at LOS F with or without *Tumwater East I-5 Distribution Center*.

The City of Tumwater is currently collecting via their TIF for intersection improvements at this location. Improvements would likely include geometric upgrades and control upgrades such as implementation of a traffic signal or modern roundabout. While the ultimate intersection configuration has not been identified, we have evaluated the intersection assuming a single circulating lane modern roundabout. With a single lane roundabout, the intersection is projected to operate at LOS A.

### **6.6 Site Access/93<sup>rd</sup> Avenue SW**

The Site Access/93<sup>rd</sup> Avenue SW intersection for the *Tumwater East I-5 Distribution Center* will operate under stop sign control for the northbound and southbound approaches. The east and west approaches are single lane. The south approach will be full access inbound but restricted to a single right-turn lane outbound.

It is understood that the Tumwater Corporate Park will have access to the project north of 93<sup>rd</sup> Avenue that will intersect 93<sup>rd</sup> Avenue either directly across from or west of the *Tumwater East I-5 Distribution Center* access. It will also provide full movements inbound, and right-turn-only outbound. Alignment of the two driveways is not necessary provided the Tumwater Corporate Park access is west of the *Tumwater East I-5 Distribution Center* access to avoid conflicts from left-in traffic.

The projected 2023 analysis with just the Tumwater Corporate Park driveway is projected to operate at LOS D. Upon construction in 2023, the intersection is projected to operate at LOS E with *Tumwater East I-5 Distribution Center* for the southbound approach.

### **6.7 Kimmie Street SW/Site Access**

The Kimmie Street SW/Site Access intersection will operate under stop sign-control for the eastbound approach. All approaches will be single lane. The intersection will operate at LOS A in 2023 with *Tumwater East I-5 Distribution Center*.

The following table summarizes the operational results for the study intersections:

**Table 4. Intersection LOS Summary PM Peak Period**

Intersection	Existing 2019 Volumes LOS (Delay)		Projected 2023 Without Project LOS (Delay)		Projected 2023 With Project LOS (Delay)	
	Worst Movement	Intersection Average	Worst Movement	Intersection Average	Worst Movement	Intersection Average
I-5 SB Ramps/93 <sup>rd</sup> Ave SW	C (26.9)	B (16.4)	F (80.1)	D (44.5)	F (105.9)	D (49.8)
I-5 NB Ramps/93 <sup>rd</sup> Ave SW	B (13.6)	A (2.8)	C (25.4)	B (16.2)	C (27.5)	B (17.8)
Kimmie St. SW/93 <sup>rd</sup> Ave SW	D (32.1)	A (2.9)	F (300+)	F (178)	F (300+)	F (300+)
Case Road SW/93 <sup>rd</sup> Ave SW	D (33.2)	D (25.4)	F (268.8)	F (206.2)	F (281.8)	F (213.8)
Site Accesses/93 <sup>rd</sup> Ave SW	N/A	N/A	D (31.4)	A (2.3)	E (36.1)	A (2.6)
Kimmie St. SW/Site Access	N/A	N/A	N/A	N/A	A (8.9)	A (7.3)

Operations with mitigation measures to address operational deficiencies are summarized in **Table 5**.

**Table 5. Projected 2023 with Project with Mitigation Improvements Operational Summary**

Intersection	East bound LOS (Delay)	v/c	West bound LOS (Delay)	v/c	North bound LOS (Delay)	v/c	South Bound LOS (Delay)	v/c	Overall LOS (Delay)
Kimmie St SW/ 93 <sup>rd</sup> Ave SW (Signal)	B (17.5)	0.81	B (19.7)	0.88	B (18.7)	0.35	C (20.3)	0.75	B (18.8)
Case Rd SW/ 93 <sup>rd</sup> Ave SW (Roundabout)	B (11.8)	0.83	A (5.9)	0.72	B (13.6)	0.31	B (14.5)	0.37	A (9.9)

## 7. MITIGATION

A significant amount of development is being planned for the area, with the 1,636,829-sf Tumwater Corporate Park representing the largest individual proposed development in the study area. A number of roadway and intersection improvements have been proposed to accommodate this area's traffic growth. The following roadway and intersection improvements will mitigate the impact of traffic from the *Tumwater East I-5 Distribution Center* and have been developed to be consistent with other potential future improvements to the 93<sup>rd</sup> Avenue SW corridor.

### 7.1 Construct Extended Eastbound Right-Turn Lane on 93<sup>rd</sup> Ave from west Lincoln Creek Driveway to project site driveway

If the proposed five-lane section is not constructed on 93<sup>rd</sup> Avenue prior to occupancy of the *Tumwater East I-5 Distribution Center*, this project will construct a portion of the future second eastbound lane. This lane will be constructed from the existing west Lincoln Creek site driveway to the proposed site driveway on 93<sup>rd</sup> Avenue and operate as an *extended right-turn pocket* into the site. Due to the existing safety and maneuverability deficiencies on 93<sup>rd</sup> Avenue, this improvement will provide a measure of safety by removing the site-generated eastbound truck vehicles from the 93<sup>rd</sup> Avenue through lane. 12-foot lanes and 6-foot shoulders will be provided. The project proponent will develop a drainage plan for any additional impervious surface approvable by the City of Tumwater.

### 7.2 Construct Improvements to Kimmie Street

The *Tumwater East I-5 Distribution Center* developer will construct improvements to Kimmie Street between 93<sup>rd</sup> Avenue and the Tumwater East I-5 Distribution Center site driveway. The improvements will include improving the structural section to accommodate truck traffic and widening to a 24-foot cross-section. A paved shoulder will be provided on the west side of the roadway.

### 7.3 Construct Frontage Improvements on 93<sup>rd</sup> Avenue

The *Tumwater East I-5 Distribution Center* developer will construct site frontage improvements on 93<sup>rd</sup> Avenue and will include widening, curbs, sidewalk and other elements to accommodate a five-lane section on 93<sup>rd</sup> Avenue.

### 7.4 Construct Interim Improvements to Kimmie Street/93<sup>rd</sup> Avenue Intersection

Development of the proposed Tumwater Corporate Park, located on the north side of 93<sup>rd</sup> Ave, will require traffic signalization and geometric improvements at this intersection and is currently advancing design of the interim traffic signal with WSDOT. If the Tumwater Corporate Park is not constructed prior to the *Tumwater East I-5 Distribution Center*, the *Tumwater East I-5 Distribution Center* will construct the interim improvements currently identified on the WSDOT and City approved *Plan for Approval* design package prepared by Tumwater Corporate Park. These plans include the following elements:

- Signalization of the intersection;
- SB right-turn lane on Kimmie Street;
- EB and WB left-turn lanes on 93<sup>rd</sup> Avenue;
- Accommodations for an ultimate 5-lane section on 93<sup>rd</sup> Avenue SW.

The proposed project's impact to this intersection is marginal and the intersection is projected to operate at LOS F for the 2023 opening year without the project. With these improvements in place, the overall intersection LOS will improve considerably and will adequately mitigate the project's impact. Given that the project generated traffic added to this intersection is relatively low, the project developer

will pursue cost-sharing agreements with the adjacent development projects that contribute to the need for improvements at the intersection.

### **7.5 City of Tumwater**

The project developer will be required to pay a Transportation Impact Fee (TIF) contribution to the City of Tumwater according to current City ordinance. The TIF will be determined by the City of Tumwater per the Impact Fee Schedule in effect at the time.

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**APPENDIX A**  
**TURNING MOVEMENT COUNTS**

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Prepared for: **SCJ Alliance**  
**Traffic Count Consultants, Inc.**

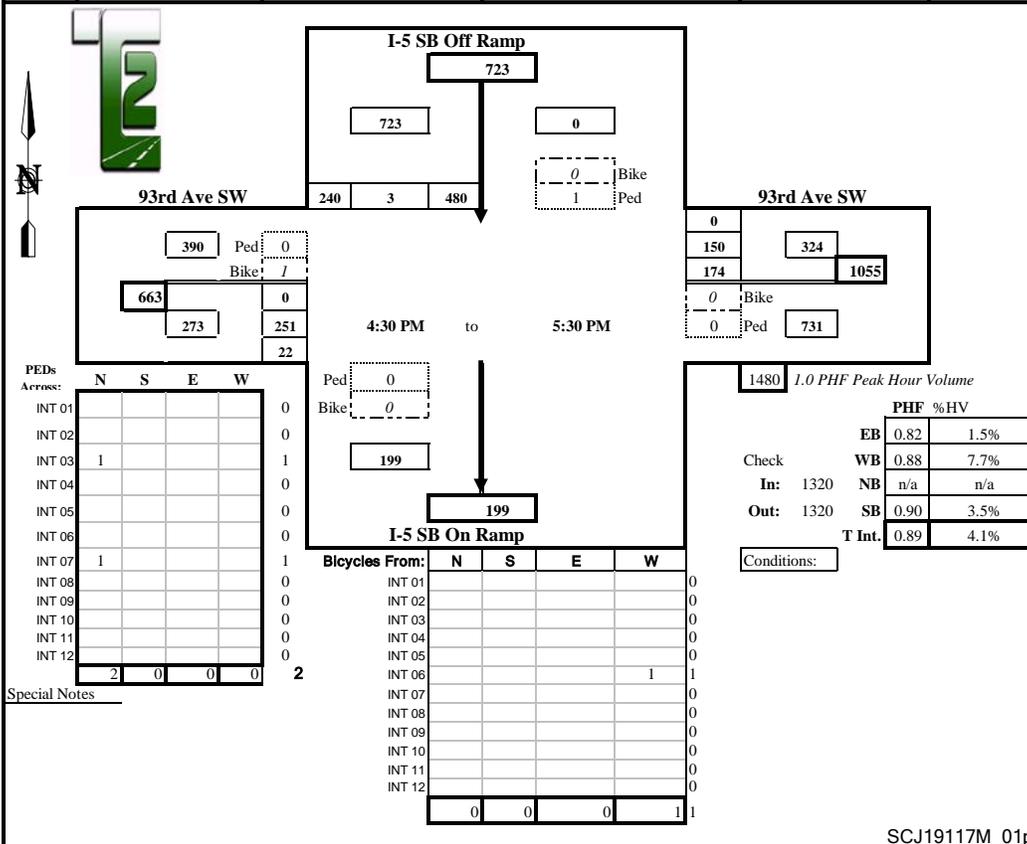
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

**Intersection:** I-5 SB Ramps & 93rd Ave SW  
**Location:** Tumwater, Washington

**Date of Count:** Tues 10/29/2019  
**Checked By:** Jess

Time Interval Ending at	From North on (SB) I-5 SB Off Ramp				From South on (NB) I-5 SB On Ramp				From East on (WB) 93rd Ave SW				From West on (EB) 93rd Ave SW				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	6	113	0	41	0	0	0	0	6	45	25	0	1	0	49	3	276
4:30 P	12	106	1	44	0	0	0	0	12	45	29	0	1	0	50	3	278
4:45 P	5	137	0	56	0	0	0	0	9	43	34	0	2	0	68	4	342
5:00 P	4	101	1	47	0	0	0	0	4	33	36	0	1	0	57	8	283
5:15 P	8	121	0	59	0	0	0	0	7	49	43	0	1	0	50	3	325
5:30 P	8	121	2	78	0	0	0	0	5	49	37	0	0	0	76	7	370
5:45 P	6	97	0	54	0	0	0	0	7	42	42	0	2	0	72	6	313
6:00 P	9	101	1	63	0	0	0	0	4	28	24	0	0	0	61	6	284
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Survey</b>	<b>58</b>	<b>897</b>	<b>5</b>	<b>442</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>54</b>	<b>334</b>	<b>270</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>483</b>	<b>40</b>	<b>2471</b>
Peak Hour: 4:30 PM to 5:30 PM																	
<b>Total</b>	<b>25</b>	<b>480</b>	<b>3</b>	<b>240</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>25</b>	<b>174</b>	<b>150</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>251</b>	<b>22</b>	<b>1320</b>
<b>Approach</b>	723				0				324				273				1320
<b>%HV</b>	3.5%				n/a				7.7%				1.5%				4.1%
<b>PHF</b>	0.90				n/a				0.88				0.82				0.89





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WBE/DBE

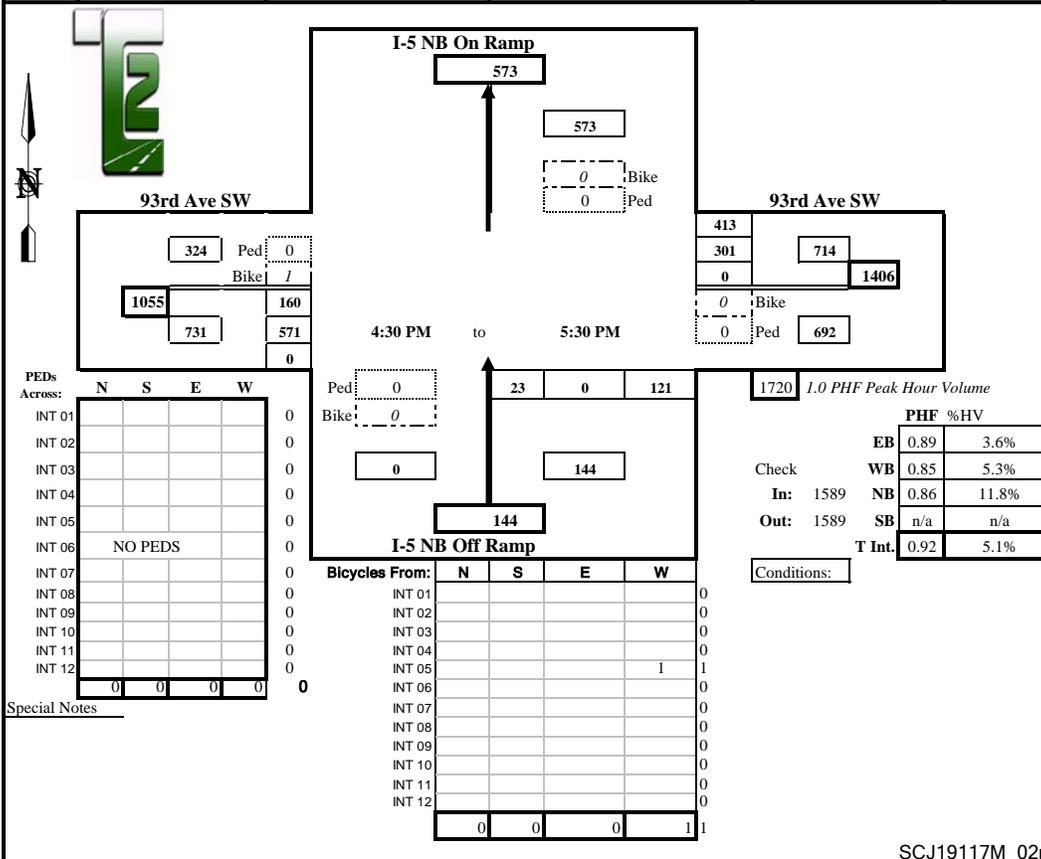
**Intersection:** I-5 NB Ramps & 93rd Ave SW

**Date of Count:** Tues 10/29/2019

**Location:** Tumwater, Washington

**Checked By:** Jess

Time Interval	From North on (SB) I-5 NB On Ramp				From South on (NB) I-5 NB Off Ramp				From East on (WB) 93rd Ave SW				From West on (EB) 93rd Ave SW				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	0	0	5	4	0	24	12	0	65	97	6	33	129	0	352
4:30 P	0	0	0	0	7	1	1	32	18	0	73	83	14	27	129	0	346
4:45 P	0	0	0	0	5	4	0	29	15	0	73	119	7	47	158	0	430
5:00 P	0	0	0	0	2	7	0	35	7	0	62	78	5	32	126	0	340
5:15 P	0	0	0	0	7	7	0	32	9	0	85	125	7	31	140	0	420
5:30 P	0	0	0	0	3	5	0	25	7	0	81	91	7	50	147	0	399
5:45 P	0	0	0	0	5	7	1	21	9	0	77	71	8	41	128	0	346
6:00 P	0	0	0	0	3	3	0	15	8	0	49	71	8	35	127	0	300
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Survey</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>37</b>	<b>38</b>	<b>2</b>	<b>213</b>	<b>85</b>	<b>0</b>	<b>565</b>	<b>735</b>	<b>62</b>	<b>296</b>	<b>1084</b>	<b>0</b>	<b>2933</b>
Peak Hour: 4:30 PM to 5:30 PM																	
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>23</b>	<b>0</b>	<b>121</b>	<b>38</b>	<b>0</b>	<b>301</b>	<b>413</b>	<b>26</b>	<b>160</b>	<b>571</b>	<b>0</b>	<b>1589</b>
<b>Approach</b>	0				144				714				731				<b>1589</b>
<b>%HV</b>	n/a				11.8%				5.3%				3.6%				<b>5.1%</b>
<b>PHF</b>	n/a				0.86				0.85				0.89				<b>0.92</b>





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WBE/DBE

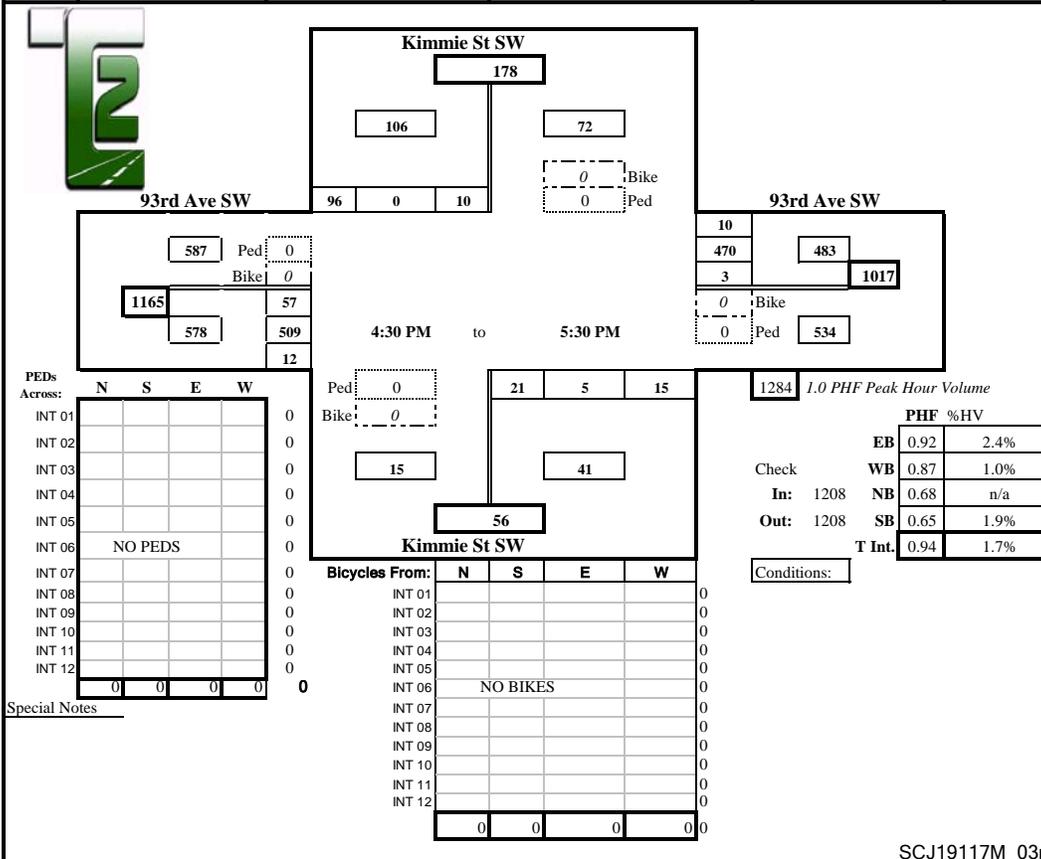
**Intersection:** Kimmie St SW & 93rd Ave SW

**Date of Count:** Tues 10/29/2019

**Location:** Tumwater, Washington

**Checked By:** Jess

Time Interval	From North on (SB) Kimmie St SW				From South on (NB) Kimmie St SW				From East on (WB) 93rd Ave SW				From West on (EB) 93rd Ave SW				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	5	3	1	16	0	6	2	3	4	2	122	2	7	7	133	4	301
4:30 P	0	2	0	12	0	1	2	1	6	1	103	3	3	10	109	3	247
4:45 P	0	1	0	12	0	5	1	6	3	2	132	5	4	17	134	6	321
5:00 P	0	1	0	19	0	1	0	2	0	0	102	3	1	17	122	1	268
5:15 P	1	6	0	35	0	8	1	6	0	0	121	2	6	14	123	3	319
5:30 P	1	2	0	30	0	7	3	1	2	1	115	0	3	9	130	2	300
5:45 P	0	1	0	8	0	1	1	2	2	1	84	2	2	13	98	3	214
6:00 P	0	1	1	10	0	1	0	1	1	1	84	0	5	9	106	1	215
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Survey</b>	<b>7</b>	<b>17</b>	<b>2</b>	<b>142</b>	<b>0</b>	<b>30</b>	<b>10</b>	<b>22</b>	<b>18</b>	<b>8</b>	<b>863</b>	<b>17</b>	<b>31</b>	<b>96</b>	<b>955</b>	<b>23</b>	<b>2185</b>
Peak Hour: 4:30 PM to 5:30 PM																	
<b>Total</b>	<b>2</b>	<b>10</b>	<b>0</b>	<b>96</b>	<b>0</b>	<b>21</b>	<b>5</b>	<b>15</b>	<b>5</b>	<b>3</b>	<b>470</b>	<b>10</b>	<b>14</b>	<b>57</b>	<b>509</b>	<b>12</b>	<b>1208</b>
<b>Approach</b>	106				41				483				578				1208
<b>%HV</b>	1.9%				n/a				1.0%				2.4%				1.7%
<b>PHF</b>	0.65				0.68				0.87				0.92				0.94





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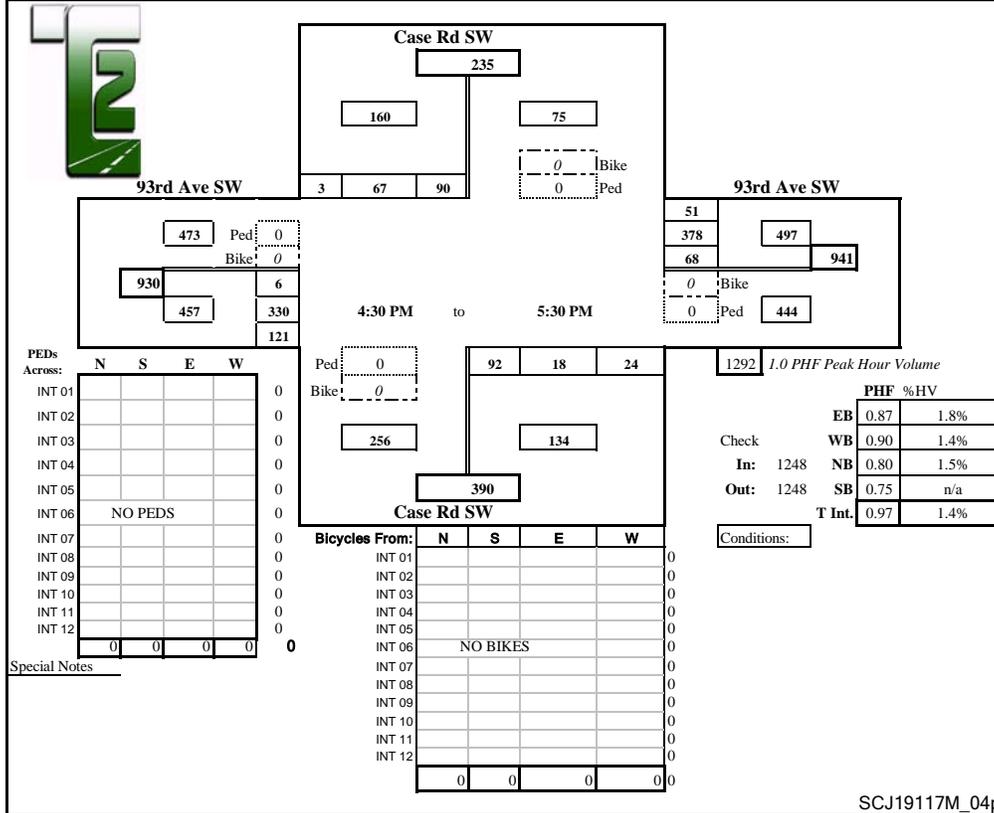
WBE/DBE

**Intersection:** Case Rd SW & 93rd Ave SW  
**Location:** Tumwater, Washington

**Date of Count:** Tues 10/29/2019  
**Checked By:** Jess

Time Interval	From North on (SB) Case Rd SW				From South on (NB) Case Rd SW				From East on (WB) 93rd Ave SW				From West on (EB) 93rd Ave SW				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	8	11	1	4	29	5	11	3	13	89	11	3	2	80	35	295
4:30 P	0	16	13	1	1	29	4	6	7	13	72	15	2	0	87	32	288
4:45 P	0	17	13	1	1	28	3	5	5	16	108	14	1	0	78	40	323
5:00 P	0	15	19	1	0	26	8	8	1	16	76	20	1	3	94	35	321
5:15 P	0	35	17	1	0	16	4	3	0	12	93	12	5	1	67	32	293
5:30 P	0	23	18	0	1	22	3	8	1	24	101	5	1	2	91	14	311
5:45 P	1	16	14	1	0	19	7	10	4	12	67	10	1	0	87	40	283
6:00 P	0	18	9	1	0	20	6	8	0	15	66	8	3	0	78	36	265
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Total Survey	1	148	114	7	7	189	40	59	21	121	672	95	17	8	662	264	2379
Peak Hour: 4:30 PM to 5:30 PM																	
Total	0	90	67	3	2	92	18	24	7	68	378	51	8	6	330	121	1248
Approach	160				134				497				457				1248
%HV	n/a				1.5%				1.4%				1.8%				1.4%
PHF	0.75				0.80				0.90				0.87				0.97



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**APPENDIX B**  
**TRAFFIC VOLUME CALCULATION WORKSHEETS**

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Tumwater East I-5 Distribution Center

PM Peak Hour Volumes

Intersection	Movement		EXISTING 2019 VOLUMES	2% GROWTH VOLUMES	TOTAL PIPELINE VOLUMES	FUTURE 2023 VOLUMES	Warehouse Passenger Vehicle Traffic					Warehouse Truck Traffic					TOTAL PROJECT ASSIGNMENT	FUTURE WITH PROJECT
							% IN	% OUT	IN 21	OUT 53	TOTAL 74	% IN	% OUT	IN 18	OUT 18	TOTAL 36		
1 I-5 SB Ramps 93rd Ave SW  TMC Date: 10/29/19  Peak Hour: 4:30 - 5:30 PHF: .89		L	0	0	0	0												
	EB	T	251	21	221	493	8%		2		2					2	494	
		R	22	2	146	170												170
		L	174	14	51	239		9%	0	5	5		58%	0	10	10	15	255
	WB	T	150	12	124	286		8%	0	4	4			0	0	0	4	291
		R	0	0	0	0			0	0	0			0	0	0	0	0
		L	0	0	0	0												
	NB	T	0	0	0	0												
		R	0	0	0	0												
		L	480	40	169	689	52%		11	0	11	42%		8	0	8	19	707
	SB	3	0	0	3			0	0	0			0	0	0	0	3	
	R	240	20	181	441			0	0	0			0	0	0	0	441	
			1,320		2321			13	9	22			8	10	18	40	2,361	
2 I-5 NB Ramps 93rd Ave SW  TMC Date: 10/29/19  Peak Hour: 4:30 - 5:30 PHF: .94		L	160	13	161	334											334	
	EB	T	571	47	231	849	60%		13		13	42%		8		8	21	870
		R	0	0	0	0												
		L	0	0	0	0			0	0	0			0	0	0	0	0
	WB	T	301	25	126	452		17%	0	9	9		58%	0	10	10	19	471
		R	413	34	312	759		52%	0	28	28		42%	0	8	8	35	794
		L	23	2	49	74												74
	NB	T	0	0	0	0												
		R	121	10	54	185	9%		2		2	58%		10		10	12	197
		L	0	0	0	0			0	0	0			0	0	0	0	0
	SB	0	0	0	0			0	0	0			0	0	0	0	0	
	R	0	0	0	0			0	0	0			0	0	0	0	0	
			1,589		2653			14	37	51			18	18	36	88	2,741	
3 Kimmie St SW 93rd Ave SW  TMC Date: 10/29/19  Peak Hour: 4:30 - 5:30 PHF: .94		L	57	5	38	100											100	
	EB	T	509	42	204	755		8%		4	4					4	759	
		R	12	1	0	13												13
		L	3	0	0	3	26%		5	0	5			0	0	0	5	9
	WB	T	470	39	198	707			0	0	0			0	0	0	0	707
		R	10	1	19	30			0	0	0			0	0	0	0	30
		L	21	2	0	23		69%		36	36		100%		18	18	54	77
	NB	T	5	0	0	5	5%			3	3						3	8
		R	15	1	0	16	18%			10	10						10	26
		L	10	1	89	100			0	0	0			0	0	0	0	100
	SB	0	0	0	0	5%		1	0	1			0	0	0	1	1	
	R	96	8	121	225			0	0	0			0	0	0	0	225	
			1,208		1977			7	53	59			0	18	18	77	2,054	



Tumwater East I-5 Distribution Center

PM Peak Hour Volumes

Intersection	Movement		EXISTING 2019 VOLUMES	2% GROWTH VOLUMES	TOTAL PIPELINE VOLUMES	FUTURE 2023 VOLUMES	Warehouse Passenger Vehicle Traffic					Warehouse Truck Traffic					TOTAL PROJECT ASSIGNMENT	FUTURE WITH PROJECT
							% IN	% OUT	IN 21	OUT 53	TOTAL 74	% IN	% OUT	IN 18	OUT 18	TOTAL 36		
4 Case Rd SW 93rd Ave SW  TMC Date: 10/29/19  Peak Hour: 4:30 - 5:30 PHF: .97		L	6	0	0	6											6	
	EB	T	330	27	274	631		21%		11	11					11	642	
		R	121	10	17	148		5%		3	3					3	151	
		L	68	6	30	104			0	0	0			0	0	0	0	104
	WB	T	378	31	208	617	21%		4	0	4			0	0	0	4	622
		R	51	4	30	85			0	0	0			0	0	0	0	85
		L	92	8	5	105	5%		1		1						1	106
	NB	T	18	1	0	19												19
		R	24	2	18	44												44
		L	90	7	41	138			0	0	0			0	0	0	0	138
	SB	T	67	6	0	73			0	0	0			0	0	0	73	
	R	3	0	0	3			0	0	0			0	0	0	0	3	
			1,248			1974			5	14	19			0	0	0	19	1,993
5 93rd Ave SW Site Access		L	0	0	45	45											45	
	EB	T	578	48	242	868											868	
		R	0	0	0	0	69%		15		15	100%		18		18	33	33
		L	0	0	0	0			0	0	0			0	0	0	0	0
	WB	T	587	48	319	954		69%	0	36	36		100%	0	18	18	54	1,009
		R	0	0	10	10			0	0	0			0	0	0	0	10
		L	0	0	0	0		0%										
	NB	T	0	0	0	0												
		R	0	0	0	0		8%		4	4						4	4
		L	0	0	0	0			0	0	0			0	0	0	0	0
	SB	T	0	0	0	0			0	0	0			0	0	0	0	
	R	0	0	135	135			0	0	0			0	0	0	0	135	
			1,165			2012			15	40	55			18	18	36	91	2,103
6 Site Access Kimmie St SW		L	0	0	0	0		92%		49	49		100%		18	18	67	67
	EB	T	0	0	0	0												
		R	0	0	0	0												
		L	0	0	0	0			0	0	0			0	0	0	0	0
	WB	T	0	0	0	0			0	0	0			0	0	0	0	0
		R	0	0	0	0			0	0	0			0	0	0	0	0
		L	0	0	0	0												
	NB	T	0	0	0	0												
		R	0	0	0	0												
		L	0	0	0	0			0	0	0			0	0	0	0	0
	SB	T	0	0	0	0			0	0	0			0	0	0	0	
	R	0	0	0	0	31%		7	0	6			0	0	0	6	6	
			0			0		7	49	54			0	18	18	72	72	



Tumwater East I-5 Distribution Center  
Pipeline Project PM Peak Hour Volumes

Intersection	Movement		National Guard Readiness Center	Restover Truck Stop	Preserve Divs 3 & 4	Bradbury Estates	Kimmie Street Plat	I-5 Commerce	Tumwater Corporate Park	Tilley Industrial	Tumwater Commerce	TOTAL		
													L	T
1 93rd Ave SW I-5 SB Ramps		L	0	0	0	0	0	0	0	0	0	0		
	EB	T	0	50	4	2	0	157	5	1	2	221		
		R	0	62	0	0	0	84	0	0	0	146		
		L	5	-21	6	3	2	-6	52	4	6	51		
	WB	T	0	38	2	1	0	55	17	5	6	124		
		R	0	0	0	0	0	0	0	0	0	0		
		L	0	0	0	0	0	0	0	0	0	0		
	NB	T	0	0	0	0	0	0	0	0	0	0		
		R	0	0	0	0	0	0	0	0	0	0		
		L	0	-30	83	42	0	0	58	8	8	169		
SB	T	0	0	0	0	0	0	0	0	0	0			
	R	0	80	0	0	0	0	101	0	0	0	181		
			179					132	18	22	892			
2 93rd Ave SW I-5 NB Ramps		L	0	34	0	0	0	127	0	0	0	161		
	EB	T	0	-14	87	46	0	30	63	9	10	231		
		R	0	0	0	0	0	0	0	0	0	0		
		L	0	0	0	0	0	0	0	0	0	0		
	WB	T	5	-5	8	4	2	22	69	9	12	126		
		R	0	7	48	25	0	-6	179	30	29	312		
		L	0	22	0	0	0	27	0	0	0	49		
	NB	T	0	0	0	0	0	0	0	0	0	0		
		R	0	15	10	5	3	0	17	2	2	54		
		L	0	0	0	0	0	0	0	0	0	0		
SB	T	0	0	0	0	0	0	0	0	0	0			
	R	0	0	0	0	0	0	0	0	0	0			
			59					328	50	53	933			
3 93rd Ave SW Kimmie St SW		L	0	0	0	0	3	0	35	0	0	38		
	EB	T	0	2	97	51	0	30	0	11	13	204		
		R	0	0	0	0	0	0	0	0	0	0		
		L	0	0	0	0	0	0	0	0	0	0		
	WB	T	0	2	56	29	0	16	10	39	46	198		
		R	0	0	1	1	0	0	17	0	0	19		
		L	0	0	0	0	0	0	0	0	0	0		
	NB	T	0	0	0	0	0	0	0	0	0	0		
		R	0	0	0	0	0	0	0	0	0	0		
		L	3	0	2	1	0	0	83	0	0	89		
SB	T	0	0	0	0	0	0	0	0	0	0			
	R	5	0	0	0	2	0	114	0	0	121			
			4					259	50	59	669			
4 93rd Ave SW Case Rd		L	0	0	0	0	0	0	0	0	0	0		
	EB	T	3	2	99	52	0	30	64	11	13	274		
		R	0	0	0	0	0	0	17	0	0	17		
		L	0	0	5	2	0	0	0	11	12	30		
	WB	T	0	2	57	30	0	16	18	39	46	208		
		R	0	0	15	8	0	0	0	3	4	30		
		L	0	0	0	0	0	0	5	0	0	5		
	NB	T	0	0	0	0	0	0	0	0	0	0		
		R	0	0	8	4	0	0	0	3	3	18		
		L	0	0	26	13	0	0	0	1	1	41		
SB	T	0	0	0	0	0	0	0	0	0	0			
	R	0	0	0	0	0	0	0	0	0	0			
			4					46	104	68	79	623		

Trip Generation for projects where data was not

National Guard Readiness Center

Size: 30 EMP			
IN	OUT	TOTAL	
0	30	30	

Preserve Div 3 & 4

Size: 323 single family homes			
IN	OUT	TOTAL	
202	118	320	

Bradbury Estates

Size: 165 single family homes			
IN	OUT	TOTAL	
103	62	165	

Kimmie Street Plat

Size: 28 single family homes			
IN	OUT	TOTAL	
18	10	28	

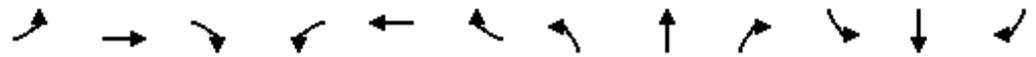
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**APPENDIX C**  
**CAPACITY ANALYSIS WORKSHEETS**

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Lanes, Volumes, Timings  
1: I-5 SB Ramps & 93rd Ave

Existing 2019  
PM Peak Hour

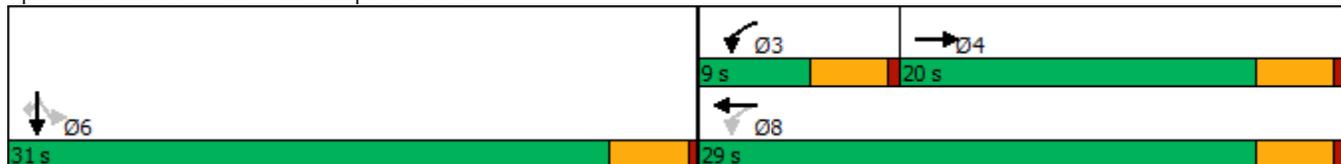


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↖			↖			↖	↖
Traffic Volume (vph)	0	251	22	174	150	0	0	0	0	480	3	240
Future Volume (vph)	0	251	22	174	150	0	0	0	0	480	3	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		0	0		0	0		300
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			40			30			30	
Link Distance (ft)		1124			945			1099			1644	
Travel Time (s)		25.5			16.1			25.0			37.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	0%	0%	0%	4%	4%	4%
Shared Lane Traffic (%)												
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		4		3	8						6	
Permitted Phases				8						6		6
Detector Phase		4		3	8					6	6	6
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0					4.0	4.0	4.0
Minimum Split (s)		20.0		8.0	20.0					20.0	20.0	20.0
Total Split (s)		20.0		9.0	29.0					31.0	31.0	31.0
Total Split (%)		33.3%		15.0%	48.3%					51.7%	51.7%	51.7%
Yellow Time (s)		3.5		3.5	3.5					3.5	3.5	3.5
All-Red Time (s)		0.5		0.5	0.5					0.5	0.5	0.5
Lost Time Adjust (s)		0.0		0.0	0.0					0.0	0.0	0.0
Total Lost Time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lead/Lag		Lag		Lead								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		None	None					Max	Max	Max

Intersection Summary

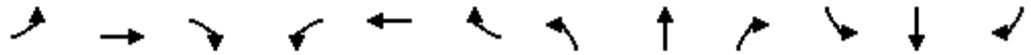
Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 57.5  
 Natural Cycle: 55  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: I-5 SB Ramps & 93rd Ave



HCM 6th Signalized Intersection Summary  
 1: I-5 SB Ramps & 93rd Ave

Existing 2019  
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	251	22	174	150	0	0	0	0	480	3	240
Future Volume (veh/h)	0	251	22	174	150	0	0	0	0	480	3	240
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1796	1796	0				1841	1841	1841
Adj Flow Rate, veh/h	0	282	25	196	169	0				539	3	270
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89				0.89	0.89	0.89
Percent Heavy Veh, %	0	2	2	7	7	0				4	4	4
Cap, veh/h	0	353	31	335	665	0				847	5	758
Arrive On Green	0.00	0.21	0.21	0.09	0.37	0.00				0.49	0.49	0.49
Sat Flow, veh/h	0	1693	150	1711	1796	0				1744	10	1560
Grp Volume(v), veh/h	0	0	307	196	169	0				542	0	270
Grp Sat Flow(s),veh/h/ln	0	0	1843	1711	1796	0				1754	0	1560
Q Serve(g_s), s	0.0	0.0	8.8	4.8	3.6	0.0				12.8	0.0	6.0
Cycle Q Clear(g_c), s	0.0	0.0	8.8	4.8	3.6	0.0				12.8	0.0	6.0
Prop In Lane	0.00		0.08	1.00		0.00				0.99		1.00
Lane Grp Cap(c), veh/h	0	0	384	335	665	0				852	0	758
V/C Ratio(X)	0.00	0.00	0.80	0.59	0.25	0.00				0.64	0.00	0.36
Avail Cap(c_a), veh/h	0	0	531	335	808	0				852	0	758
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	20.9	15.2	12.2	0.0				10.6	0.0	8.9
Incr Delay (d2), s/veh	0.0	0.0	6.0	2.6	0.2	0.0				3.6	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	4.1	1.8	1.2	0.0				4.8	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	0.0	26.9	17.8	12.4	0.0				14.2	0.0	10.2
LnGrp LOS	A	A	C	B	B	A				B	A	B
Approach Vol, veh/h		307			365						812	
Approach Delay, s/veh		26.9			15.3						12.9	
Approach LOS		C			B						B	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			9.0	15.6		31.0		24.6				
Change Period (Y+Rc), s			4.0	4.0		4.0		4.0				
Max Green Setting (Gmax), s			5.0	16.0		27.0		25.0				
Max Q Clear Time (g_c+I1), s			6.8	10.8		14.8		5.6				
Green Ext Time (p_c), s			0.0	0.8		3.8		0.8				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			16.4									
HCM 6th LOS			B									

HCM 6th TWSC  
2: I-5 NB Ramps & 93rd Ave

Existing 2019  
PM Peak Hour

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↖	↗		↕				
Traffic Vol, veh/h	160	571	0	0	301	413	23	0	121	0	0	0
Future Vol, veh/h	160	571	0	0	301	413	23	0	121	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	Free	-	-	Yield	-	-	None
Storage Length	125	-	-	-	-	300	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16965	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	4	4	4	5	5	5	12	12	12	0	0	0
Mvmt Flow	170	607	0	0	320	439	24	0	129	0	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	320	0	0
Stage 1	-	-	947
Stage 2	-	-	320
Critical Hdwy	4.14	-	6.52
Critical Hdwy Stg 1	-	-	5.52
Critical Hdwy Stg 2	-	-	5.52
Follow-up Hdwy	2.236	-	3.608
Pot Cap-1 Maneuver	1229	0	0
Stage 1	-	0	362
Stage 2	-	0	714
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1229	-	153
Mov Cap-2 Maneuver	-	-	153
Stage 1	-	-	312
Stage 2	-	-	714

Approach	EB	WB	NB
HCM Control Delay, s	1.8	0	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT
Capacity (veh/h)	569	1229	-	-
HCM Lane V/C Ratio	0.269	0.138	-	-
HCM Control Delay (s)	13.6	8.4	-	-
HCM Lane LOS	B	A	-	-
HCM 95th %tile Q(veh)	1.1	0.5	-	-

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	57	509	12	3	470	10	21	5	15	10	0	96
Future Vol, veh/h	57	509	12	3	470	10	21	5	15	10	0	96
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	2	2	2
Mvmt Flow	61	541	13	3	500	11	22	5	16	11	0	102

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	511	0	0	554	0	0	1233	1187	548	1192	1188	506
Stage 1	-	-	-	-	-	-	670	670	-	512	512	-
Stage 2	-	-	-	-	-	-	563	517	-	680	676	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1054	-	-	1021	-	-	155	190	540	164	188	566
Stage 1	-	-	-	-	-	-	450	459	-	545	536	-
Stage 2	-	-	-	-	-	-	514	537	-	441	453	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1054	-	-	1021	-	-	119	173	540	145	171	566
Mov Cap-2 Maneuver	-	-	-	-	-	-	119	173	-	145	171	-
Stage 1	-	-	-	-	-	-	412	420	-	499	534	-
Stage 2	-	-	-	-	-	-	420	535	-	387	415	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			0.1			32.1			15.8		
HCM LOS							D			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	176	1054	-	-	1021	-	-	444
HCM Lane V/C Ratio	0.248	0.058	-	-	0.003	-	-	0.254
HCM Control Delay (s)	32.1	8.6	0	-	8.5	0	-	15.8
HCM Lane LOS	D	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.9	0.2	-	-	0	-	-	1

Intersection	
Intersection Delay, s/veh	25.4
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕			↕	
Traffic Vol, veh/h	6	330	121	68	378	51	92	18	24	90	67	3
Future Vol, veh/h	6	330	121	68	378	51	92	18	24	90	67	3
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	0	0	0
Mvmt Flow	6	340	125	70	390	53	95	19	25	93	69	3
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	27.3	30.7	13.3	14
HCM LOS	D	D	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	69%	1%	15%	0%	56%
Vol Thru, %	13%	72%	85%	0%	42%
Vol Right, %	18%	26%	0%	100%	2%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	134	457	446	51	160
LT Vol	92	6	68	0	90
Through Vol	18	330	378	0	67
RT Vol	24	121	0	51	3
Lane Flow Rate	138	471	460	53	165
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.282	0.782	0.828	0.083	0.333
Departure Headway (Hd)	7.344	5.975	6.481	5.689	7.273
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	488	603	556	628	493
Service Time	5.414	4.025	4.23	3.438	5.341
HCM Lane V/C Ratio	0.283	0.781	0.827	0.084	0.335
HCM Control Delay	13.3	27.3	33.2	9	14
HCM Lane LOS	B	D	D	A	B
HCM 95th-tile Q	1.1	7.4	8.4	0.3	1.4

Lanes, Volumes, Timings  
1: I-5 SB Ramps & 93rd Ave

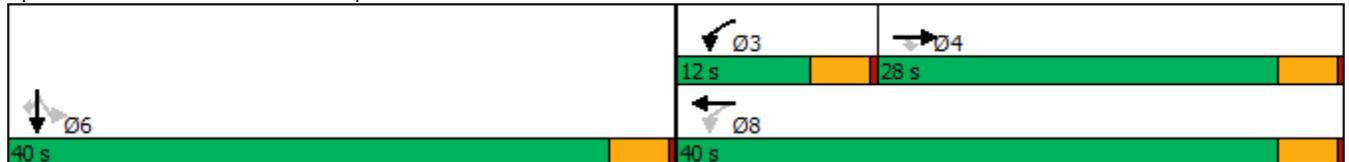
Projected 2023 without project  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	493	170	239	286	0	0	0	0	689	3	441
Future Volume (vph)	0	493	170	239	286	0	0	0	0	689	3	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	150		0	0		0	0		300
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			40			30			30	
Link Distance (ft)		1124			945			1099			1644	
Travel Time (s)		25.5			16.1			25.0			37.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	0%	0%	0%	4%	4%	4%
Shared Lane Traffic (%)												
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		4		3	8						6	
Permitted Phases			4	8						6		6
Detector Phase		4	4	3	8					6	6	6
Switch Phase												
Minimum Initial (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
Minimum Split (s)		20.0	20.0	8.0	20.0					20.0	20.0	20.0
Total Split (s)		28.0	28.0	12.0	40.0					40.0	40.0	40.0
Total Split (%)		35.0%	35.0%	15.0%	50.0%					50.0%	50.0%	50.0%
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5	3.5	3.5
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5	0.5	0.5
Lost Time Adjust (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Lost Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Recall Mode		None	None	None	None					Max	Max	Max

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: I-5 SB Ramps & 93rd Ave



HCM 6th Signalized Intersection Summary  
 1: I-5 SB Ramps & 93rd Ave

Projected 2023 without project  
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗	↖	↑						↖	↗
Traffic Volume (veh/h)	0	493	170	239	286	0	0	0	0	689	3	441
Future Volume (veh/h)	0	493	170	239	286	0	0	0	0	689	3	441
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1796	1796	0				1841	1841	1841
Adj Flow Rate, veh/h	0	554	191	269	321	0				774	3	496
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89				0.89	0.89	0.89
Percent Heavy Veh, %	0	2	2	7	7	0				4	4	4
Cap, veh/h	0	561	476	265	808	0				786	3	702
Arrive On Green	0.00	0.30	0.30	0.10	0.45	0.00				0.45	0.45	0.45
Sat Flow, veh/h	0	1870	1585	1711	1796	0				1747	7	1560
Grp Volume(v), veh/h	0	554	191	269	321	0				777	0	496
Grp Sat Flow(s),veh/h/ln	0	1870	1585	1711	1796	0				1753	0	1560
Q Serve(g_s), s	0.0	23.6	7.7	8.0	9.6	0.0				35.0	0.0	20.5
Cycle Q Clear(g_c), s	0.0	23.6	7.7	8.0	9.6	0.0				35.0	0.0	20.5
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	561	476	265	808	0				789	0	702
V/C Ratio(X)	0.00	0.99	0.40	1.02	0.40	0.00				0.98	0.00	0.71
Avail Cap(c_a), veh/h	0	561	476	265	808	0				789	0	702
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	27.8	22.3	20.6	14.7	0.0				21.7	0.0	17.7
Incr Delay (d2), s/veh	0.0	34.6	0.5	59.4	0.3	0.0				28.6	0.0	5.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	15.4	2.8	7.3	3.5	0.0				19.3	0.0	7.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	62.5	22.8	80.1	15.0	0.0				50.3	0.0	23.7
LnGrp LOS	A	E	C	F	B	A				D	A	C
Approach Vol, veh/h		745			590						1273	
Approach Delay, s/veh		52.3			44.7						39.9	
Approach LOS		D			D						D	
Timer - Assigned Phs			3	4		6		8				
Phs Duration (G+Y+Rc), s			12.0	28.0		40.0		40.0				
Change Period (Y+Rc), s			4.0	4.0		4.0		4.0				
Max Green Setting (Gmax), s			8.0	24.0		36.0		36.0				
Max Q Clear Time (g_c+I1), s			10.0	25.6		37.0		11.6				
Green Ext Time (p_c), s			0.0	0.0		0.0		1.8				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			44.5									
HCM 6th LOS			D									

Lanes, Volumes, Timings  
2: I-5 NB Ramps & 93rd Ave

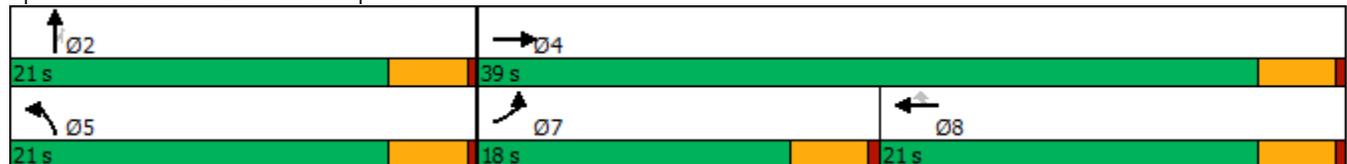
Projected 2023 without project  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	334	849	0	0	452	759	74	1	185	0	0	0
Future Volume (vph)	334	849	0	0	452	759	74	1	185	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	0		300	0		250	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30				30
Link Distance (ft)		945			818			1212				488
Travel Time (s)		16.1			13.9			27.5				11.1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	12%	12%	12%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA			NA	Perm	Prot	NA	Perm			
Protected Phases	7	4			8		5	2				
Permitted Phases						8			2			
Detector Phase	7	4			8	8	5	2	2			
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	8.0	20.0			20.0	20.0	8.0	20.0	20.0			
Total Split (s)	18.0	39.0			21.0	21.0	21.0	21.0	21.0			
Total Split (%)	30.0%	65.0%			35.0%	35.0%	35.0%	35.0%	35.0%			
Yellow Time (s)	3.5	3.5			3.5	3.5	3.5	3.5	3.5			
All-Red Time (s)	0.5	0.5			0.5	0.5	0.5	0.5	0.5			
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag	Lag						
Lead-Lag Optimize?	Yes				Yes	Yes						
Recall Mode	None	Min			None	None	None	None	None			

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 57.2  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: I-5 NB Ramps & 93rd Ave



HCM 6th Signalized Intersection Summary  
2: I-5 NB Ramps & 93rd Ave

Projected 2023 without project  
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	334	849	0	0	452	759	74	1	185	0	0	0
Future Volume (veh/h)	334	849	0	0	452	759	74	1	185	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1841	1841	0	0	1826	1826	1722	1722	1722			
Adj Flow Rate, veh/h	355	903	0	0	481	0	79	1	197			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	4	4	0	0	5	5	12	12	12			
Cap, veh/h	424	1182	0	0	570		295	4	266			
Arrive On Green	0.24	0.64	0.00	0.00	0.31	0.00	0.18	0.18	0.18			
Sat Flow, veh/h	1753	1841	0	0	1826	1547	1621	21	1459			
Grp Volume(v), veh/h	355	903	0	0	481	0	80	0	197			
Grp Sat Flow(s),veh/h/ln	1753	1841	0	0	1826	1547	1641	0	1459			
Q Serve(g_s), s	8.8	15.7	0.0	0.0	11.2	0.0	1.9	0.0	5.8			
Cycle Q Clear(g_c), s	8.8	15.7	0.0	0.0	11.2	0.0	1.9	0.0	5.8			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	424	1182	0	0	570		299	0	266			
V/C Ratio(X)	0.84	0.76	0.00	0.00	0.84		0.27	0.00	0.74			
Avail Cap(c_a), veh/h	540	1417	0	0	683		614	0	546			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	16.4	5.7	0.0	0.0	14.6	0.0	16.0	0.0	17.6			
Incr Delay (d2), s/veh	9.0	2.1	0.0	0.0	8.2	0.0	0.5	0.0	4.0			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	3.8	2.8	0.0	0.0	4.8	0.0	0.7	0.0	2.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.4	7.8	0.0	0.0	22.8	0.0	16.5	0.0	21.6			
LnGrp LOS	C	A	A	A	C		B	A	C			
Approach Vol, veh/h		1258			481	A		277				
Approach Delay, s/veh		12.8			22.8			20.1				
Approach LOS		B			C			C				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		12.3		33.2			15.0	18.2				
Change Period (Y+Rc), s		4.0		4.0			4.0	4.0				
Max Green Setting (Gmax), s		17.0		35.0			14.0	17.0				
Max Q Clear Time (g_c+I1), s		7.8		17.7			10.8	13.2				
Green Ext Time (p_c), s		0.7		6.2			0.4	1.0				

Intersection Summary

HCM 6th Ctrl Delay	16.2
HCM 6th LOS	B

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC  
3: Kimmie St & 93rd Ave

Projected 2023 without project  
PM Peak Hour

Intersection												
Int Delay, s/veh	178											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	100	755	13	3	707	30	23	5	16	100	1	225
Future Vol, veh/h	100	755	13	3	707	30	23	5	16	100	1	225
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	2	2	2
Mvmt Flow	106	803	14	3	752	32	24	5	17	106	1	239

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	784	0	0	817	0	0	1916	1812	810	1807	1803	768
Stage 1	-	-	-	-	-	-	1022	1022	-	774	774	-
Stage 2	-	-	-	-	-	-	894	790	-	1033	1029	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.1	6.5	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.5	4	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	834	-	-	815	-	-	52	79	383	~ 61	79	402
Stage 1	-	-	-	-	-	-	287	316	-	391	408	-
Stage 2	-	-	-	-	-	-	338	404	-	281	311	-
Platoon blocked, %		-	-	-	-	-						
Mov Cap-1 Maneuver	834	-	-	815	-	-	~ 17	60	383	~ 44	60	402
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 17	60	-	~ 44	60	-
Stage 1	-	-	-	-	-	-	220	242	-	300	405	-
Stage 2	-	-	-	-	-	-	135	401	-	201	239	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	\$ 567.5	\$ 1000.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	30	834	-	-	815	-	-	114
HCM Lane V/C Ratio	1.56	0.128	-	-	0.004	-	-	3.042
HCM Control Delay (s)	\$ 567.5	9.9	0	-	9.4	0	-	\$ 1000.4
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	5.4	0.4	-	-	0	-	-	33

Notes  
 -: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	206.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕			↕	
Traffic Vol, veh/h	6	631	148	104	617	85	105	19	44	138	73	3
Future Vol, veh/h	6	631	148	104	617	85	105	19	44	138	73	3
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	0	0	0
Mvmt Flow	6	651	153	107	636	88	108	20	45	142	75	3
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	268.8	232.7	20	22.5
HCM LOS	F	F	C	C

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	62%	1%	14%	0%	64%
Vol Thru, %	11%	80%	86%	0%	34%
Vol Right, %	26%	19%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	168	785	721	85	214
LT Vol	105	6	104	0	138
Through Vol	19	631	617	0	73
RT Vol	44	148	0	85	3
Lane Flow Rate	173	809	743	88	221
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.398	1.529	1.502	0.158	0.498
Departure Headway (Hd)	10.308	7.565	8.104	7.304	10.013
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	352	486	453	494	362
Service Time	8.308	5.565	5.804	5.004	8.013
HCM Lane V/C Ratio	0.491	1.665	1.64	0.178	0.61
HCM Control Delay	20	268.8	258.8	11.4	22.5
HCM Lane LOS	C	F	F	B	C
HCM 95th-tile Q	1.9	38.5	35	0.6	2.7

Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔			↔
Traffic Vol, veh/h	45	868	954	10	0	135
Future Vol, veh/h	45	868	954	10	0	135
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	49	943	1037	11	0	147

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	1048	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	664	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	664	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	31.4
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	664	-	-	-	279
HCM Lane V/C Ratio	0.074	-	-	-	0.526
HCM Control Delay (s)	10.9	0	-	-	31.4
HCM Lane LOS	B	A	-	-	D
HCM 95th %tile Q(veh)	0.2	-	-	-	2.8

Lanes, Volumes, Timings  
1: I-5 SB Ramps & 93rd Ave

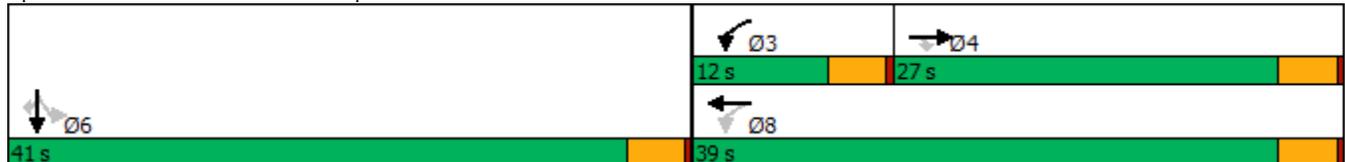
Projected 2023 with project  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	494	170	255	291	0	0	0	0	707	3	441
Future Volume (vph)	0	494	170	255	291	0	0	0	0	707	3	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		200	150		0	0		0	0		300
Storage Lanes	0		1	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			40			30			30	
Link Distance (ft)		1124			945			1099			1644	
Travel Time (s)		25.5			16.1			25.0			37.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	2%	2%	2%	7%	7%	7%	0%	0%	0%	4%	4%	4%
Shared Lane Traffic (%)												
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		4		3	8						6	
Permitted Phases			4	8						6		6
Detector Phase		4	4	3	8					6	6	6
Switch Phase												
Minimum Initial (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
Minimum Split (s)		20.0	20.0	8.0	20.0					20.0	20.0	20.0
Total Split (s)		27.0	27.0	12.0	39.0					41.0	41.0	41.0
Total Split (%)		33.8%	33.8%	15.0%	48.8%					51.3%	51.3%	51.3%
Yellow Time (s)		3.5	3.5	3.5	3.5					3.5	3.5	3.5
All-Red Time (s)		0.5	0.5	0.5	0.5					0.5	0.5	0.5
Lost Time Adjust (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Lost Time (s)		4.0	4.0	4.0	4.0					4.0	4.0	4.0
Lead/Lag		Lag	Lag	Lead								
Lead-Lag Optimize?		Yes	Yes	Yes								
Recall Mode		None	None	None	None					Max	Max	Max

Intersection Summary

Area Type: Other  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: I-5 SB Ramps & 93rd Ave



HCM 6th Signalized Intersection Summary  
1: I-5 SB Ramps & 93rd Ave

Projected 2023 with project  
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	494	170	255	291	0	0	0	0	707	3	441
Future Volume (veh/h)	0	494	170	255	291	0	0	0	0	707	3	441
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1796	1796	0				1841	1841	1841
Adj Flow Rate, veh/h	0	555	191	287	327	0				794	3	496
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89				0.89	0.89	0.89
Percent Heavy Veh, %	0	2	2	7	7	0				4	4	4
Cap, veh/h	0	538	456	261	786	0				808	3	721
Arrive On Green	0.00	0.29	0.29	0.10	0.44	0.00				0.46	0.46	0.46
Sat Flow, veh/h	0	1870	1585	1711	1796	0				1747	7	1560
Grp Volume(v), veh/h	0	555	191	287	327	0				797	0	496
Grp Sat Flow(s),veh/h/ln	0	1870	1585	1711	1796	0				1753	0	1560
Q Serve(g_s), s	0.0	23.0	7.8	8.0	10.0	0.0				35.8	0.0	20.0
Cycle Q Clear(g_c), s	0.0	23.0	7.8	8.0	10.0	0.0				35.8	0.0	20.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	538	456	261	786	0				811	0	721
V/C Ratio(X)	0.00	1.03	0.42	1.10	0.42	0.00				0.98	0.00	0.69
Avail Cap(c_a), veh/h	0	538	456	261	786	0				811	0	721
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	28.5	23.1	21.0	15.5	0.0				21.2	0.0	16.9
Incr Delay (d2), s/veh	0.0	47.3	0.6	84.9	0.4	0.0				27.7	0.0	5.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	16.8	2.9	9.1	3.7	0.0				19.5	0.0	7.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	0.0	75.8	23.7	105.9	15.8	0.0				48.9	0.0	22.2
LnGrp LOS	A	F	C	F	B	A				D	A	C
Approach Vol, veh/h		746			614						1293	
Approach Delay, s/veh		62.5			57.9						38.7	
Approach LOS		E			E						D	
<b>Timer - Assigned Phs</b>			3	4		6		8				
Phs Duration (G+Y+Rc), s			12.0	27.0		41.0		39.0				
Change Period (Y+Rc), s			4.0	4.0		4.0		4.0				
Max Green Setting (Gmax), s			8.0	23.0		37.0		35.0				
Max Q Clear Time (g_c+I1), s			10.0	25.0		37.8		12.0				
Green Ext Time (p_c), s			0.0	0.0		0.0		1.8				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			49.8									
HCM 6th LOS			D									

Lanes, Volumes, Timings  
2: I-5 NB Ramps & 93rd Ave

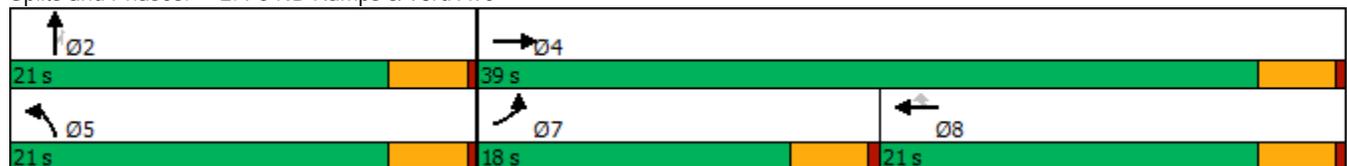
Projected 2023 with project  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	334	870	0	0	471	794	74	1	197	0	0	0
Future Volume (vph)	334	870	0	0	471	794	74	1	197	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		0	0		300	0		250	0		0
Storage Lanes	1		0	0		1	0		1	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30				30
Link Distance (ft)		945			818			1212				488
Travel Time (s)		16.1			13.9			27.5				11.1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	12%	12%	12%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA			NA	Perm	Prot	NA	Perm			
Protected Phases	7	4			8		5	2				
Permitted Phases						8			2			
Detector Phase	7	4			8	8	5	2	2			
Switch Phase												
Minimum Initial (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0			
Minimum Split (s)	8.0	20.0			20.0	20.0	8.0	20.0	20.0			
Total Split (s)	18.0	39.0			21.0	21.0	21.0	21.0	21.0			
Total Split (%)	30.0%	65.0%			35.0%	35.0%	35.0%	35.0%	35.0%			
Yellow Time (s)	3.5	3.5			3.5	3.5	3.5	3.5	3.5			
All-Red Time (s)	0.5	0.5			0.5	0.5	0.5	0.5	0.5			
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0			
Total Lost Time (s)	4.0	4.0			4.0	4.0		4.0	4.0			
Lead/Lag	Lead				Lag	Lag						
Lead-Lag Optimize?	Yes				Yes	Yes						
Recall Mode	None	Min			Min	Min	None	None	None			

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 57.2  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: I-5 NB Ramps & 93rd Ave



# HCM 6th Signalized Intersection Summary

## 2: I-5 NB Ramps & 93rd Ave

Projected 2023 with project  
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	334	870	0	0	471	794	74	1	197	0	0	0
Future Volume (veh/h)	334	870	0	0	471	794	74	1	197	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1841	1841	0	0	1826	1826	1722	1722	1722			
Adj Flow Rate, veh/h	355	926	0	0	501	0	79	1	210			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	4	4	0	0	5	5	12	12	12			
Cap, veh/h	420	1181	0	0	579		308	4	277			
Arrive On Green	0.24	0.64	0.00	0.00	0.32	0.00	0.19	0.19	0.19			
Sat Flow, veh/h	1753	1841	0	0	1826	1547	1621	21	1459			
Grp Volume(v), veh/h	355	926	0	0	501	0	80	0	210			
Grp Sat Flow(s),veh/h/ln	1753	1841	0	0	1826	1547	1641	0	1459			
Q Serve(g_s), s	9.2	17.2	0.0	0.0	12.2	0.0	2.0	0.0	6.5			
Cycle Q Clear(g_c), s	9.2	17.2	0.0	0.0	12.2	0.0	2.0	0.0	6.5			
Prop In Lane	1.00		0.00	0.00		1.00	0.99		1.00			
Lane Grp Cap(c), veh/h	420	1181	0	0	579		311	0	277			
V/C Ratio(X)	0.84	0.78	0.00	0.00	0.86		0.26	0.00	0.76			
Avail Cap(c_a), veh/h	518	1358	0	0	655		588	0	523			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	17.2	6.1	0.0	0.0	15.2	0.0	16.4	0.0	18.2			
Incr Delay (d2), s/veh	10.3	2.7	0.0	0.0	10.7	0.0	0.4	0.0	4.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	4.2	3.5	0.0	0.0	5.6	0.0	0.7	0.0	2.2			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.5	8.8	0.0	0.0	25.9	0.0	16.8	0.0	22.4			
LnGrp LOS	C	A	A	A	C		B	A	C			
Approach Vol, veh/h		1281			501	A		290				
Approach Delay, s/veh		14.0			25.9			20.9				
Approach LOS		B			C			C				
Timer - Assigned Phs		2		4			7	8				
Phs Duration (G+Y+Rc), s		13.0		34.4			15.4	19.0				
Change Period (Y+Rc), s		4.0		4.0			4.0	4.0				
Max Green Setting (Gmax), s		17.0		35.0			14.0	17.0				
Max Q Clear Time (g_c+I1), s		8.5		19.2			11.2	14.2				
Green Ext Time (p_c), s		0.7		6.1			0.3	0.8				

### Intersection Summary

HCM 6th Ctrl Delay	17.8
HCM 6th LOS	B

### Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th TWSC  
3: Kimmie St & 93rd Ave

Projected 2023 with project  
PM Peak Hour

Intersection

Int Delay, s/veh 306.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	100	759	13	9	707	30	77	8	26	100	1	225
Future Vol, veh/h	100	759	13	9	707	30	77	8	26	100	1	225
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	1	1	1	0	0	0	2	2	2
Mvmt Flow	106	807	14	10	752	32	82	9	28	106	1	239

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	784	0	0	821
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.11
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.209
Pot Cap-1 Maneuver	834	-	-	813
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %		-	-	-
Mov Cap-1 Maneuver	834	-	-	813
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.1	\$ 2317.9	\$ 1137.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	22	834	-	-	813	-	-	104
HCM Lane V/C Ratio	5.368	0.128	-	-	0.012	-	-	3.335
HCM Control Delay (s)	\$ 2317.9	9.9	0	-	9.5	0	-	\$ 1137.5
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	15	0.4	-	-	0	-	-	34.2

Notes

~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	213.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕		↕			↕	
Traffic Vol, veh/h	6	642	151	104	622	85	106	19	44	138	73	3
Future Vol, veh/h	6	642	151	104	622	85	106	19	44	138	73	3
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	0	0	0
Mvmt Flow	6	662	156	107	641	88	109	20	45	142	75	3
Number of Lanes	0	1	0	0	1	1	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	281.8	237.6	20.1	22.7
HCM LOS	F	F	C	C

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	63%	1%	14%	0%	64%
Vol Thru, %	11%	80%	86%	0%	34%
Vol Right, %	26%	19%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	169	799	726	85	214
LT Vol	106	6	104	0	138
Through Vol	19	642	622	0	73
RT Vol	44	151	0	85	3
Lane Flow Rate	174	824	748	88	221
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.4	1.559	1.514	0.159	0.498
Departure Headway (Hd)	10.384	7.584	8.146	7.347	10.09
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	348	486	457	492	360
Service Time	8.384	5.584	5.846	5.047	8.09
HCM Lane V/C Ratio	0.5	1.695	1.637	0.179	0.614
HCM Control Delay	20.1	281.8	264.1	11.4	22.7
HCM Lane LOS	C	F	F	B	C
HCM 95th-tile Q	1.9	40.1	35.5	0.6	2.7

HCM 6th TWSC  
5: Site Driveway/Driveway & 93rd Ave

Projected 2023 with project  
PM Peak Hour

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕				↕			↕
Traffic Vol, veh/h	45	868	33	1	1009	10	0	0	4	0	0	135
Future Vol, veh/h	45	868	33	1	1009	10	0	0	4	0	0	135
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	49	943	36	1	1097	11	0	0	4	0	0	147

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1108	0	0	979	0	0	-	-	961	-	-	1103
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	4.12	-	-	4.12	-	-	-	-	6.22	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	-	-	3.318	-	-	3.318
Pot Cap-1 Maneuver	630	-	-	705	-	-	0	0	311	0	0	257
Stage 1	-	-	-	-	-	-	0	0	-	0	0	-
Stage 2	-	-	-	-	-	-	0	0	-	0	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	630	-	-	705	-	-	-	-	311	-	-	257
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0			16.7			36.1		
HCM LOS							C			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	311	630	-	-	705	-	-	257
HCM Lane V/C Ratio	0.014	0.078	-	-	0.002	-	-	0.571
HCM Control Delay (s)	16.7	11.2	0	-	10.1	0	-	36.1
HCM Lane LOS	C	B	A	-	B	A	-	E
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	3.2

HCM 6th TWSC  
6: Kimmie St & Site Driveway

Projected 2023 with project  
PM Peak Hour

Intersection

Int Delay, s/veh 7.3

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations						
Traffic Vol, veh/h	67	1	1	5	5	6
Future Vol, veh/h	67	1	1	5	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	1	1	5	5	6

Major/Minor Minor2 Major1 Major2

Conflicting Flow All	15	8	11	0	-	0
Stage 1	8	-	-	-	-	-
Stage 2	7	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	1004	1074	1608	-	-	-
Stage 1	1015	-	-	-	-	-
Stage 2	1016	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	1003	1074	1608	-	-	-
Mov Cap-2 Maneuver	1003	-	-	-	-	-
Stage 1	1014	-	-	-	-	-
Stage 2	1016	-	-	-	-	-

Approach EB NB SB

HCM Control Delay, s	8.9	1.2	0
HCM LOS	A		

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT SBR

Capacity (veh/h)	1608	-	1004	-	-
HCM Lane V/C Ratio	0.001	-	0.071	-	-
HCM Control Delay (s)	7.2	0	8.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Lanes, Volumes, Timings  
3: Kimmie St & 93rd Ave

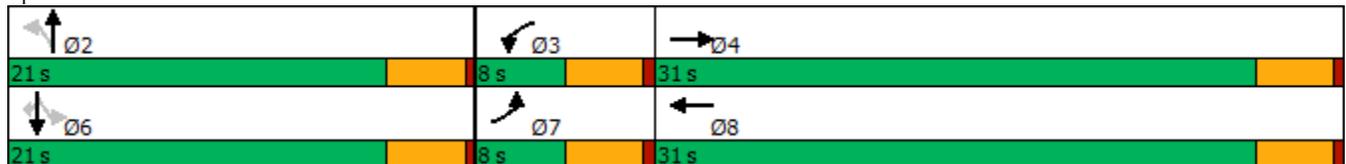
Projected 2023 with project  
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	759	13	9	707	30	77	8	26	100	1	225
Future Volume (vph)	100	759	13	9	707	30	77	8	26	100	1	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30				30
Link Distance (ft)		812			3700			1361				943
Travel Time (s)		13.8			63.1			30.9				21.4
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	0%	0%	0%	2%	2%	2%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			2				6
Permitted Phases							2			6		6
Detector Phase	7	4		3	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	20.0
Total Split (s)	8.0	31.0		8.0	31.0		21.0	21.0		21.0	21.0	21.0
Total Split (%)	13.3%	51.7%		13.3%	51.7%		35.0%	35.0%		35.0%	35.0%	35.0%
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	Min		None	Min		None	None		None	None	None

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 52.5  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 3: Kimmie St & 93rd Ave



# HCM 6th Signalized Intersection Summary

## 3: Kimmie St & 93rd Ave

Projected 2023 with project  
PM Peak Hour

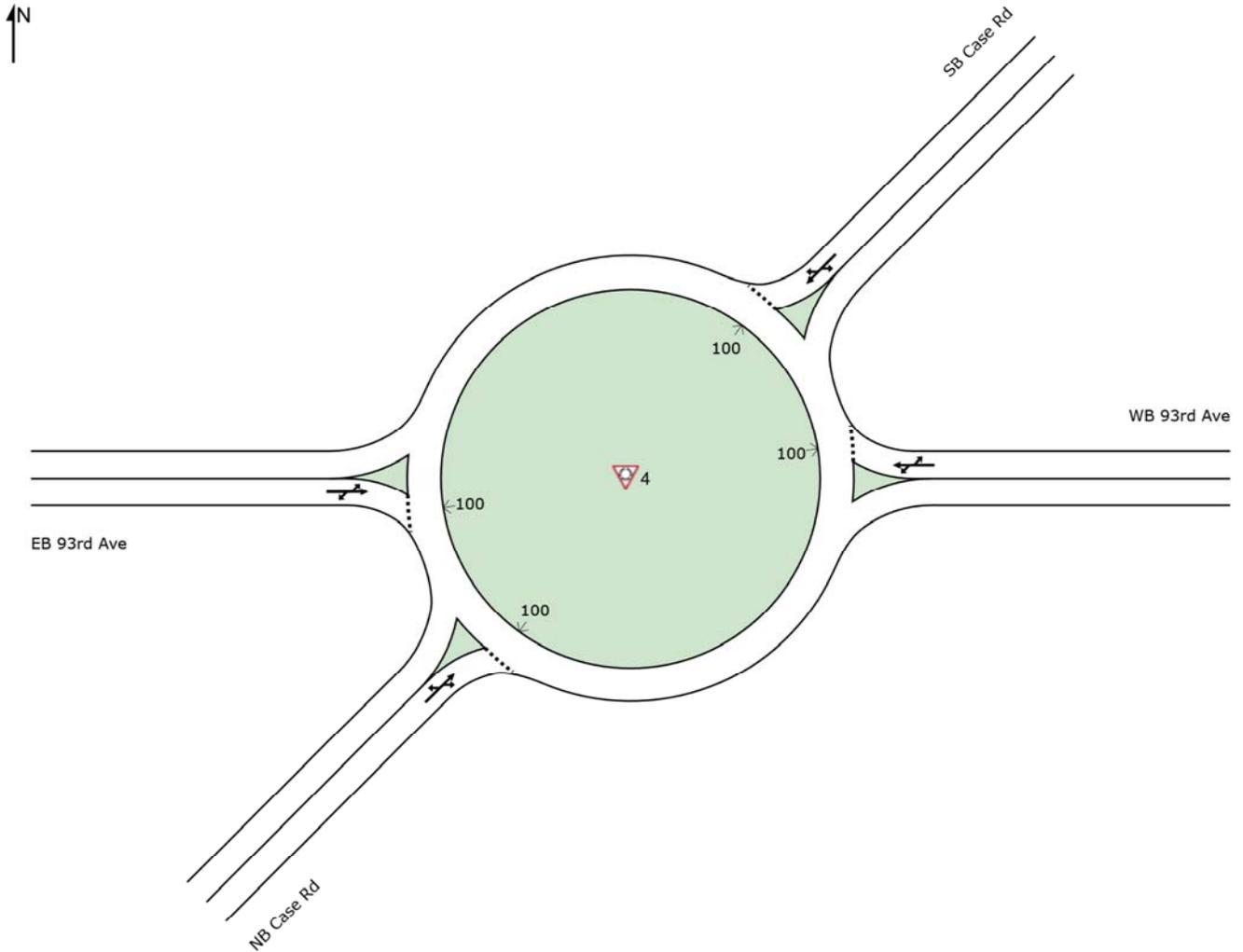


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	100	759	13	9	707	30	77	8	26	100	1	225
Future Volume (veh/h)	100	759	13	9	707	30	77	8	26	100	1	225
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1885	1885	1885	1900	1900	1900	1870	1870	1870
Adj Flow Rate, veh/h	106	807	14	10	752	32	82	9	28	106	1	239
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	1	1	1	0	0	0	2	2	2
Cap, veh/h	135	993	17	19	855	36	249	39	50	438	3	319
Arrive On Green	0.08	0.54	0.54	0.01	0.48	0.48	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	1781	1833	32	1795	1795	76	618	196	251	1447	17	1585
Grp Volume(v), veh/h	106	0	821	10	0	784	119	0	0	107	0	239
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1795	0	1871	1065	0	0	1464	0	1585
Q Serve(g_s), s	2.8	0.0	17.5	0.3	0.0	18.4	2.9	0.0	0.0	0.0	0.0	6.9
Cycle Q Clear(g_c), s	2.8	0.0	17.5	0.3	0.0	18.4	5.8	0.0	0.0	2.9	0.0	6.9
Prop In Lane	1.00		0.02	1.00		0.04	0.69		0.24	0.99		1.00
Lane Grp Cap(c), veh/h	135	0	1010	19	0	892	339	0	0	442	0	319
V/C Ratio(X)	0.78	0.00	0.81	0.54	0.00	0.88	0.35	0.00	0.00	0.24	0.00	0.75
Avail Cap(c_a), veh/h	146	0	1035	148	0	1039	529	0	0	646	0	554
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.1	0.0	9.1	23.9	0.0	11.5	18.1	0.0	0.0	16.7	0.0	18.3
Incr Delay (d2), s/veh	22.4	0.0	4.9	21.8	0.0	7.9	0.6	0.0	0.0	0.3	0.0	3.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	5.6	0.2	0.0	7.0	1.2	0.0	0.0	0.9	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.5	0.0	14.1	45.7	0.0	19.4	18.7	0.0	0.0	17.0	0.0	21.8
LnGrp LOS	D	A	B	D	A	B	B	A	A	B	A	C
Approach Vol, veh/h		927			794			119				346
Approach Delay, s/veh		17.5			19.7			18.7				20.3
Approach LOS		B			B			B				C
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		13.8	4.5	30.4		13.8	7.7	27.2				
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0				
Max Green Setting (Gmax), s		17.0	4.0	27.0		17.0	4.0	27.0				
Max Q Clear Time (g_c+I1), s		7.8	2.3	19.5		8.9	4.8	20.4				
Green Ext Time (p_c), s		0.4	0.0	3.2		0.9	0.0	2.8				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				18.8								
HCM 6th LOS				B								

# SITE LAYOUT

## Site: 4 [4) Case Rd at 93rd Ave]

Projected 2023 with Project and Mitigation  
Tumwater East I-5 Industrial Development  
PM Peak Hour  
Site Category: (None)  
Roundabout



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Organisation: SCJ ALLIANCE | Created: Wednesday, November 6, 2019 7:25:42 PM

Project: N:\Projects\0580 Puget Western Inc\0580.07 Kenosha East Addition Traffic Impact Analysis\Phase 40 - 2019 TIA Update\Operations\Sidra  
\Case Road at 93rd Avenue.sip8

# MOVEMENT SUMMARY

## Site: 4 [4] Case Rd at 93rd Ave]

Projected 2023 with Project and Mitigation  
 Tumwater East I-5 Industrial Development  
 PM Peak Hour  
 Site Category: (None)  
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: WB 93rd Ave												
1a	L1	107	1.0	0.723	10.0	LOS B	8.3	208.1	0.68	0.55	0.68	35.3
6	T1	641	1.0	0.723	5.3	LOS A	8.3	208.1	0.68	0.55	0.68	35.6
16b	R3	88	1.0	0.723	5.5	LOS A	8.3	208.1	0.68	0.55	0.68	34.1
Approach		836	1.0	0.723	5.9	LOS A	8.3	208.1	0.68	0.55	0.68	35.4
NorthEast: SB Case Rd												
1bx	L3	142	0.0	0.369	17.1	LOS B	2.5	63.2	0.87	0.93	0.87	33.0
6x	T1	75	0.0	0.369	9.9	LOS A	2.5	63.2	0.87	0.93	0.87	32.6
16ax	R1	3	0.0	0.369	9.5	LOS A	2.5	63.2	0.87	0.93	0.87	32.3
Approach		221	0.0	0.369	14.5	LOS B	2.5	63.2	0.87	0.93	0.87	32.9
West: EB 93rd Ave												
5a	L1	6	2.0	0.832	16.5	LOS B	13.4	340.5	0.96	0.98	1.27	33.4
2	T1	662	2.0	0.832	11.7	LOS B	13.4	340.5	0.96	0.98	1.27	33.7
12b	R3	156	2.0	0.832	11.9	LOS B	13.4	340.5	0.96	0.98	1.27	32.4
Approach		824	2.0	0.832	11.8	LOS B	13.4	340.5	0.96	0.98	1.27	33.4
SouthWest: NB Case Rd												
5bx	L3	109	2.0	0.305	16.4	LOS B	2.1	52.5	0.86	0.90	0.86	33.4
2x	T1	20	2.0	0.305	9.2	LOS A	2.1	52.5	0.86	0.90	0.86	32.9
12ax	R1	45	2.0	0.305	8.9	LOS A	2.1	52.5	0.86	0.90	0.86	32.7
Approach		174	2.0	0.305	13.6	LOS B	2.1	52.5	0.86	0.90	0.86	33.2
All Vehicles		2055	1.4	0.832	9.9	LOS A	13.4	340.5	0.83	0.79	0.95	34.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: N:\Projects\0580 Puget Western Inc\0580.07 Kenosha East Addition Traffic Impact Analysis\Phase 40 - 2019 TIA Update\Operations\Sidra \Case Road at 93rd Avenue.sip8

## Appendix E

USFWS Cultural Resources Team (CRT letter (FWS/IR09/IR12, May 28, 2020)



United States Department of the Interior

FISH AND WILDLIFE SERVICE

20555 SW Gerda Lane

Sherwood, Oregon 97140

Phone: 503-625-4377, fax: 503-625-4887



In Reply Refer to: FWS/IR09/IR12

28 May 2020

To: Martin Acker  
Program: ES  
Funding: HCP

From: R1/R8 Cultural Resources Team  
Anan Raymond, Regional Historic Preservation Officer

Subject: Section 106 Compliance: **Tumwater East Commercial Area/ Tumwater West Conservation Area HCP**, Thurston County, Washington

Thank you for requesting the assistance of the Cultural Resources Team (CRT) regarding the project listed above. The U.S. Fish and Wildlife Service (FWS) is reviewing the Habitat Conservation Plan (HCP) pursuant to the Endangered Species Act of 1973 (ESA) for the subject and issuing a Section 10 incidental take permit (ITP). Federally listed species which have the potential to occur in the development area for the project include the Mazama pocket gopher.

**Undertaking and APE:** The applicant is preparing the HCP in support of their application for an ITP issued by the FWS. The covered activities evaluated in the HCP are otherwise lawful and permitted under Washington’s SEQA process, and include commercial warehouse development on four parcels (12721130000, 12721140100, 12721110400, and 12721110200) located east of I-5 and south of 93rd Avenue SW in the City of Tumwater, Washington (T17N R2W S21, Maytown 7.5’ USGS quad) (Figure 1 and 2). The entire site will be excavated or filled, graded, and developed, including stormwater ponds, impervious cover, and landscaping, resulting in site-wide ground disturbance. The site is located in the City of Tumwater, and the proposed development is consistent with the City’s development plans and zoning. The site was previously used for residential and agricultural land uses, and is currently vacant and has no buildings.

The HCP includes mitigation for Mazama pocket gopher on the Conservation Site on the west side of I-5. The entire 67.5-acre Tumwater West site will be dedicated in perpetuity to the conservation of the Olympia subspecies of Mazama pocket gopher. Trees will be removed from the southernmost 4 acres of the Conservation Area. If stump removal occurs, the methods creating the least ground disturbance will be implemented. A vacant residence and shed will be removed from the northern portion of the conservation site. The site will be maintained in grassland cover, with management prescriptions to transition toward native prairie cover during the 20-year proposed permit term. Native prairie cover is a high-performance goal, not a compliance threshold for conservation site management. The federally-threatened gopher lives in upper layers of the soil, so minimizing ground disturbance while maintaining herbaceous cover is the compliance threshold for the

INTERIOR REGION 8  
LOWER COLORADO BASIN

INTERIOR REGION 9  
COLUMBIA-PACIFIC  
NORTHWEST

INTERIOR REGION 10  
CALIFORNIA-GREAT BASIN

INTERIOR REGION 12  
PACIFIC ISLANDS

CALIFORNIA\*  
\*PARTIAL

IDAHO, MONTANA\*,  
OREGON\*, WASHINGTON  
\*PARTIAL

CALIFORNIA, NEVADA

AMERICAN SAMOA, GUAM,  
HAWAII, NORTHERN  
MARIANA ISLANDS

conservation site. The Service's decision would be whether to issue an incidental take permit to cover take of the Olympia subspecies of Mazama pocket gopher consistent with the Applicant's Habitat Conservation Plan. Construction activities would be permitted by the local municipality.

Ground-disturbing actions will occur throughout the 79-acre development site located east of the interstate highway, and along the existing road shoulders on 93rd Ave SW and Kimmie St SW between the project site and the interstate highway. Development will be completed within 20 years of permit issuance, likely sooner. All vegetation and surface soils may be excavated, compacted, filled, and/or covered. Full development would result in multiple warehouses (~1-4 buildings) with parking lots, and stormwater ponds. Fencing may be installed within, or at the perimeter, of the development site.

The Applicant will permanently maintain grassland conditions on the 67.5-acre site west of the highway. Development rights would be extinguished through a conservation easement. The entire conservation site would be managed to maintain grassland conditions as habitat for the Olympia subspecies of Mazama pocket gopher in perpetuity. A vacant building and some trees will be removed with measures to avoid ground disturbance outside the footprint of the existing building (e.g., work done by hand, or weight-distributing mats where equipment crosses native soils). Other management may include mowing, seeding, prescribed fire, and other measures to promote native prairie restoration.

The area of potential effects (APE) is the commercial development site east of the Interstate 5 where ~79 acres will be developed for commercial uses and the 67.5 acre conservation area on the west side of Interstate 5 which will be permanently maintained in grassland cover to benefit the pocket gopher.

**Background Information and Land Use History:** According to the information you provided, the project is in the South Puget Lowlands, an area with extensive forest lands and historically-expansive prairies and oak savannahs resulting from the receding Vashon Glacier approximately 10,000 to 15,000 years ago. Flora and fauna unique to the area settled on the glacial outwash plains, which slowly developed into prairie ecosystems maintained by natural and anthropogenic fire. Where fire did not occur, native forests grew. Native Americans periodically burned the prairies to reinvigorate the grasses and forbs, which were important food sources, and to prevent the growth and expansion of coniferous trees. These areas were managed and burned repeatedly for thousands of years, which created prairies in the South Puget Lowlands and supported some endemic plants and animals.

Non-indigenous people began arriving in the early- to mid-1800s and transformed many of the prairies into cultivated fields and livestock pastures. As of the early 2000s, only about 8% of the original prairie areas still support grassland vegetation and about 2-3% of the historical prairie is still characterized by native prairie vegetation. Both the development area and the conservation area have been subject to the construction and removal of structures as well as agriculture.

**Cultural Resource Identification Effort:** A cultural resource investigation of the commercial development area on the east side of I-5 was conducted by Aqua Terra Cultural Resource Consultants (ATCRC) under contract to Puget Western, Inc. The effort included archival research, visual and subsurface inspection of the APE and development of a regional prehistoric, ethnographic, and historic context that is summarized in the referenced report (Perhay and Amell 2019). A total of 327 shovel test probes and augur tests were excavated throughout the development area. As a result of the survey and testing, no prehistoric or historic cultural materials were observed (Perhay and Amell 2019:13). An abandoned single-family home structure dating to approximately 1940 with two outbuildings was identified, recorded, and determined not eligible (DAHP 4 February 2020).

A record search for the area encompassing the conservation area indicates no previous cultural resources or

surveys documented within the APE. No field identification effort was conducted for the current undertaking, because the habitat management activities – mowing, seeding, and prescribed fire-- do not involve ground disturbance beyond the levels experienced during past residential occupation and agricultural manipulation.

**Consultation:** In 2019, the contractor corresponded with the Nisqually Tribe in the context of SEQA to request technical cultural information and provide details about the survey schedule for the development area (Perhay and Amell 2019:3). Cultural resources specialist Brad Beach responded with no concerns and a request to be kept informed regarding the results of the survey. No project-specific consultation was conducted by the FWS.

**Recommendations:** Based on a review of geologic and hydrologic processes, past and present land use, and the results of cultural resource identification efforts, the FWS has concluded that the activities fall under Appendix A of the Programmatic Agreement among the FWS, Washington State Historic Preservation Office, and the Advisory Council on Historic Preservation (PA). No additional field inventory for cultural resources is warranted in regards to this project. An Appendix A determination indicates that the FWS has evaluated the potential impact of the proposed project on cultural resources at the location listed above, and we do not anticipate that the project would affect or impact historic properties. The project will be included in the annual report prepared by the Cultural Resources Team (CRT) and submitted to the SHPO under the terms of the PA at the end of the fiscal year.

However, appropriate steps should be taken to address inadvertent discovery of cultural materials:

- The contractor's report for the development area provides a protocol for the inadvertent discovery of archaeological resources or human remains which has been attached to this memo as Attachment A. This IDP should be shared with the project applicant, whose responsibility it is to ensure that all field crew are trained and briefed on the contents and its importance.

If this protocol is followed, the project can be considered in compliance with Section 106. This determination of effect applies only to the activities described above. Plans for future federally-funded ground disturbing activities within the same location may require a separate determination of effect, and may require additional consultation and inventory efforts to ensure Section 106 compliance. Please notify us if there are changes to the scope of planned activities or proposed physical footprint. If you have any questions, please call us at 503-625-4377. Thank you for considering cultural resources.

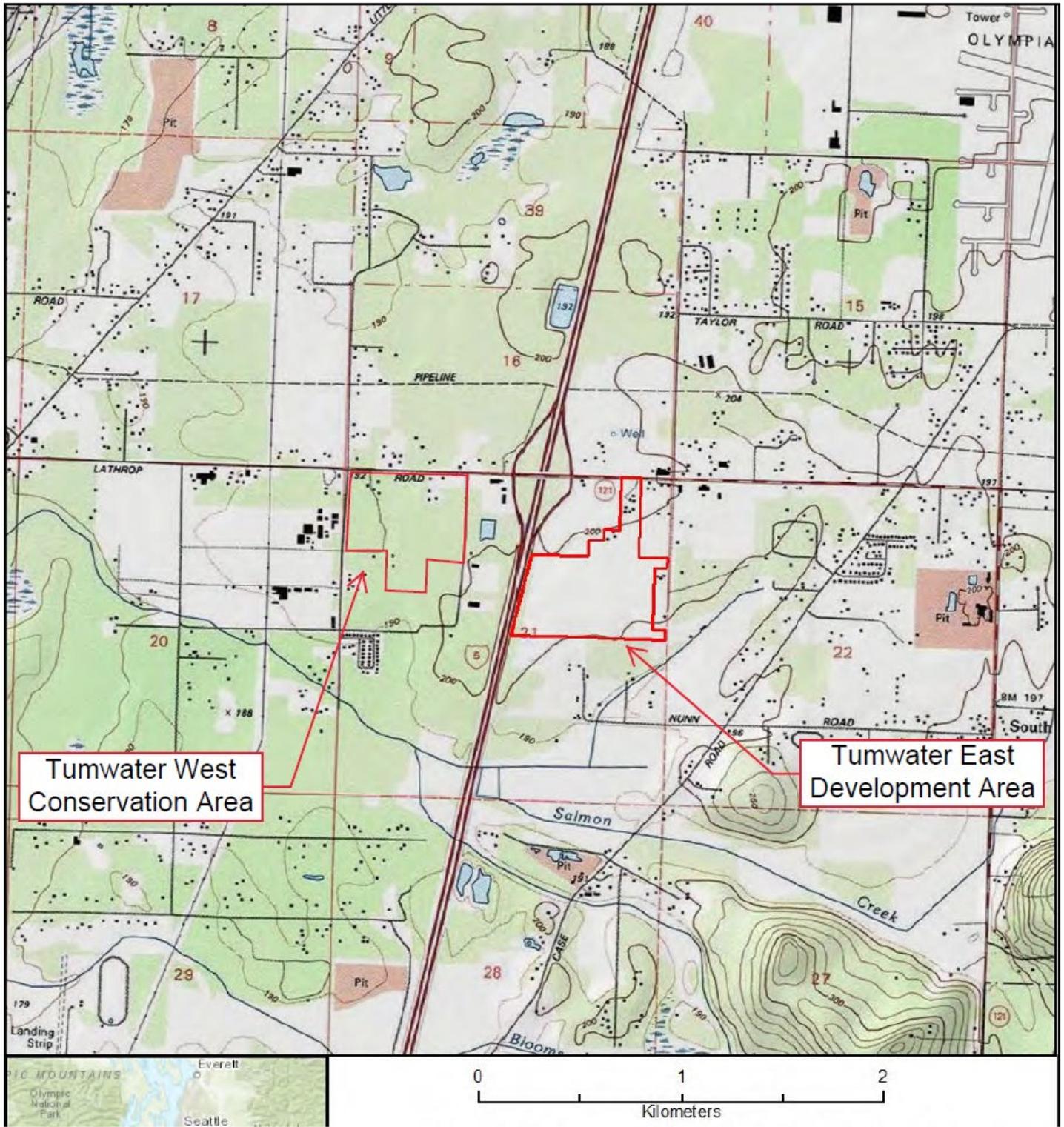


Figure 1. Project location on Maytown 7.5' USGS quad.



Figure 2. Close up of project location on aerial photograph.

Appendix F  
Public Comments Received