Stafford Meadows at Frog Pond West

Wilsonville, Oregon

Request for

Annexation
Zoning Map Amendment
Planned Development – Stage 1
Planned Development – Stage 2
Site Development Review
Sensitive Resource Impact Review
Type C Tree Plan
Subdivision

RECEIVED
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BY:_____________

Prepared for:
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, OR 97210

April 18, 2018

Prepared By:
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Portland, OR 97204

Project No. 17868.100

City of Wilsonville
Exhibit B2 DB18-0008 et al

REQUESTS

Annexation, Zoning Map Amendment, Planned Development, Site Development Review, Sensitive Resource Impact Review, Type C Tree Plan, and Subdivision approval is requested for the sites at 6651, 6855, 6875, and 7025 SW Boeckman Rd. The site is located within the West Neighborhood of the Frog Pond Area Plan boundaries, and is subject to Planned Development (PD) review. The project is a residential PD including 44-46 single-family residential dwellings and infrastructure improvements. The site contains 3 existing single-family homes, 5 existing outbuildings, and a mapped significant natural resource area (SROZ).

SITE INFORMATION

SUBJECT PROPERTY:	6651 SW Boeckman Rd (TLID 31W12D 02001) 6855 SW Boeckman Rd (TLID 31W12D 02100) 6875 SW Boeckman Rd (TLID 31W12D 02201) 7025 SW Boeckman Rd (TLID 31W12D 02202)
SITE AREA:	16.15 ac
COMPREHENSIVE PLAN DESIGNATION:	*Current:* Clackamas County RRFF5 *Proposed:* Residential Neighborhood RN
ZONING DESIGNATION:	*Current*: Clackamas County RRFF5 *Overlay:* Significant Resources Overlay Zone SROZ *Proposed:* Residential Neighborhood RN *Overlay:* Planned Development PD

APPLICANT/PROPERTY OWNER

APPLICANT(S):	West Hills Land Development LLC 3330 NW Yeon Ave, Suite 200 Portland, OR 97210 Contact: Dan Grimberg 503.726.7033 dan@westhillsdevelopment.com
OWNER(S):	*6651 SW Boeckman Rd:* The Killinger Trust 2516 Tice Creek Drive #2 Walnut Creek, CA 94595 *7025 SW Boeckman Rd:* Louie M. Pike and Gayla D. Cushman-Pike 7025 SW Boeckman Rd Wilsonville, OR 97070 *6875 SW Boeckman Rd:* Dale I. Kreilkamp and Verla S. Kreilkamp 6875 SW Boeckman Rd Wilsonville, OR 97070 *6855 SW Boeckman Rd:* Wehler Family Survivor's Trust & Wehler Family Decedent's Trust 6855 SW Boeckman Rd Wilsonville, OR 97070

PROJECT DEVELOPMENT TEAM

APPLICANT'S REPRESENTATIVE/ LAND USE PLANNER:	Otak, Inc. 808 SW Third Avenue, Suite 300 Portland, OR 97204 Contact: Li Alligood, AICP 503.415.2384 li.alligood@otak.com
CIVIL ENGINEER:	Contact: Matt Klym, PE 503.415.2351 Matt.klym@otak.com
LANDSCAPE ARCHITECT:	Contact: David Haynes, PLA 360.906.6782 david.haynes@otak.com
GEOTECHNICAL ENGINEER:	Hardman Geotechnical Services, Inc. 10110 SW Nimbus Ave, Suite B-5 Portland, OR 97223 Contact: Scott Hardman 503.530.8076 shardman.hgsi@frontier.com
NATURAL RESOURCES CONSULTANT:	Anchor QEA 6720 SW Macadam Avenue, Suite 125 Portland, Oregon 97219 Contact: Greg Summers 503.924.6196 gsummers@anchorqea.com
ARBORIST:	Portland Tree Consulting PO Box 19042 Portland, OR 97280 Contact: Peter Torres, MF 503.452.8160 peter@pdxtreeconsulting.com

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Reduced Size Plan Set

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I. Requests

Annexation, Zoning Map Amendment, Planned Development, Site Development Review, Sensitive Resource Impact Review, Type C Tree Plan, and Subdivision approval is requested for the sites at 6651, 6855, 6875, and 7025 SW Boeckman Rd. The site is located within the West Neighborhood of the Frog Pond Area Plan boundaries, and is subject to Planned Development (PD) review. The project is a residential PD including 44-46 single-family residential dwellings and infrastructure improvements. The site contains 3 existing single-family homes, 5 existing outbuildings, and a mapped significant natural resource area (SROZ).

Annexation approval is required to annex the site into City limits and connect to City utilities.

Zoning Map Amendment approval is required to apply the RN zoning to the site.

Planned Development approval is required because all development in the RN Zone requires approval as a Planned Development.

Site Development Review approval is required for review of tracts and their landscaping, landscaping in the public right-of-way, and the Boeckman Road wall.

Sensitive Resource Impact Review approval is required due to the presence of mapped SROZ on the site.

Type C Tree Plan approval is required to remove trees on site for development.

Subdivision approval is required to divide the property into 44 or 46 single-family lots and 13 tracts. Land division of 4 lots or more are defined as subdivisions.

II. Project Description

The proposed development will include 44-46 lots, depending on the disposition of Tract M, a Future Development Tract. As shown on Sheets P2.00 and P3.00, there are two proposed options for the development of Tract M:

- Option A would divide this tract into Lots 45 and 46, and extend Street B to the eastern property line. Tract K would be developed as a pedestrian pathway. This would result in a 46-lot development.
- Option B reflects the potential transfer of Tract M to another ownership. In this scenario, the tract would be separated from the project site boundaries and Street B would terminate at its western boundary. Track K would be graded for future development with a pedestrian connection but construction of that connection would occur with future development of Tract M by others. This would result in a 44-lot development.

The 16.15-acre site consists of 4 separate properties located in unincorporated Clackamas County, within the City of Wilsonville Urban Growth Boundary (UGB) and within the Frog Pond West subarea of the city. The site is currently zoned Clackamas County Rural Residential Farm Forest 5-Acre (RRFF5). This application will annex the site to the City of Wilsonville and apply the Residential Neighborhood RN zone to the site.

The site is currently in residential and agricultural use, and is adjacent to the City of Wilsonville PDR4 zone to the south, the Frog Pond PF, Subdistrict 13 zone to the west, the Frog Pond R-7, Subdistrict 5 to the north, and the Frog Pond Civic, Subdistrict 12 zone to the east. The site to the west is designated for future development with a school. The site to the north is “land banked” for future development with a park or residences. There is a drainage ditch (Willow Creek) and associated significant resource running north-south through the western portion of the site.

The home on Lot 25 is occupied by Ms. Wehler and will remain in place until the final plat for the subdivision is recorded, and will be replaced with a new home on proposed Lot 22. Per agreements between Ms. Wehler and the applicant, this lot is approximately 30,000 sq. ft. in area and will retain its mature trees.

III. Comprehensive Plan

A. *Urban Growth Management*

Response: Annexation of the site is subject to the provisions of the Urban Growth Management chapter of the Comprehensive Plan, specifically Goal 2.1 and Policy 2.2.1.

Policy 2.2.1.

The City of Wilsonville shall plan for the eventual urbanization of land within the local planning area, beginning with land within the Urban Growth Boundary.

Implementation Measure 2.2.1.a

Allow annexation when it is consistent with future planned public services and when a need is clearly demonstrated for immediate urban growth.

Response: The Comprehensive Plan states:

> *"Based on Metro's (1981) regional growth allocation statistics, Wilsonville's population was projected to grow to 15,600 by the year 2000. In the same time period, the City's economic growth is expected to generate a total of 14,400 jobs. Those projections proved to be surprisingly accurate. In fact, Wilsonville's population in 2000 approached the 15,600 figure, and the number of jobs exceeded the 14,400 figure."*

The subject site is located within the West Neighborhood of the Frog Pond planning area. The Frog Pond Area Plan was adopted in 2015 and the Frog Pond West Master Plan was adopted in 2017 and provides for single-family residential uses to meet the needs of Wilsonville's growing population.

The Frog Pond Area Plan includes a transportation framework, parks and open space framework, and infrastructure framework to support development within the Frog Pond area and sure adequate public services. This criterion is met.

Implementation Measure 2.2.1.e

Changes in the City boundary will require adherence to the annexation procedures prescribed by State law and Metro standards. Amendments to the City limits shall be based on consideration of:

1. *Orderly, economic provision of public facilities and services, i.e., primary urban services are available and adequate to serve additional development or improvements are scheduled through the City's approved Capital Improvements Plan.*

Response: The Frog Pond Area Plan includes implementation measures to ensure the orderly and economic provision of public facilities and services for the Frog Pond Area, including Frog Pond West. Site development is proposed with concurrent applications for Stage I and Stage II Planned Unit Development and Land Division, which proposes the extension of public facilities and services to the Stafford Meadows site. These proposed services are generally consistent with the Frog Pond Area Plan and Frog Pond West Master Plan, and the City's Finance Plan and Capital Improvements Plan. This criterion is met.

2. *Availability of sufficient land for the various uses to insure choices in the marketplace for a 3 to 5 year period.*

Response: The inclusion of the Frog Pond area within the UGB and the adoption of the Frog Pond Area Plan demonstrate the need for residential development in the Frog Pond Area. Annexation of the subject site will allow development of the uses envisioned by the adopted Frog Pond West Master Plan.

3. *Statewide Planning Goals.*

Response: The Statewide Planning Goals provide direction to local jurisdictions regarding the State's policies on land use. These goals are implemented at the local level through Comprehensive Plans, which are required and reviewed by the Department of Land Conservation and Development (DLCD) for conformance with the Statewide Planning Goals. It is assumed that the City's adopted Comprehensive Plan (which includes the adopted Frog Pond Area Plan and Frog Pond West Master Plan) is in compliance with the Statewide Planning Goals (specifically Goal 2: Land Use Planning), and that compliance with the Wilsonville Comprehensive Plan also demonstrates compliance with the Statewide Planning Goals.

Relevant Statewide Planning Goals include:
- Goal 10: Housing
- Goal 12: Transportation
- Goal 14: Urbanization

Responses to each are addressed below.

Goal 10: Housing
This goal identifies a need for "needed housing," which is defined for cities having populations larger than 2,500 as attached and detached single-family housing, multiple-family housing, and manufactured homes. Annexation of the subject site into the Wilsonville city limits will provide detached single-family housing, which is defined as "needed housing" and will serve an identified need in the city.

Goal 12: Transportation
This goal identifies the importance of a safe, convenient, and economic transportation system, and requires local jurisdictions to adopt a Transportation System Plan (TSP). The proposed annexation area will comply with the Wilsonville Transportation System Plan, which has been updated to include the Frog Pond West area. Annexation of the subject site will allow for development of the site, including new street connections included in the TSP.

Goal 14: Urbanization
This goal identifies the need for orderly and efficient growth, the need to accommodate housing and employment within the urban growth boundary, and the importance of livable communities. The orderly annexation of this site, which is located within the Frog Pond West area, will provide additional housing within the UGB.

4. *Applicable Metro Plans;*

Response: The Metro Code contains relevant requirements. Section 3.07 Urban Growth Management Functional Plan (Functional Plan) provides direction to communities within Metro's jurisdiction regarding the region's land use and transportation policies, and Chapter 3.09 Local Government Boundary Changes identifies requirements for annexations.

Wilsonville is located within the jurisdiction of Metro, and its local plans and land use ordinance are subject to review by Metro. It is assumed that the City's adopted Comprehensive Plan (which includes the adopted Frog Pond West Master Plan) is in compliance with the Functional Plan, and that compliance with the Wilsonville Comprehensive Plan also demonstrates compliance with the Functional Plan.

Metro Code 3.07 Urban Growth Management Functional Plan

Applicable Titles of the Functional Plan are addressed below.

Title 1: Housing Capacity
Annexation of the subject site will increase the housing capacity of the city, as described and confirmed through adoption of the Frog Pond West Master Plan.

Title 11: Planning for New Urban Areas
The City of Wilsonville's adopted Frog Pond Area Plan and Frog Pond West Master Plan include a comprehensive overview of future development in the Frog Pond planning area. The proposed annexation will expand the boundaries of the city and allow for orderly development of the Frog Pond West Area.

Metro Code 3.09 Local Government Boundary Changes

3.09.040 Requirements for Petitions

- *A. A petition for a boundary change must contain the following information:*
  - *1. The jurisdiction of the reviewing entity to act on the petition;*
  - *2. A map and a legal description of the affected territory in the form prescribed by the reviewing entity;*
  - *3. For minor boundary changes, the names and mailing addresses of all persons owning property and all electors within the affected territory as shown in the records of the tax assessor and county clerk; and*
  - *4. For boundary changes under ORS 198.855(3), 198.857, 222.125 or 222.170, statements of consent to the annexation signed by the requisite number of owners or electors.*
- *B. A city, county and Metro may charge a fee to recover its reasonable costs to carry out its duties and responsibilities under this chapter.*

The petition included as Appendix A includes the information required by this section.

5. Encouragement of development within the City limits before conversion of urbanizable (UGB) areas.

Response: The subject site is located within the Frog Pond West planning area, which has been the subject of a great deal of local planning efforts. Expansion of the City's UGB to include this area was completed due to a determination that there was inadequate development area within the existing city limits. Annexation of this site will allow development that implements the vision of the Frog Pond West Master Plan.

B. Land Use and Development

Response: The requested zone change to RN(PD) is subject to compliance with Comprehensive Plan map designation and applicable goals, policies and objectives as well as compliance with the Land Use and Development chapter of the Comprehensive Plan, specifically Policy 4.1.4 and implementation measures 4.1.4.b, d, e, q, and x.

Policy 4.1.4 *The City of Wilsonville shall provide opportunities for a wide range of housing types, sizes, and densities at prices and rent levels to accommodate people who are employed in Wilsonville.*

Implementation Measure 4.1.4.b

Plan for and permit a variety of housing types consistent with the objectives and policies set forth under this section of the Comprehensive Plan, while maintaining a reasonable balance between the economics of building and the cost of supplying public services. It is the City's desire to provide a variety of housing types needed to meet a wide range of personal preferences and income levels. The City also recognizes the fact that adequate public facilities and services must be available in order to build and maintain a decent, safe, and healthful living environment.

Response: The proposed zone change to Residential Neighborhood RN and Planned Development PD implements the adopted Frog Pond West Master Plan and allows for development of single-family detached housing. The proposed development permitted by the zone change will provide adequate public facilities and services to serve the new dwellings.

Implementation Measure 4.1.4.d

Encourage the construction and development of diverse housing types, but maintain a general balance according to housing type and geographic distribution, both presently and in the future. Such housing types may include, but shall not be limited to: Apartments, single-family detached, single-family common wall, manufactured homes, mobile homes, modular homes, and condominiums in various structural forms.

Response: The Frog Pond West Master Plan anticipates single-family development. The proposed zone change implements the adopted Frog Pond West Master Plan and allows for development of single-family detached housing.

Implementation Measure 4.1.4.e

Targets are to be set in order to meet the City's Goals for housing and assure compliance with State and regional standards.

Response: The Frog Pond Area Plan and Frog Pond West Master Plan establish minimum and maximum residential densities for this area in compliance with State and regional standards. The proposed zone change will allow development of the subject site in conformance with those densities.

Implementation Measure 4.1.4.q

The City will continue to allow for mobile homes and manufactured dwellings, subject to development review processes that are similar to those used for other forms of housing. Individual units will continue to be allowed on individual lots, subject to design standards. Mobile home parks and subdivisions shall be subject to the same procedures as other forms of planned developments.

Response: No mobile homes or manufactured dwellings are proposed, but the applicant acknowledges that they are allowed.

Implementation Measure 4.1.4.x

Apartments and mobile homes are to be located to produce an optimum living environment for the occupants and surrounding residential areas. Development criteria includes:

1. *Buffering by means of landscaping, fencing, and distance from conflicting uses.*
2. *Compatibility of design, recognizing the architectural differences between apartment buildings and houses.*
3. *On-site recreation space as well as pedestrian and bicycle access to parks, schools, mass transit stops and convenience shopping.*
4. *The siting of buildings to minimize the visual effects of parking areas and to increase the availability of privacy and natural surveillance for security.*

Response: No apartments or mobile homes are proposed or permitted by the requested zoning.

RESIDENTIAL PLANNING DISTRICTS SHOWN ON THE LAND USE MAP OF THE COMPREHENSIVE PLAN

Response: The Frog Pond West Master Plan and the RN zone identify minimum density targets for the Frog Pond West subdistricts. As shown in Table 1, the density range in the R-10 land use designation, Sub-district 3 is 15-18 dwelling units per acre and the density range in the R-7 land use designation, Sub-district 2 is 26-31 dwelling units per acre. The proposed development will consist of 44 to 46 lots; either outcome would meet the minimum zone density as shown in Table 1 below.

Table 1—Proposed Residential Units

Land Use Designation	Sub-district	Area (ac)	Minimum du/ac	Maximum du/ac	Proposed du/ac	Comment
R-10	3	4.30	15	18.64	16-18	Meets density requirements
R-7	2	11.85	26	31.91	26	Meets density requirements
Total		***16.15***	***41***	***50.55***	***44-46***	

These densities are not specifically addressed in Comprehensive Plan policies. Per Section 4.124, these densities would be subject to PDR-6 or PDR-7 designations, which are addressed below.

Density (18-20 du/ac)
The purpose of this district is to provide for efficient use of land near the major commercial or employment centers by providing for high-density residential development. It is a further purpose of this district to encourage mixed uses in commercial areas. This density would generally fall under the PDR-6 and PDR-7 (or other categories that could work out to this level of density) zoning district categories as outlined in the Development Code.

The following areas may be designated urban high-density residential:

1. *Areas located on major or minor arterials and where such development will not result in significant traffic impacts through low- or medium-density residential areas.*
2. *Areas located within or adjacent to major shopping centers, employment centers and/or adjacent to mass transit routes.*

Because of the land use intensity allowable in this district, the zoning will be restricted to a Planned Development review.

All developments will be subject to Development Review Board approval, including lot sizes, setbacks, open space, and parking requirements. Where feasible, under-structure parking will be encouraged on structures over two (2) stories in height.

Response: The site is subject to approval through Planned Development review. The proposed RN zone includes several subdistricts; the site includes the R-7 and R-10 land use designations. The site has access from Boeckman Road, a minor arterial, and the Willow Creek Drive extension, a collector street. The development will not result in significant traffic impacts through areas outside of the Frog Pond Plan Area. The site is located adjacent to a SMART route. The site is located within an urban higher density planning district and additional urban development is anticipated nearby.

C. Areas of Special Interest

Area L

This area is located north of Boeckman Road, south of Frog Pond Lane, west of Wilsonville (Stafford) Road, and east of Boeckman Creek. It contains a mixture of rural-residential and small agricultural uses. Eventual redevelopment of the area is expected to be primarily residential. The West Linn – Wilsonville School District and a church have acquired property in the area, causing speculation that redevelopment with full urban services could occur prior to 2010. In fact construction of a new church has already commenced at the corner of Boeckman Road and Wilsonville/Stafford Road.

The existing development patterns, and values of the existing homes in the Frog Pond neighborhood are expected to slow the redevelopment process. Most of the land-owners in the area have expressed little or no interest in urban density redevelopment. The Metro standard for urbanizing residential land is an average residential density of at least 10 units/acre. Those densities may not appeal to many of the current residents of the area who live in large homes on lots with acreage. In view of the School District's plans to construct a school within the neighborhood, the City must prepare plans to serve the new school and the surrounding area.

Response: The site is located within Area L, now known as the Frog Pond Plan Area. The Frog Pond West Master Plan was adopted in 2017 and provides land use and infrastructure plans for urban density redevelopment. The proposed zone change to RN implements the provisions of the Frog Pond West Master Plan.

IV. Zoning

A. *Section 4.113. Standards Applying To Residential Developments In Any Zone.*

(.01) Outdoor Recreational Area in Residential Developments.

- *A. Purpose. The purposes of the following standards for outdoor recreational area are to provide adequate light, air, open space and usable recreational facilities to occupants of each residential development. Outdoor recreational area shall be: […]*

(.02) Open Space Area shall be provided in the following manner:[…]

Response: This application requests application of the Residential Neighborhood RN zone to the subject site. These standards are superseded by the standards of 4.127(.09), which are addressed in Section IV.C of this narrative.

(.03) Building Setbacks (for Fence Setbacks, see subsection .08)

- *A. For lots over 10,000 square feet: […]*
- *B. For lots not exceeding 10,000 square feet: […]*

Response: The application requests application of the Residential Neighborhood RN zone to the subject site. These standards are superseded by the standards of 4.127(.08), which are addressed in Section IV.C of this narrative.

[…]

(.06) Off Street Parking: Off-street parking shall be provided as specified in Section 4.155.

Response: The provisions of Section 4.155 are addressed in Section VI of this narrative.

(.07) Signs: Signs shall be governed by the provisions of Sections 4.156.01 – 4.156.11.

Response: The provisions of Sections 4.156.01-11 are addressed in Section VI of this narrative.

(.08) Fences:

- *A. The maximum height of a sight-obscuring fence located in the required front yard of a residential development shall not exceed four (4) feet.*
- *B. The maximum height of a sight-obscuring fence located in the side yard of a residential lot shall not exceed four (4) feet forward of the building line and shall not exceed six (6) feet in height in the rear yard, except as approved by the Development Review Board. Except, however, that a fence in the side yard of residential corner lot may be up to six (6) feet in height, unless a greater restriction is imposed by the Development Review Board acting on an application. A fence of up to six (6) feet in height may be constructed with no setback along the side, the rear, and in the front yard of a residential lot adjoining the rear of a corner lot as shown in the attached Figure.*
- *C. Notwithstanding the provisions of Section 4.122(10)(a) and (b), the Development Review Board may require such fencing as shall be deemed necessary to promote and provide traffic safety, noise mitigation, and nuisance abatement, and the compatibility of different uses permitted on adjacent lots of the same zone and on adjacent lots of different zones.*
- *D. Fences in residential zones shall not include barbed wire, razor wire, electrically charged wire, or be constructed of sheathing material such as plywood or flakeboard.*

Response: The site is located within Frog Pond West and is subject to these standards with the exception of the standards of 4.127(0.17) related to the Boeckman Road and Stafford Road frontages. No fences are proposed at this time. The provisions of 4.127(0.17) are addressed in Section IV.C of this narrative.

(.09) Corner Vision: Vision clearance shall be provided as specified in Section 4.177, or such additional requirements as specified by the City Engineer.

Response: The provisions of Section 4.177 are addressed in Section V.I of this narrative.

(.10) Prohibited Uses:

A. Uses of structures and land not specifically permitted in the applicable zoning districts.

B. The use of a trailer, travel trailer or mobile coach as a residence, except as specifically permitted in an approved RV park.

C. Outdoor advertising displays, advertising signs, or advertising structures except as provided in Sections 4.156.05, 4.156.07, 4.156.09, and 4.156.10.

Response: No prohibited uses are proposed. These provisions are not applicable.

(.11) Accessory Dwelling Units.

A. Accessory Dwelling Units, developed on the same lot as the detached or attached single-family dwelling to which it is accessory, shall be permitted outright, subject to the standards and requirements of this Section. […]

Response: No Accessory Dwelling Units are proposed. These standards are not applicable.

(.12) Reduced Setback Agreements. The following procedure has been created to allow the owners of contiguous residential properties to reduce the building setbacks that would typically be required between those properties, or to allow for neighbors to voluntary waive the solar access provisions of Section 4.137. Setbacks can be reduced to zero through the procedures outlined in this subsection. […]

Response: No reduced setbacks are proposed. These standards are not applicable.

(.13) Bed and Breakfasts.

A. Purpose. The purpose of this subsection is to provide standards for the establishment of bed and breakfast facilities. […]

Response: No Bed and Breakfasts are proposed. These standards are not applicable.

B. Section 4.124. Standards applying to all Planned Development Zones.

(.01) Height Guidelines: In "S" overlay zones, the solar access provisions of Section 4.137 shall be used to determine maximum building heights. In cases that are subject to review by the Development Review Board, the Board may further regulate heights as follows: […]

Response: The subject site is not located within the "S" overlay zone. These standards are not applicable.

(.02) Underground Utilities shall be governed by Sections 4.300 to 4.320. All utilities above ground shall be located so as to minimize adverse impacts on the site and neighboring properties.

Response: The provisions of Sections 4.300 to 4.320 are addressed in Section VII of this narrative.

(.03) Notwithstanding the provisions of Section 4.140 to the contrary, the Development Review Board, in order to implement the purposes and objectives of Section 4.140, and based on findings of fact supported by the record may:

A. Waive the following typical development standards:

1. *minimum lot area;*
2. *lot width and frontage;*
3. *height and yard requirements;*
4. *lot coverage;*
5. *lot depth;*
6. *street widths;*
7. *sidewalk requirements;*
8. *height of buildings other than signs;*
9. *parking space configuration and drive aisle design;*
10. *minimum number of parking or loading spaces;*
11. *shade tree islands in parking lots, provided that alternative shading is provided;*
12. *fence height;*
13. *architectural design standards;*
14. *transit facilities; and*
15. *On-site pedestrian access and circulation standards; and*
16. *Solar access standards, as provided in section 4.137.*

[Amended by Ord. #719, 6/17/13.]

Response: No waivers to these standards are requested.

[…]

(.05) Appropriate PDR zone based on Comprehensive Plan Density:

Comprehensive Plan Density	Zoning District
0-1 u/acre	PDR-1
2-3 u/acre	PDR-2
4-5 u/acre	PDR-3
6-7 u/acre	PDR-4
10-12 u/acre	PDR-5
16-20 u/acre	PDR-6
20 + u/acre	PDR-7

Table 1: PDR Zone based on Comprehensive Plan Density

[Section 4.124(.05) amended by Ordinance No. 538, 2/21/02.]

Response: The Comprehensive Plan density for the subject site ranges from 15 to 31 dwelling units per acre, which would fall within the PDR-6 and PDR-7 categories. The Comprehensive Plan Designation of Residential Neighborhood is implemented by the Residential Neighborhood RN zone and a PD overlay.

(.06) Block and access standards:

1. *Maximum block perimeter in new land divisions: 1,800 feet.*
2. *Maximum spacing between streets or private drives for local access: 530 feet, unless waived by the Development Review Board upon finding that barriers such as railroads, freeways, existing buildings, topographic variations, or designated Significant Resource Overlay Zone areas will prevent street extensions meeting this standard. [Amended by Ord. 682, 9/9/10]*
3. *Maximum block length without pedestrian and bicycle crossing: 330 feet, unless waived by the Development Review Board upon finding that barriers such as railroads, freeways, existing buildings, topographic variations, or designated Significant Resource Overlay Zone areas will prevent pedestrian and bicycle facility extensions meeting this standard.*

Response: None of the proposed blocks exceed the maximum block perimeters of 1,800 ft. or the maximum spacing standards of 530 ft. Each of the blocks meet the 330 ft. block length without pedestrian and bicycle crossing. Pedestrian connections are provided in 3 locations between Street B and Boeckman Road per the Frog Pond West Master Plan. Pedestrian connections are not proposed between Streets B and C or mid-block between Streets D and E.

[…]

(.09) Habitat-Friendly Development Practices. To the extent practicable, development and construction activities of any lot shall consider the use of habitat-friendly development practices, which include:

- *A. Minimizing grading, removal of native vegetation, disturbance and removal of native soils, and impervious area;*
- *B. Minimizing adverse hydrological impacts on water resources, such as using the practices described in Part (a) of Table NR-2 in Section 4.139.03, unless their use is prohibited by an applicable and required state or federal permit, such as a permit required under the federal Clean Water Act, 33 U.S.C. §§1251 et seq., or the federal Safe Drinking Water Act, 42 U.S.C. §§300f et seq., and including conditions or plans required by such permit;*
- *C. Minimizing impacts on wildlife corridors and fish passage, such as by using the practices described in Part (b) of Table NR-2 in Section 4.139.03; and*
- *D. Using the practices described in Part (c) of Table NR-2 in Section 4.139.03.*

[Section 4.118(.09) added by Ord. # 674 11/16/09]

Response: The site design has minimized impacts on the site through a minimization of impervious area; stormwater treatment using low impact development approach (LIDA) planters; and enhancement of the on-site Willow Creek SROZ area.

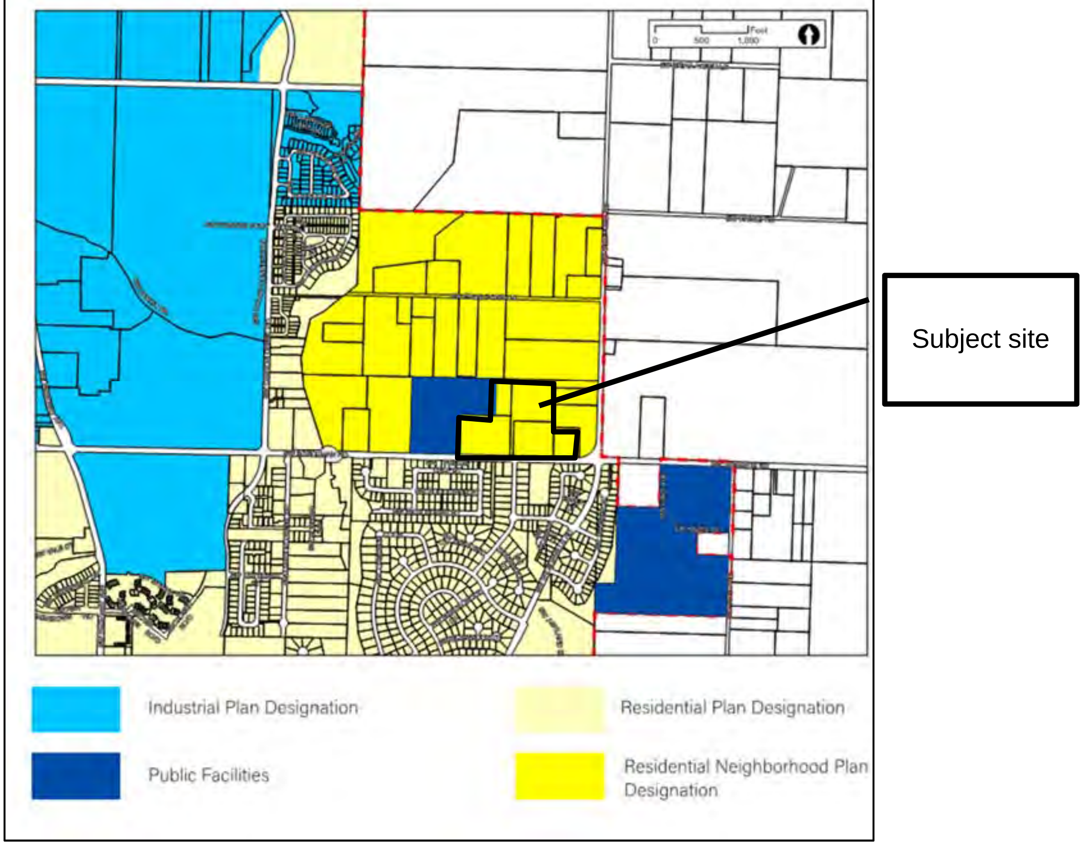
C. *Section 4.127. Residential Neighborhood (RN) Zone.*

(.01) Purpose. The Residential Neighborhood (RN) zone applies to lands within Residential Neighborhood Comprehensive Plan Map designation. The RN zone is a Planned Development zone, subject to applicable Planned Development regulations, except as superseded by this section or in legislative master plans. The purposes of the RN Zone are to:

- *A. Implement the Residential Neighborhood policies and implementation measures of the Comprehensive Plan.*
- *B. Implement legislative master plans for areas within the Residential Neighborhood Comprehensive Plan Map designation.*
- *C. Create attractive and connected neighborhoods in Wilsonville.*
- *D. Regulate and coordinate development to result in cohesive neighborhoods that include: walkable and active streets; a variety of housing appropriate to each neighborhood; connected paths and open spaces; parks and other non-residential uses that are focal points for the community; and, connections to and integration with the larger Wilsonville community.*
- *E. Encourage and require quality architectural and community design as defined by the Comprehensive Plan and applicable legislative master plans.*
- *F. Provide transportation choices, including active transportation options.*
- *G. Preserve and enhance natural resources so that they are an asset to the neighborhoods, and there is visual and physical access to nature.*

Response: Per Figure 5 of the Frog Pond West Master Plan (below), the site is located within the RN Comprehensive Plan Map designation, and is subject to these provisions and to applicable Planned Development (PD) regulations.

Figure 5. Comprehensive Plan Designations



(.02) Permitted uses:

A. Open Space.
B. Single-Family Dwelling Unit.
C. Attached Single-Family Dwelling Unit. In the Frog Pond West Neighborhood, a maximum of 2 dwelling units, not including ADU's, may be attached.
D. Duplex.
E. Multiple-Family Dwelling Units, except when not permitted in a legislative master plan, subject to the density standards of the zone. Multi-family dwelling units are not permitted within the Frog Pond West Master Plan area.
F. Cohousing.
G. Cluster Housing.
H. Public or private parks, playgrounds, recreational and community buildings and grounds, tennis courts, and similar recreational uses, all of a non-commercial nature, provided that any principal building or public swimming pool shall be located not less than forty-five (45) feet from any other lot.
I. Manufactured homes.

Response: The proposed residential PD includes 44-46 single-family dwelling units, which is a permitted use in the RN zone.

(.03) Permitted accessory uses to single family dwellings:

A. Accessory uses, buildings and structures customarily incidental to any of the principal permitted uses listed above, and located on the same lot.
B. Living quarters without kitchen facilities for persons employed on the premises or for guests. Such facilities shall not be rented or otherwise used as a separate dwelling unless approved as an accessory dwelling unit or duplex.

- C. *Accessory Dwelling Units, subject to the standards of Section 4.113 (.11).*
- D. *Home occupations.*
- E. *A private garage or parking area.*
- F. *Keeping of not more than two (2) roomers or boarders by a resident family.*
- G. *Temporary buildings for uses incidental to construction work, which buildings shall be removed upon completion or abandonment of the construction work.*
- H. *Accessory buildings and uses shall conform to front and side yard setback requirements. If the accessory buildings and uses do not exceed 120 square feet or ten (10) feet in height, and they are detached and located behind the rear-most line of the main buildings, the side and rear yard setbacks may be reduced to three (3) feet.*
- I. *Livestock and farm animals, subject to the provisions of Section 4.162.*

Response: No accessory uses are proposed at this time.

(.04) Uses permitted subject to Conditional Use Permit requirements:

- A. *Public and semi-public buildings and/or structures essential to the physical and economic welfare of an area, such as fire stations, sub-stations and pump stations.*
- B. *Commercial Recreation, including public or private clubs, lodges or meeting halls, golf courses, driving ranges, tennis clubs, community centers and similar commercial recreational uses. Commercial Recreation will be permitted upon a finding that it is compatible with the surrounding residential uses and promotes the creation of an attractive, healthful, efficient and stable environment for living, shopping or working. All such uses except golf courses and tennis courts shall conform to the requirements of Section 4.124(.04)(D) (Neighborhood Commercial Centers).*
- C. *Churches; public, private and parochial schools; public libraries and public museums.*
- D. *Neighborhood Commercial Centers limited to the provisions of goods and services primarily for the convenience of and supported by local residents. Neighborhood Commercial Centers are only permitted where designated on an approved legislative master plan.*

Response: No Conditional Uses are proposed.

(.05) Residential Neighborhood Zone Sub-districts:

- A. *RN Zone sub-districts may be established to provide area-specific regulations that implement legislative master plans.*
  1. *For the Frog Pond West Neighborhood, the sub-districts are listed in Table 1 of this code and mapped on Figure 6 of the Frog Pond West Master Plan. The Frog Pond West Master Plan Sub-District Map serves as the official sub-district map for the Frog Pond West Neighborhood.*

Response: The site is located within the Frog Pond West neighborhood, and includes properties within Sub-districts 2 and 3, as shown in Figure 6 of the Frog Pond West Master Plan and in Table 2 below.

(.06) Minimum and Maximum Residential Units:

- A. *The minimum and maximum number of residential units approved shall be consistent with this code and applicable provisions of an approved legislative master plan.*
  1. *For the Frog Pond West Neighborhood, Table 1 in this code and Frog Pond West Master Plan Table 1 establish the minimum and maximum number of residential units for the sub-districts.*
  2. *For parcels or areas that are a portion of a sub-district, the minimum and maximum number of residential units are established by determining the proportional gross acreage and applying that proportion to the minimums and maximums listed in Table 1. The maximum density on a parcel may be increased, up to a maximum of 10% of what would otherwise be permitted, based on an adjustment to an SROZ boundary that is consistent with 4.139.06.*

Response: As shown in Table 2 below, the proposed residential PD includes either 44 or 46 lots/dwelling units, depending on the final development of Tract M, which meets the minimum density requirements for Sub-districts 2 and 3.

Table 2 – Proposed residential units

Land Use Designation	**Sub-district**	**Area (ac)**	**Minimum du/ac**	**Maximum du/ac**	**Proposed du/ac**	**Comment**
R-10	3	4.30	15	18.64	16-18	Meets density requirements
R-7	2	11.85	26	31.91	26	Meets density requirements
Total		***16.15***	***41***	***50.55***	***44-46***	

B. The City may allow a reduction in the minimum density for a sub-district when it is demonstrated that the reduction is necessary due to topography, protection of trees, wetlands and other natural resources, constraints posed by existing development, infrastructure needs, provision of non-residential uses and similar physical conditions.

Response: No reduction to minimum density is requested. This provision is not applicable.

(.07) Development Standards Generally

A. Unless otherwise specified by this the regulations in this Residential Development Zone chapter, all development must comply with Section 4.113, Standards Applying to Residential Development in Any Zone.

Response: Compliance with applicable regulations of Section 4.113 is addressed in Section IV.A of this narrative. Some regulations of 4.127 supersede the regulations of 4.113.

(.08) Lot Development Standards:

A. Lot development shall be consistent with this code and applicable provisions of an approved legislative master plan.

B. Lot Standards Generally. For the Frog Pond West Neighborhood, Table 2 establishes the lot development standards unless superseded or supplemented by other provisions of the Development Code.

C. Lot Standards for Small Lot Sub-districts. The purpose of these standards is to ensure that development in the Small Lot Sub-districts includes varied design that avoids homogenous street frontages, creates active pedestrian street frontages and has open space that is integrated into the development pattern. […]

Response: The site does not contain Small Lot Sub-districts, and the provisions of (.08)C above are not applicable.

Table 2 establishes the following lot development standards for the Frog Pond West neighborhood. These standards supersede the setback standards of 4.113(.03). Lot dimensional standards are applied at the time of subdivision approval, while site development standards (setbacks, height, etc.) are applied at the time of building permit review. Sheet P2.00 illustrates the building envelopes for site and Appendix I provides examples of house plans. As shown in Table 3 below, the proposed lots meet the relevant standards.

Table 3 – Compliance with Frog Pond West Neighborhood Lot Standards

Standard	Required	Proposed	Required	Proposed	Comments
	R-10 Zone		R-7 Zone		
Min Lot Size	8,000 sf	8,118-30,248 sf	6,000 sf	6,017-6,146 sf	Meets standards.
Min Lot Depth	60 ft.	88.2-132 ft	60 ft.	85.6-101.7 ft	Meets standards.
Min Lot Width	40 ft	61.5-101.5 ft	35 ft	60 ft.	Meets standards

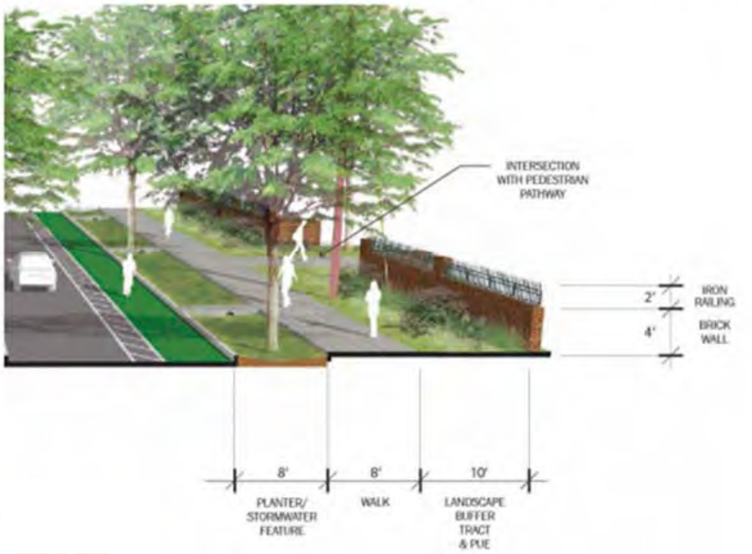
D. Lot Standards Specific to the Frog Pond West Neighborhood.

1. Lots adjacent to Boeckman Road and Stafford Road shall meet the following standards:

a. Rear or side yards adjacent to Boeckman Road and Stafford Road shall provide a wall and landscaping consistent with the standards in Figure 10 of the Frog Pond West Master Plan.

Response: There are 9 lots proposed adjacent to Boeckman Road. As shown in Sheets L2.0 and L2.2, these lots include a wall and landscaping consistent with Figure 10 of the Frog Pond West Master Plan (below).

Figure 10. Boeckman Road and Stafford Road Frontage Improvements



2. Lots adjacent to the collector-designated portions of Willow Creek Drive and Frog Pond Lane shall not have driveways accessing lots from these streets, unless no practical alternative exists for access. Lots in Large Lot Sub-districts are exempt from this standard.

Response: The site includes a portion of collector-designated Willow Creek Drive/Street A (between Street C and Boeckman Road). No driveways are proposed to access this portion of Willow Creek Drive.

(.09) Open Space:

A. Purpose. The purposes of these standards for the Residential Neighborhood Zone are to:

1. Provide light, air, open space, and useable recreation facilities to occupants of each residential development.

2. Retain and incorporate natural resources and trees as part of developments.

3. Provide access and connections to trails and adjacent open space areas.

For Neighborhood Zones which are subject to adopted legislative master plans, the standards work in combination with, and as a supplement to, the park and open space *recommendations of those legislative master plans. These standards supersede the Outdoor Recreational Area requirements in WC Section 4.113 (.01) and (02).*

B. *Within the Frog Pond West Neighborhood, the following standards apply:*
   1. *Properties within the R-10 Large Lot Single Family sub-districts and R-7 Medium Lot Single Family sub-districts are exempt from the requirements of this section. If the Development Review Board finds, based upon substantial evidence in the record, that there is a need for open space, they may waive this exemption and require open space proportional to the need.*

Response: As shown in Figure 6 of the Frog Pond West Master Plan, the site consists of properties within the R-10 and R-7 sub-districts and is exempt from the requirements of this section.

2. *For properties within the R-5 Small Lot Single Family sub-districts, Open Space Area shall be provided in the following manner: […]*

Response: The site does not contain R-5 sub-districts. These standards are not applicable.

(.10) Block, access and connectivity standards:

A. *Purpose. These standards are intended to regulate and guide development to create: a cohesive and connected pattern of streets, pedestrian connections and bicycle routes; safe, direct and convenient routes to schools and other community destinations; and, neighborhoods that support active transportation and Safe Routes to Schools.*

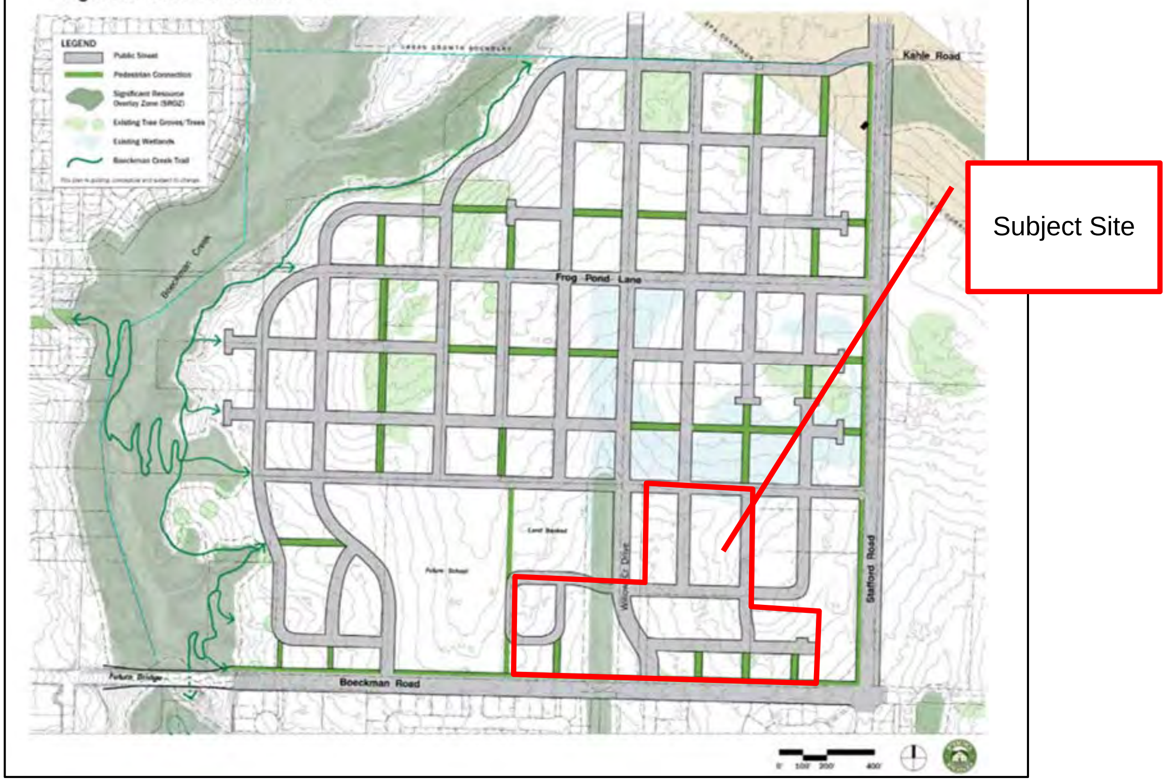
B. *Blocks, access and connectivity shall comply with adopted legislative master plans.*
   1. *Within the Frog Pond West Neighborhood, streets shall be consistent with Figure 18, Street Demonstration Plan, in the Frog Pond West Master Plan. The Street Demonstration Plan is intended to be guiding, not binding. Variations from the Street Demonstration Plan may be approved by the Development Review Board, upon finding that one or more of the following justify the variation: barriers such as existing buildings and topography; designated Significant Resource Overlay Zone areas; tree groves, wetlands or other natural resources; existing or planned parks and other active open space that will serve as pedestrian connections for the public; alignment with property lines and ownerships that result in efficient use of land while providing substantially equivalent connectivity for the public; and/or site design that provides substantially equivalent connectivity for the public.*

Response: As shown in Figure 18, Street Demonstration Plan (below), several public street and pedestrian connections are planned to and through the subject site. Generally, the street network is a modified grid, and access to this area of Frog Pond West is provided by Willow Creek Drive via its intersection with Boeckman Road. The street network is expected to cross the SROZ area to provide access to sites to its west.

Sheet P2.00 illustrates the proposed blocks, access, and connectivity for Stafford Meadows. Street A, or the planned Willow Creek Drive, intersects Boeckman Road near the center of the site and connects the east-west Streets B and C. North-south streets D and E provide connections to east-west Street F. Willow Creek Drive will extend to the north, beyond the site boundary, and is shown for reference. Street C crosses the SROZ to provide access to Lots 1 to 11 and will provide access to the future public park planned to the north.

Three pedestrian connections are proposed between Street B and Boeckman Road. Two connections are full-width, and a third is half-width to be completed with development of the church property to the east.

Figure 18. Street Demonstration Plan



(.011) Signs. Per the requirements of Sections 4.156.01 through 4.156.11 and applicable provisions from adopted legislative master plans.

Response: The requirements of Sections 4.156.01 through 4.156.11 are addressed in Section V.C of this narrative.

(.012) Parking. Per the requirements of Section 4.155 and applicable provisions from adopted legislative master plans.

Response: The requirements of Section 4.155 are addressed in Section V.B of this narrative. The adopted legislative master plan applicable to this site is the Frog Pond West Master Plan, which has been codified in the zoning ordinance.

(.013) Corner Vision Clearance. Per the requirements of Section 4.177.

Response: The requirements of Section 4.177 are addressed in Section V.I of this narrative.

(.014) Main Entrance Standards

A. Purpose. These standards:

1. *Support a physical and visual connection between the living area of the residence and the street;*
2. *Enhance public safety for residents and visitors and provide opportunities for community interaction;*
3. *Ensure that the pedestrian entrance is visible or clearly identifiable from the street by its orientation or articulation; and*
4. *Ensure a connection to the public realm for development on lots fronting both private and public streets by making the pedestrian entrance visible or clearly identifiable from the public street.*

B. Location. At least one main entrance for each structure must:

1. *Be within 12 feet of the longest street-facing front wall of the dwelling unit; and*
2. *Either:*
    a. *Face the street*
    b. *Be at an angle of up to 45 degrees from the street; or*
    c. *Open onto a porch. The porch must:*
        (i) *Be at least 6 feet deep*
        (ii) *Have at least one entrance facing the street; and*
        (iii) *Be covered with a roof or trellis*

Response: The individual dwelling designs will be reviewed at the time of building permit submittal. As shown in Appendix I, all proposed dwellings will include a main entrance that meets the standards of this section.

(.015) Garage Standards

A. Purpose. These standards:

1. *Ensure that there is a physical and visual connection between the living area of the residence and the street;*
2. *Ensure that the location and amount of the living area of the residence, as seen from the street, is more prominent than the garage;*
3. *Prevent garages from obscuring the main entrance from the street and ensure that the main entrance for pedestrians, rather than automobiles, is the prominent entrance;*
4. *Provide for a pleasant pedestrian environment by preventing garages and vehicle areas from dominating the views of the neighborhood from the sidewalk; and*
5. *Enhance public safety by preventing garages from blocking views of the street from inside the residence.*

B. Street-Facing Garage Walls

1. *Where these regulations apply. Unless exempted, the regulations of this subsection apply to garages accessory to residential units.*
2. *Exemptions:*
    a. *Garages on flag lots.*
    b. *Development on lots which slope up or down from the street with an average slope of 20 percent or more.*
3. *Standards.*
    a. *The length of the garage wall facing the street may be up to 50 percent of the length of the street-facing building façade. For duplexes, this standard applies to the total length of the street-facing façades. For all other lots and structures, the standards apply to the street-facing façade of each unit. For corner lots, this standard applies to only one street side of the lot. For lots less that are less than 50 feet wide at the front lot line, the standard in (b) below applies.*
    b. *For lots less than 50 wide at the front lot line, the following standards apply:*
        (i) *The width of the garage door may be up to 50 percent of the length of the street-facing façade.*
        (ii) *The garage door must be recessed at least 4 feet from the front façade or 6 feet from the front of a front porch.*
        (iii) *The maximum driveway width is 18 feet.*
    a. *Where a dwelling abuts a rear or side alley or a shared driveway, the garage shall orient to the alley or shared drive.*
    b. *Where three or more contiguous garage parking bays are proposed facing the same street, the garage opening closest to a side property line shall be recessed at least two feet behind the adjacent opening(s) to break up the street facing elevation and diminish the appearance of the garage from the street. Side-loaded garages, i.e., where the garage openings are turned away from the street, are exempt from this requirement.*
    c. *A garage entry that faces a street may be no closer to the street than the longest street facing wall of the dwelling unit. There must be at least 20 feet between the garage door*

and the sidewalk. This standard does not apply to garage entries that do not face the street.

Response: The individual dwelling designs will be reviewed at the time of building permit submittal. As shown on the plan sheets in Appendix I, all proposed dwellings will include garages that meet the standards of this section.

(0.16) Residential Design Standards

- *A. Purpose. These standards:*
  - *1. Support consistent quality standards so that each home contributes to the quality and cohesion of the larger neighborhood and community.*
  - *2. Support the creation of architecturally varied homes, blocks and neighborhoods, whether a neighborhood develops all at once or one lot at a time, avoiding homogeneous street frontages that detract from the community's appearance.*
- *B. Applicability. These standards apply to all façades facing streets, pedestrian connections, or elsewhere as required by this Code or the Development Review Board. Exemptions from these standards include: (1) Additions or alterations adding less than 50% to the existing floor area of the structure; and, (2) Additions or alterations not facing a street.*

Response: All of the proposed dwelling facades will face streets or pedestrian connections and are subject to these standards.

- *C. Windows. The standards for minimum percentage of façade surface area in windows are below. These standard apply only to facades facing streets and pedestrian connections.*
  - *1. For two-story homes:*
    - *a. 15% - front facades*
    - *b. 12.5% – front facades if a minimum of six (6) design elements are provided per Section 4.127 (0.15) E, Design Menu.*
    - *c. 10% - front facades facing streets if a minimum of seven (7) design elements are provided per Section 4.127 (0.15) E, Design Menu.*
  - *2. For one-story homes:*
    - *a. 12.5% - front facades*
    - *b. 10 % – front facades if a minimum of six (6) design elements are provided per Section 4.127 (0.15) E, Design Menu.*
  - *3. For all homes: 5% for street-side facades.*
  - *4. Windows used to meet this standard must provide views from the building to the street. Glass block does not meet this standard. Windows in garage doors and other doors count toward this standard.*

Response: The individual dwelling designs will be reviewed at the time of building permit submittal. As shown in Appendix I, all proposed dwellings will include windows that meet the standards of this section.

- *D. Articulation. Plans for residential buildings shall incorporate design features such as varying rooflines, offsets, balconies, projections (e.g., overhangs, porches, or similar features), recessed or covered entrances, window reveals, or similar elements that break up otherwise long, uninterrupted elevations. Such elements shall occur at a minimum interval of 30 feet on façades facing streets, pedestrian connections, or elsewhere as required by this Code or the Development Review Board. Where a façade governed by this standard is less than 30 feet in length, at least one of the above-cited features shall be provided.*

Response: The individual dwelling designs will be reviewed at the time of building permit submittal. As shown in Appendix I, all proposed dwellings will include articulation design features that meet the standards of this section.

E. Residential Design Menu. Residential structures shall provide a minimum of five (5) of the design elements listed below for front facades, unless otherwise specified by the code. For side facades facing streets or pedestrian connections, a minimum of three (3) of the design elements must be provided. Where a design features includes more than one element, it is counted as only one of the five required elements.

1. *Dormers at least three (3) feet wide.*
2. *Covered porch entry – minimum 48 square foot covered front porch, minimum six (6) feet deep and minimum of a six (6) foot deep cover. A covered front stoop with minimum 24 square foot area, 4 foot depth and hand rails meets this standard.*
3. *Front porch railing around at least two (2) sides of the porch.*
4. *Front facing second story balcony – projecting from the wall of the building a minimum of four (4) feet and enclosed by a railing or parapet wall.*
5. *Roof overhang of 16 inches or greater.*
6. *Columns, pillars or posts at least four (4) inches wide and containing larger base materials.*
7. *Decorative gables – cross or diagonal bracing, shingles, trim, corbels, exposed rafter ends or brackets (does not include a garage gable if garage projects beyond dwelling unit portion of street façade).*
8. *Decorative molding above windows and doors.*
9. *Decorative pilaster or chimneys.*
10. *Shakes, shingles, brick, stone or other similar decorative materials occupying at least 60 square feet of the street façade.*
11. *Bay or bow windows – extending a minimum of 12 inches outward from the main wall of a building and forming a bay or alcove in a room within the building.*
12. *Sidelight and/or transom windows associated with the front door or windows in the front door.*
13. *Window grids on all façade windows (excluding any windows in the garage door or front door).*
14. *Maximum nine (9) foot wide garage doors or a garage door designed to resemble two (2) smaller garage doors and/or windows in the garage door (only applicable to street facing garages).*
15. *Decorative base materials such as natural stone, cultured stone or brick extending at least 36 inches above adjacent finished grade occupying a minimum of 10 % of the overall primary street facing façade.*
16. *Entry courtyards which are visible from, and connected directly to, the street. Courtyards shall have a minimum depth of 10 feet and minimum width of 80% of the non-garage/driveway building width to be counted as a design element.*

Response: Each of the proposed detached residential structures will include at least 5 of the listed elements on the front-facing elevations and 3 of the listed elements on facades facing pedestrian connections as illustrated in Sheet P2.00 and Appendix I.

F. House Plan Variety. No two directly adjacent or opposite dwelling units may possess the same front or street-facing elevation. This standard is met when front or street-facing elevations differ from one another due to different materials, articulation, roof type, inclusion of a porch, fenestration, and/or number of stories. Where façades repeat on the same block face, they must have at least three intervening lots between them that meet the above standard. Small Lot developments over 10 acres shall include duplexes and/or attached 2-unit single family homes comprising 10% of the homes – corner locations are preferred.

Response: Appendix I illustrates examples of home designs. Five different detached dwelling types are provided, and they will not be repeated on adjacent or opposite lots along the same street frontage. This standard will be verified at the time of building permit submittal.

G. Prohibited Building Materials. The following construction materials may not be used as an exterior finish:

1. *Vinyl siding.*
2. *Wood fiber hardboard siding.*
3. *Oriented strand board siding.*
4. *Corrugated or ribbed metal.*
5. *Fiberglass panels.*

Response: As shown in Appendix I, no prohibited building materials are proposed. Conformance with these standards will be verified at the time of building permit submittal.

(0.17) Fences

A. Within Frog Pond West, fences shall comply with standards in 4.113 (.08) except as follows:

1. *Columns for the brick wall along Boeckman Road and Stafford Road shall be placed at lot corners where possible.*
2. *A solid fence taller than 4 feet in height is not permitted within 8 feet of the brick wall along Boeckman Road and Stafford Road, except for fences placed on the side lot line that are perpendicular to the brick wall and end at a column of the brick wall.*
3. *Height transitions for fences shall occur at fence posts.*

Response: As shown in Sheet P2.00, 9 lots are proposed along Boeckman Road. A brick wall is proposed along the rear of these lots as shown in Sheet L2.1 and L3.1. The proposed wall design includes columns at regular intervals along Boeckman Road. This design will be continued along the frontage of the proposed development west of the school site. Columns will be placed at lot corners where they occur along the interval, but the design team believes that the column intervals should take priority over the lot corner placement due to varying zones and lot sizes along the Boeckman Road frontage. No fences are proposed within 8 ft. of Boeckman Road.

(0.18) Homes Adjacent to Schools, Parks and Public Open Spaces

A. Purpose. The purpose of these standards is to ensure that development adjacent to schools and parks is designed to enhance those public spaces with quality design that emphasizes active and safe use by people and is not dominated by driveways, fences, garages, and parking.

B. Applicability. These standards apply to development that is adjacent to or faces schools and parks. As used here, the term adjacent includes development that is across a street or pedestrian connection from a school or park.

Response: Lots 1, 2, and 3 are adjacent to the future school site to the west and Lots 1, 6, and 7 are adjacent to the “land banked” site to the north (this site is reserved for future school facilities, a neighborhood park, and/or residential use). These lots are subject to these standards.

C. Development must utilize one or more of the following design elements:

1. *Alley loaded garage access.*
2. *On corner lots, placement of the garage and driveway on the side street that does not face the school, park, or public open space.*
3. *Recess of the garage a minimum of four feet from the front façade of the home. A second story above the garage, with windows, is encouraged for this option.*

Response: Lots 1 to 11 are accessed by Street G. The site constraints presented by the Willow Creek SROZ, the minimum lot sizes in the R-10 district, and the requirement for public frontage for each lot prevents the use of an alley. C.1 above is not used to meet the standards of this section. Lot 7 is a corner lot and is subject to C.2 above. It is separated from the “land banked” site by Street G. The driveway is located on Street G, which faces away from the “land banked” site and faces Lot 6. The home constructed on this site will provide garage access from the Street G frontage. This standard is met for this lot. Lots 1, 2, 3, and 6 are subject to the provisions of C.3 above. Compliance with these requirements will be verified at the time of building permit submittal.

D. Development must be oriented so that the fronts or sides of homes face adjacent schools or parks. Rear yards and rear fences may generally not face the schools or parks, unless approved through the waiver process of 4.118 upon a finding that there is no practicable alternative due to the size, shape or other physical constraint of the subject property.

Response: Lots 1, 2, 3, 6, and 7 are adjacent to schools or parks. The side lot line of Lots 1, 2, and 3 face the future school site to the west; the front lot lines of Lots 1 and 6 face the future park site to the north; and the side lot line of Lot 7 faces the future park site to the north. No rear lot lines face the school or park site. This standard is met.

D. Section 4.139. Significant Resource Overlay Zone (SROZ) Ordinance.

Section 4.139.04 Uses and Activities Exempt from These Regulations

A request for exemption shall be consistent with the submittal requirements listed under Section 4.139.06(.01)(B – I), as applicable to the exempt use and activity. [Added by Ord. # 674 11/16/09]
[…]
(.08) The construction of new roads, pedestrian or bike paths into the SROZ in order to provide access to the sensitive area or across the sensitive area, provided the location of the crossing is consistent with the intent of the Wilsonville Comprehensive Plan. Roads and paths shall be constructed so as to minimize and repair disturbance to existing vegetation and slope stability.
[…]
(.18) Private or public service connection laterals and service utility extensions.
[…]
(.20) The installation of public streets and utilities specifically mapped within a municipal utility master plan, the Transportation Systems Plan or a capital improvement plan.

Response: The proposed road related impacts are exempt from the regulations of the SROZ Ordinance per (.08) above, which pertains to the construction of new roads or pedestrian/bike paths in the SROZ where the purpose of the crossing is to provide access to or across a sensitive area and where the location of the crossing is consistent with the intent of the City of Wilsonville Comprehensive Plan or (.20) above, which allows the installation of public streets and utilities specifically mapped with a municipal utility master plan, the Transportation System Plan, or a capital improvement plan. The intent of the proposed road work is to provide vehicular, bike, and pedestrian connectivity within the Stafford Meadows development, and all of these roads are public roads identified in both the City's current Transportation System Plan and the Frog Pond West Master Plan. As such, the proposed crossing meets the criteria required for these exemptions.

Project encroachments into the SROZ from the proposed stormwater piping and outfalls are also an exempt activity per (.18) above, which allows for private or public-sector service connection laterals and service utility extensions.

[…]
(.22) Any impacts to resource functions from the above excepted activities, such as gravel construction pads, erosion/sediment control materials or damaged vegetation, shall be mitigated using appropriate repair or restoration/enhancement techniques.

Response: Impacts will be mitigated per the standards of 4.139.07 and as described in the Significant Resource Impact Report included as Appendix D.

Section 4.139.05 Significant Resource Overlay Zone Map Verification

The map verification requirements described in this Section shall be met at the time an applicant requests a building permit, grading permit, tree removal permit, land division approval, or other land use decision. Map verification shall not be used to dispute whether the mapped Significant Resource Overlay Zone *boundary is a significant natural resource. Map refinements are subject to the requirements of Section 4.139.10(.01)(D).*

(.01) In order to confirm the location of the Significant Resource Overlay Zone, map verification shall be required or allowed as follows:

- *A. Development that is proposed to be either in the Significant Resource Overlay Zone or less than 100 feet outside of the boundary of the Significant Resource Overlay Zone, as shown on the Significant Resource Overlay Zone Map.*
- *B. A lot or parcel that:*
  - *1. Either contains the Significant Resource Overlay Zone, or any part of which is less than 100 feet outside the boundary of the Significant Resource Overlay Zone, as shown on the Significant Resource Overlay Zone Map; and*
  - *2. Is the subject of a land use application for a partition, subdivision, or any land use application that the approval of which would authorize new development on the subject lot or parcel.*

(.02) An application for Significant Resource Overlay Zone Map Verification may be submitted even if one is not required pursuant to Section 4.139.05(.01).

Response: Although the land use application includes a request for a Planned Development, the City's Significant Resource Overlay Map does not include the Frog Pond West area, and map verification is not requested. A map refinement to include an accurate overlay has been requested subject to the requirements of Section 4.139.10(.01)(D). The applicable requirements are addressed in the response to that section.

(.03) If a lot or parcel or parcel is subject to Section 4.139.05(.01), an application for Significant Resource Overlay Zone Map Verification shall be filed concurrently with the other land use applications referenced in Section 4.139.05(.01)(B)(2) unless a previously approved Significant Resource Overlay Zone Map Verification for the subject property remains valid.

Response: Although the land use application includes a request for a Planned Development, the City's Significant Resource Overlay Map does not include the Frog Pond West area, and map verification is not requested. A map refinement to include an accurate overlay has been requested subject to the requirements of Section 4.139.10(.01)(D). The applicable requirements are addressed in the response to that section.

(.04) An applicant for Significant Resource Overlay Zone Map Verification shall use one or more of the following methods to verify the Significant Resource Overlay Zone boundary:

- *A. The applicant may concur with the accuracy of the Significant Resource Overlay Zone Map of the subject property;*
- *B. The applicant may demonstrate a mapping error was made in the creation of the Significant Resource Overlay Zone Map;*
- *C. The applicant may demonstrate that the subject property was developed lawfully prior to June 7, 2001.*

Response: The City's April 29, 2009, Significant Resource Overlay Zone map (City of Wilsonville 2009) does not show any mapped SROZs on the project site. However, in the 2017 Master Plan for Frog Pond West, the City identifies a potential SROZ along Willow Creek north of SW Boeckman Road (Figure 11). This SROZ extends approximately 822 feet to the north of SW Boeckman Road, crossing both the Pike property and the adjacent tax lot to the north (tax lot 31W12D002200). Although no specific width is assigned to this SROZ in the Master Plan, information provided by the City indicates that it is assumed to extend 50 feet on either side of the Willow Creek channel.

The applicant's natural resource consultant, Anchor QEA, has prepared a delineation of Willow Creek, within the SROZ indicated in the Frog Pond West Master Plan, and calculated its vegetated corridor per City of Wilsonville provisions. This delineation is intended to refine the Significant Resource Overlay Zone Map per (.04)B above.

(.05) The Planning Director shall determine the location of any Significant Resource Overlay Zone on the subject property by considering information submitted by the applicant, information collected during any site visit that may be made to the subject property, information generated by Significant Resource Overlay Zone Map Verification that has occurred on adjacent properties, and any other relevant information that has been provided.

(.06) For applications filed pursuant to Section 4.139.05(.04)(A) and (C), a Significant Resource Overlay Zone Map Verification shall be consistent with the submittal requirements listed under Section 4.139.06(.01)(B-H).

(.07) For applications filed pursuant to Section 4.139.05(.04)(B), a Significant Resource Overlay Zone Map Verification shall be consistent with the submittal requirements listed under Section 4.139.06(.02)(D)(1). [Section 4.139.05 added by Ord. # 674 11/16/09]

Response: The application has been filed pursuant to Section 4.139.05(.04)(B) and is subject to the submittal requirements listed under Section 4.139.06(.02)(D)(1). The requirements are addressed in the response to that section below.

Section 4.139.06 Significant Resource Impact Report (SRIR) and Review Criteria

[…]

(.01) Abbreviated SRIR Requirements. It is the intent of this subsection to provide a user-friendly process for the applicant. Only the materials necessary for the application review are required. At the discretion of the Planning Director, an abbreviated SRIR may be submitted for certain small-scale developments such as single family dwellings, additions to single family dwellings, minor additions and accessory structures. The following requirements shall be prepared and submitted as part of the abbreviated SRIR evaluation:

A. A Site Development Permit Application must be submitted in compliance with the Planning and Land Development Ordinance;
B. Outline of any existing features including, but not limited to, structures, decks, areas previously disturbed and existing utility locations;*
C. Location of any wetlands or water bodies on the site and the location of the stream centerline and top-of-bank;
D. Within the area proposed to be disturbed, the location, size and species of all trees that are more than six (6) inches in diameter at breast height (DBH). Trees outside the area proposed to be disturbed may be individually shown or shown as drip line with an indication of species type or types;
E. The location of the SROZ and Impact Area boundaries;*
F. A minimum of three slope cross-section measurements transecting the site, equally spaced at no more than 100-foot increments. The measurements should be made perpendicular to the stream;*
G. A map that delineates the Metro UGMFP Title 3 Water Quality Resource Area boundary (using Metro Title 3 field observed standards);*
H. Current photos of site conditions shall be provided to supplement the above information.*
I. A narrative describing the possible and probable impacts to natural resources and a plan to mitigate for such impacts.

Response: City staff have indicated that an abbreviated SRIR is appropriate for this development. The Significant Resource Impact Report (SRIR) is included as Appendix D and contains all of the required information.

(.02) Application Requirements for a Standard SRIR. The following requirements must be prepared and submitted as part of the SRIR evaluation for any development not included in paragraph A above: […]

Response: The applicant is subject to an abbreviated SRIR. These requirements are not applicable.

(.03) SRIR Review Criteria. In addition to the normal Site Development Permit Application requirements as stated in the Planning and Land Development Ordinance, the following standards shall apply to the issuance of permits requiring an SRIR. The SRIR must demonstrate how these standards are met in a manner that meets the purposes of this Section.

A. Except as specifically authorized by this code, development shall be permitted only within the Area of Limited Conflicting Use (see definition) found within the SROZ;

Response: Proposed project encroachments into the refined Willow Creek SROZ and its associated SROZ Impact Area would result from the construction of Street A, the Street C road crossing over Willow Creek, the proposed stormwater outfalls, and the improvement work along SW Boeckman Road. These activities will require impacts on the Willow Creek stream channel, adjacent wetland, and associated riparian corridor, and the installation of stormwater piping and two outfalls in the riparian corridor.

The proposed road related impacts are exempt from the regulations of the SROZ Ordinance per either Section 4.139.04(.08), which pertains to the construction of new roads or pedestrian/bike paths in the SROZ where the purpose of the crossing is to provide access to or across a sensitive area and where the location of the crossing is consistent with the intent of the City of Wilsonville Comprehensive Plan (City of Wilsonville 2013), or Section 4.139.04(.20), which allows the installation of public streets and utilities specifically mapped with a municipal utility master plan, the Transportation System Plan, or a capital improvement plan. The intent of the proposed road work is to provide vehicular, bike, and pedestrian connectivity within the Stafford Meadows development, and all of these roads are public roads identified in both the City's current Transportation System Plan and the Frog Pond West Master Plan. As such, the proposed crossing meets the criteria required for these exemptions.

Project encroachments into the SROZ from the proposed stormwater piping and outfalls are also an exempt activity per Section 4.139.04(.18) of the SROZ Ordinance, which allows for private or public-sector service connection laterals and service utility extensions.

B. Except as specifically authorized by this code, no development is permitted within Metro's Urban Growth Management Functional Plan Title 3 Water Quality Resource Areas boundary;

Response: No development activities are proposed to occur within areas mapped as Metro UGMFP Title 3 Water Quality Resource Areas. Although the downstream (off-site) portion of Willow Creek is mapped as a Title 3 Water Quality Resource Area, this mapping ends at SW Boeckman Road and does not extend onto the project site. As such, it would not be impacted by the proposed project.

C. No more than five (5) percent of the Area of Limited Conflicting Use (see definition) located on a property may be impacted by a development proposal. On properties that are large enough to include Areas of Limited Conflicting Use on both sides of a waterway, no more than five (5) percent of the Area of Limited Conflicting Use on each side of the riparian corridor may be impacted by a development proposal. This condition is cumulative to any successive development proposals on the subject property such that the total impact on the property shall not exceed five (5) percent;

Response: The SROZ riparian corridor type present on the project site (Riparian Corridor Type NR-4) does not include an Area of Limiting Conflicting Use. As such, this criterion is not applicable to the Stafford Meadows project.

D. Mitigation of the area to be impacted shall be consistent with Section 4.139.06 of this code and shall occur in accordance with the provisions of this Section;

Response: The mitigation standards contained in Section 4.139.07 of the City's SROZ Ordinance are applicable to project encroachments into the Area of Conflicting Uses of significant wildlife habitat resources areas. Mitigation for project activities that would affect wetlands and other waters regulated by USACE and DSL or riparian corridors, such as those proposed for the Stafford Meadows project, are to be mitigation in accordance with state and federal mitigation requirements.

As described under Criteria J, the applicant intends obtain a Clean Water Act Section 404 Permit from USACE and an Oregon Removal-Fill Permit from DSL to excavate material from and place fill material into Willow Creek and Wetlands A and B (see Appendix C for a wetland delineation) to facilitate construction of the proposed project. Mitigation for these wetland and other water impacts will be achieved by purchasing wetland mitigation credits from an approved wetland mitigation bank serving the project site (e.g., Mud Slough Mitigation Bank). Mitigation for permanent project impacts on the upland portions of the SROZ will be achieved by enhancing the remaining areas of upland riparian corridor within the SROZ boundaries through the planting of native trees and shrubs.

E. The impact on the Significant Resource is minimized by limiting the degree or magnitude of the action, by using appropriate technology or by taking affirmative steps to avoid, reduce or mitigate impacts;

Response: Project impacts on the SROZ around Willow Creek have been minimized by reducing the width of the proposed local street that would cross this resource from the 52 feet specified in the Frog Pond West Master Plan for Local Streets to 31 feet. This is accomplished by removing the roadside parking and planter/stormwater features from the proposed road cross section and using a downstream retaining wall to reduce the width of the crossing corridor. Furthermore, the applicant has elected to use a concrete box culvert to maintain stream conveyance rather than a pipe culvert, reducing the amount of excavation and fill material need for culvert installation.

Project impacts on the SROZ from the installation of stormwater piping and two outfalls will primarily be temporary impacts, with all disturbed areas return to pre-construction grades once installation is complete. Minor permanent impact will be required in the form of small riprap pads.

F. The impacts to the Significant Resources will be rectified by restoring, rehabilitating, or creating enhanced resource values within the "replacement area" (see definitions) on the site or, where mitigation is not practical on-site, mitigation may occur in another location approved by the City;

Response: Permitted impacts to the upland riparian corridor resources within the Willow Creek SROZ will be mitigated by enhancing the remaining portions of the upland riparian corridor within the SROZ by planting native trees and shrubs in accordance with the plant spacing and diversity standards contained in Section 4.139.07(.02)(E)(3) and (4) of the City's SROZ Ordinance.

G. Non-structural fill used within the SROZ area shall primarily consist of natural materials similar to the soil types found on the site;

Response: Most of the fill that will be placed in the SROZ and SROZ Impact Areas for the construction of the proposed Street C road crossing and the installation of the stormwater lines and outfalls will be structural fill. Final grading around the road crossing and the upper portions of backfill in the stormwater line installation trenches will be accomplished using native soil. Small areas of riprap will be required at each end of the box culvert and below each stormwater outfall to serve as energy dissipation pads.

H. The amount of fill used shall be the minimum required to practically achieve the project purpose;

Response: The amount of fill material proposed for the construction of the concrete box culvert road crossing and stormwater lines has been minimized to the extent practicable to allow construction of these features to City development standards.

I. Other than measures taken to minimize turbidity during construction, stream turbidity shall not be significantly increased by any proposed development or alteration of the site;

Response: Stream turbidity will not be significantly increased by the proposed project or any other alterations of the project site. Aside from the erosion and sedimentation control measures that would be implemented during construction, long-term measures to protect the water quality of the stream include enhancing the SROZ along Willow Creek with native trees and shrubs planted in accordance with the plant spacing and diversity standards contained in Section 4.139.07(.02)(E)(3) and (4) of the City's SROZ Ordinance. In addition, stormwater from the proposed development would be treated using stormwater planters adjacent to the future roadways and in a stormwater detention basin prior to be discharged to the SROZ through a controlled outlet.

J. Appropriate federal and state permits shall be obtained prior to the initiation of any activities regulated by the U.S. Army Corps of Engineers and the Oregon Division of State Lands in any jurisdictional wetlands or water of the United States or State of Oregon, respectively.

Response: The applicant intends to obtain a Clean Water Act Section 404 Permit from the U.S. Army Corps of Engineers and an Oregon Removal-Fill Permit from the Oregon Department of State lands for the construction of the culverted road crossing across Willow Creek and Wetland A, and for the placement of fill material into Wetland B for the construction of residential lots and streets. Compensatory mitigation for these impacts will be achieved through the purchase of wetland mitigation credits from an approved wetland mitigation bank serving the project site (e.g., Mud Slough Mitigation Bank).

Section 4.139.07 Mitigation Standards

The following mitigation standards apply to significant wildlife habitat resource areas for encroachments within the Area of Limited Conflicting Uses, and shall be followed by those proposing such encroachments. Wetland mitigation shall be conducted as per permit conditions from the US Army Corps of Engineers and Oregon Division of State Lands. While impacts are generally not allowed in the riparian corridor resource area, permitted impacts shall be mitigated by: using these mitigation standards if the impacts are to wildlife habitat values; and using state and federal processes if the impacts are to wetland resources in the riparian corridor. Mitigation is not required for trees lost to a natural event such as wind or floods.

(.01) The applicant shall review the appropriate Goal 5 Inventory Summary Sheets for wildlife habitat (i.e. upland) contained in the City of Wilsonville Natural Resource Inventory and Goal 5/Title 3/ESA Compliance and Protection Plan ("Compliance and Protection Plan"- May 2000) to determine the resource function ratings at the time the inventory was conducted.

Response: The subject SROZ is not included in the Goal 5 summary sheets or the Compliance and Protection Plan.

(.02) The applicant shall prepare a Mitigation Plan document containing the following elements:

Response: The Mitigation Plan is included as Section 7 of the SRIR included as Attachment D. Specific components of the Mitigation Plan are addressed below.

A. The Mitigation Plan shall contain an assessment of the existing natural resource function ratings at the time of the proposed encroachment for the site compared to the function ratings recorded in the Compliance and Protection Plan.

Response: As noted above, the subject SROZ is not included in the Compliance and Protection Plan and no comparison is available.

B. *The Mitigation Plan shall contain an assessment of the anticipated adverse impacts to significant wildlife habitat resources. The impact assessment shall discuss impacts by resource functions (as listed in the Compliance and Protection Plan, May 2000) for each resource type, and shall map the area of impact (square feet or acres) for each function.*

Response: To accommodate the construction of the proposed Stafford Meadows project in accordance with the Master Plan, encroachment into the SROZ and SROZ Impact Areas will be required. Proposed encroachments will result from construction of Street A, the Street C road crossing over Willow Creek, the proposed stormwater outfalls, and the improvement work along SW Boeckman Road. These activities will result in impacts to the Willow Creek channel, its adjacent wetlands, and upland portions of its riparian corridor. The SROZ Impact Area would also be affected.

Direct project effects on SROZ resources include temporary disturbance of aquatic habitat in Willow Creek and temporary and permanent disturbance of degraded herbaceous wetland and upland habitats in the riparian corridor. Overall, impacts on these resources are expected to be minor given their degraded condition. Willow Creek is non-fish bearing and intermittent and offers relatively limited habitat for other aquatic organisms (e.g., amphibians). Installation of the box culvert for the Street C road crossing and extension of the existing culverts under SW Boeckman Road would not result in the loss of significant aquatic habitat nor would they change the flow characteristics of Willow Creek. Project impacts on wetland and upland riparian areas and habitat would primarily result in the removal of degraded herbaceous areas and potentially a few shrubs; no trees are located in the SROZ, so there would be no impacts related to tree removal. Project impacts would not adversely affect the limited level of function and value currently provided by these resources.

Once the project has been constructed, the increased levels of noise and human presence associated with residential development could temporarily displace wildlife from nearby habitats. However, because rural and urban development disturbance currently occurs on and around the project site, some level of habituation by wildlife to noise and human activity has occurred. Consequently, indirect impacts to wildlife from disturbance and displacement are expected to be minor.

C. *The Mitigation Plan shall present a proposed mitigation action designed to replace the lost or impacted resource functions described in Subsection B, above. The mitigation plan shall be designed to replace lost or impacted functions by enhancement of existing resources on, or off the impact site, or creation of new resource areas.*

Response: As described in Section 7 for the SRIR, proposed permanent project impacts on Willow Creek and its associated wetlands will be compensated for by purchasing stream and wetland mitigation credits from an approved wetland mitigation bank serving the project site (e.g., Mud Slough Mitigation Bank). This mitigation will be coordinated through the USACE and DSL permitting processes.

Temporary impacts on upland portions of the SROZ and the SROZ Impact Area from installation of the stormwater outfalls will be mitigated by restoring those locations to pre-project grades and planting all disturbed soils with a native seed mix.

D. *For mitigation projects based on resource function enhancement, the area ratios presented in Table NR - 2 shall be applied. These ratios are based on the resource function ratings at the time of the proposed action, as described in Subsection A, above. The mitigation action shall be conducted on the appropriate size area as determined by the ratios in Table NR - 2.*

Response: The mitigation projects are not based on resource function enhancement, and the ratios presented in Table NR-4 have not been applied. Note that it appears that the reference to Table NR-2 above should be NR-4, which contains the mentioned ratios.

E. The Mitigation Plan shall include a planting plan containing the following elements:

1. *Required Plants and Plant Densities. All trees, shrubs and ground cover shall be native vegetation. An applicant shall comply with Section 4.139.06(.02)(E)(1)(a) or (b), whichever results in more tree plantings, except where the disturbance area is one acre or more, the applicant shall comply with Section 4.139.06(.02)(E)(1)(b).*
    a. *The mitigation requirement shall be calculated based on the number and size of trees that are removed from the site. Trees that are removed from the site shall be replaced as shown in Table NR – 3. Conifers shall be replaced with conifers. Bare ground shall be planted or seeded with native grasses or herbs.*
    b. *The mitigation requirement shall be calculated based on the size of the disturbance within the Significant Resource Overlay Zone. Native trees and shrubs shall be planted at a rate of five (5) trees and twenty-five (25) shrubs per every 500 square feet of disturbance area (calculated by dividing the number of square feet of disturbance area by 500, and then multiplying that result times five (5) trees and twenty-five (25) shrubs, and rounding all fractions to the nearest whole number of trees and shrubs; for example, if there will be 330 square feet of disturbance area, then 330 divided by 500 equals 0.66, and 0.66 times five equals 3.3, so three (3) trees shall be planted, and 0.66 times twenty-five (25) equals 16.5, so seventeen (17) shrubs shall be planted). Bare ground shall be planted or seeded with native grasses or herbs.*
2. *Plant Size. Replacement trees and shrubs shall be at least one-gallon in size and shall be at least twelve (12) inches in height.*
3. *Plant Spacing. Trees shall be planted between eight (8) and twelve (12) feet on center, and shrubs shall be planted between four (4) and five (5) feet on center, or clustered in single species groups of no more than four (4) plants, with each cluster planted between eight (8) and ten (10) feet on center. When planting near existing trees, the drip line of the existing tree shall be the starting point for plant spacing measurements.*
4. *Plant Diversity. Shrubs shall consist of at least two (2) different species. If five (5) trees or more are planted, then no more than fifty (50) percent of the trees may be of the same genus.*
5. *Invasive Vegetation. Invasive non-native or noxious vegetation shall be removed within the mitigation area prior to planting, and shall be removed or controlled for five (5) years following the date that the mitigation planting is completed.*
6. *Mulching and Browse Protection. Mulch shall be applied around new plantings at a minimum of three inches in depth and eighteen inches in diameter. Browse protection shall be installed on trees and shrubs. Mulching and browse protection shall be maintained during the two-year plant establishment period.*
7. *Tree and Shrub Survival. Trees and shrubs that die shall be replaced in kind to the extent necessary to ensure that a minimum of eighty (80) percent of the trees and shrubs initially required shall remain alive on the fifth anniversary of the date that the mitigation planting is completed.*

[Section 4.139.07(.02)(E.) added by Ord. # 674 11/16/09]

Response: The Mitigation Planting Plan is included as Sheet L2.3 and contains the required information.

(.03) Proposals for mitigation action where new natural resource functions and values are created (i.e. creating wetland or wildlife habitat where it does not presently exist) will be reviewed and may be approved by the Development Review Board or Planning Director if it is determined that the proposed action will create natural resource functions and values that are equal to or greater than those lost by the proposed impact activity.

(.04) Mitigation actions shall be implemented prior to or at the same time as the impact activity is conducted.

(.05) Mitigation plans shall have clearly stated goals and measurable performance standards.

Response: No mitigation actions to create new natural resource functions and values are proposed.

(.06) All mitigation plans shall contain a monitoring and maintenance plan to be conducted for a period of five years following mitigation implementation. The applicant shall be responsible for ongoing maintenance and management activities, and shall submit an annual report to the Planning Director documenting such activities, and reporting progress towards the mitigation goals. The report shall contain, at a minimum, photographs from established photo points, quantitative measure of success criteria, including plant survival and vigor if these are appropriate data. The Year 1 annual report shall be submitted one year following mitigation action implementation. The final annual report (Year 5 report) shall document successful satisfaction of mitigation goals, as per the stated performance standards. If the ownership of the mitigation site property changes, the new owners will have the continued responsibilities established by this section.

Response: A mitigation plan is included as Section 7 of the Significant Resource Impact Report included as Appendix E.

(.07) The Mitigation Plan document shall be prepared by a natural resource professional.

Response: The Mitigation Plan has been prepared by Anchor QEA, LLC, a natural resource consultant.

(.08) Prior to any site clearing, grading or construction, the SROZ area shall be staked, and fenced per approved plan. During construction, the SROZ area shall remain fenced and undisturbed except as allowed by an approved development permit.

(.09) For any development which creates multiple parcels intended for separate ownership, the City shall require that the SROZ areas on the site be encumbered with a conservation easement or tract.

(.10) The City may require a conservation easement over the SROZ that would prevent the owner from activities and uses inconsistent with the purpose of this Section and any easements therein. The purpose of the conservation easement is to conserve and protect resources as well as to prohibit certain activities that are inconsistent with the purposes of this section. Such conservation easements do not exclude the installation of utilities.

(.11) At the Planning Directors discretion, mitigation requirements may be modified based on minimization of impacts at the impact activity site. Where such modifications are granted by the Planning Director, the Director shall clearly indicate the reasons for doing so in the record, citing the relevant information relied upon in reaching the decision.

(.12) The Director may study the possibility of a payment-in-lieu-of system for natural resource impact mitigation. This process would involve the public acquisition and management of natural resource properties partially funded by these payments.

Response: Acknowledged.

Section 4.139.08 Activities Requiring a Class I Administrative Review Process

(.01) Class I Procedure for Amending the Significant Resource Overlay Zone Boundary. The Director may authorize an adjustment to the SROZ by a maximum of 2% (two percent) of the Area of Limited Conflicting Use. On properties that are large enough to include Areas of Limited Conflicting Use on both sides of a waterway or wetland, no more than 2% of the Area of Limited Conflicting Use on each side of the riparian corridor may be adjusted, provided the applicant demonstrates that the following standards are met:[…]

Response: The proposed activities are except from review. These requirements are not applicable.

Section 4.139.09 Activities Requiring a Class II Administrative Review Process

[…]

Response: The proposed activities are exempt from review. These requirements are not applicable.

Section 4.139.10 Development Review Board (DRB) Process

The following actions require review through a Development Review Board quasi-judicial process. Nothing contained herein shall be deemed to require a hearing body to approve a request for a permit under this Section.

(.01) Exceptions. The following exceptions may be authorized through a Development Review Board quasi-judicial review procedure.

[…]

D. Map Refinement process. The applicant may propose to amend the SROZ boundary through a Development Review Board quasi-judicial zone change where more detailed information is provided, such as a state approved wetland delineation. The criteria for amending the SROZ are as follows:

1. Any map refinement must be evaluated by considering the riparian corridor types contained in this ordinance.

Response: The applicant requests a SROZ Map Refinement concurrent with the requested zone change. As stated in Section 3.8.2, although the City's 2009 SROZ map (City of Wilsonville 2009) does not show any mapped SROZs on the project site, Figure 11 of the 2017 Master Plan for Frog Pond West identifies a potential SROZ along the Willow Creek riparian corridor on the Pike property. That SROZ extends approximately between SW Boeckman Road and the northern extent of off-site tax lot 31W12D002200. At the time this SROZ was identified, the City assigned it a preliminary vegetated corridor width of 50 feet extending from either side of the Willow Creek channel centerline.

Based on field data collected by Anchor QEA wetland scientists during the 2017 wetland delineation and an assessment of the existing wildlife habitat and riparian corridor conditions present on the project site, the applicant is requesting a refinement to the City's preliminary SROZ mapping along Willow Creek. Specifically, the applicant is requesting that the vegetated corridor width of the proposed SROZ along Willow Creek be reduced from 50 to 15 feet on either side of the channel. This requested refinement is based on the following observations of Willow Creek and its associated riparian corridor:

- Willow Creek is a non-fish bearing, intermittent stream draining less than 100 acres.
- Adjacent slopes within 200 feet of Willow Creek are less than 25%.
- Wetlands adjacent to Willow Creek are limited to emergent and scrub-shrub wetlands, are less than 0.5 acre in size, and are not considered to be locally significant.
- Neither Willow Creek nor its associated riparian corridor is mapped as a Title 3 Water Quality Resource Area under Metro's Urban Growth Functional Management Plan.
- Willow Creek and its associated riparian corridor do not warrant a Goal 5 safe harbor boundary.

See Appendix D for additional detail.

2. Other supporting documents to be considered in evaluating a proposal to refine a map include, but are not limited to:

- *a. Natural Resources Inventories (LWI/RCI);*
- *b. The Economic, Social, Environmental and Energy (ESEE) Analysis;*
- *c. Metro Functional Plans;*
- *d. Wilsonville Comprehensive Plan;*
- *e. State approved wetland delineations;*
- *f. Detailed slope analysis*

Response: The City's Local Wetland Inventory (LWI) was prepared in 1999, but did not include the Frog Pond West area. The site does not contain Metro Title 3 resources. The Frog Pond Area

Plan and Frog Pond West Master Plans, which are Comprehensive Plan documents, include SROZ designation for the Willow Creek riparian corridor, which is further discussed above. There are no known State-approved wetland delineations for the subject site. A wetland inventory has been prepared for submittal to the Department of State Lands (DSL) for concurrence and is included as Appendix C. No sloped areas have been identified on site.

3. *An SRIR must be prepared by the applicant in conformance with the provisions of this Section.*
4. *The Hearing Body (including City Council) may amend the Significant Resource Overlay Zone (in or out) upon making a determination that the land area in question is or is not a significant resource. The criteria for determining that land is significant shall be based on finding that the site area has at least one rating of "high" using the function criteria listed in the Natural Resource Function Rating Matrices.*

Response: The SRIR has been prepared by Anchor QEA and is included as Appendix D. The area in question did not receive a "high" rating using the function criteria of this section.

(.02) Adding Wetlands. Except for water quality or storm water detention facilities, the City shall initiate amendments to the Significant Resource Overlay Zone maps to add wetlands when the City receives significant evidence that a wetland meets any one of the following criteria:

A. The wetland is fed by surface flows, sheet flows or precipitation, and has evidence of flooding during the growing season, and has 60 percent or greater vegetated cover, and is over one-half acre in size; or the wetland qualifies as having intact water quality function under the 1996 Oregon Freshwater Wetland Assessment Methodology; or

B. The wetland is in the Metro Title 3 Flood Management Area as corrected by the most current FEMA Flood Insurance Rate Maps, and has evidence of flooding during the growing season, and is five acres or more in size, and has a restricted outlet or no outlet; or the wetland qualifies as having intact hydrologic control function under the 1996 Oregon Freshwater Wetland Assessment Methodology; or

C. The wetland or a portion of the wetland is within a horizontal distance of less than one - fourth mile from a water body which meets the Department of Environmental Quality definition of water quality limited water body in OAR Chapter 340, Division 41 (1996).

D. Created or restored wetlands that meet the requirements of Section 4.139.10(.02) shall be added to the Significant Resource Overlay Zone. [Added by Ord. # 674 11/16/09]

Response: Anchor QEA wetland scientists performed wetland delineation field work on December 6 and 14, 2017, and wetland determination field work on May 3, 2016, October 21, 2016, and January 17, 2017. Field work was conducted according to methods presented in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010), and Oregon Administrative Rules 141-090-0005 to 141-090-0055. Plant indicator status was determined using the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016).

As stated in Section 3.5.4 of the SRIR, two wetlands (Wetlands A and B) and one other water (Willow Creek) were identified on the project site during the delineation (Figure 11). The description, classification, and on-site area of these features are summarized in Table 3 of the SRIR with site photos provided in Appendix B. Each area is also briefly described in the following sections. Table 4 of the SRIR provides an assessment of whether the identified wetland would meet the City's criteria for adding wetlands to their SROZ inventory per Section 4.139.10(.02) of the SROZ Ordinance.

Wetland A is not mapped in the City's 1999 LWI (Figure 9) but is shown on the 2014 wetland inventory conducted by PHS (Figure 10). As indicated in Table 4 of the SRIR, Wetland A does not meet the City's criteria for adding wetlands to the SROZ. Wetland B was not mapped in the City's 1999 LWI (Figure 9) but is shown on the 2014 wetland inventory conducted by PHS (Figure 10). As indicated in Table 4 of the SRIR, Wetland A does not meet the City's criteria for adding wetlands to the SROZ.

(.03) Development of structures, additions and improvements that relate to uses other than single family residential.

(.04) Variances. A variance may be taken to any of the provisions of this Section per the standards of Section 4.196 of the Planning and Land Development Ordinance.

Response: No variances are requested.

Section 4.139.11 Special Provisions

(.01) Reduced front, rear and side yard setback. Applications on properties containing the SROZ may reduce the front, rear and side yard setback for developments or additions to protect the significant resource, as approved by the Development Review Board.

(.02) Density Transfer. For residential development proposals on lands which contain the SROZ, a transfer of density shall be permitted within the development proposal site. The following formula shall be used to calculate the density that shall be permitted for allowed residential use on the property:

- *A. Step 1. Calculate Expected Maximum Density. The Expected Maximum Density (EMD) is calculated by multiplying the acreage of the property by the maximum density permitted in the Wilsonville Comprehensive Plan.*
- *B. Step 2. The density that shall be permitted on the property shall be equal to the EMD obtained in Step 1, provided:*
  - *1. The density credit can only be transferred to that portion of the development site that is not located within the designated Significant Resource; and*
  - *2. 50% of the maximum number of dwelling units that are within the SROZ are allowed to be transferred to the buildable portion of the proposed development site provided that the standards for outdoor living area, landscaping, building height and parking shall still be met. Applicants proposing a density transfer must demonstrate compatibility between adjacent properties as well as satisfy the setback requirements of the zone in which the development is proposed or meet Section 4.139.10 A. above; and*
  - *3. The types of residential uses and other applicable standards permitted in the zone shall remain the same; and*
  - *4. Land area within the Significant Resource Overlay Zone may be used to satisfy the requirements for outdoor recreation/open space area consistent with the provisions found in Section 4.113 of the Planning and Land Development Ordinance.*

Response: No setback reductions or density transfers are proposed.

(.03) Alteration of constructed drainageways. Alteration of constructed drainageways may be allowed provided that such alterations do not adversely impact stream flows, flood storage capacity and in stream water quality and provide more efficient use of the land as well as provide improved habitat value through mitigation, enhancement and/or restoration. Such alterations must be evaluated through an SRIR and approved by the City Engineer and Development Review Board.

Response: No alteration of constructed drainageways is proposed.

E. Section 4.140. Planned Development Regulations.

[…]

(.02) Lot Qualification.

- *A. Planned Development may be established on lots which are suitable for and of a size to be planned and developed in a manner consistent with the purposes and objectives of Section 4.140.*

B. *Any site designated for development in the Comprehensive Plan may be developed as a Planned Development, provided that it is zoned "PD." All sites which are greater than two (2) acres in size, and designated in the Comprehensive Plan for commercial, residential, or industrial use shall be developed as Planned Developments, unless approved for other uses permitted by the Development Code. Smaller sites may also be developed through the City's PD procedures, provided that the location, size, lot configuration, topography, open space and natural vegetation of the site warrant such development.*

Response: The subject site is 16.15 acres in area and is designated in the Comprehensive Plan for residential use. The proposed development will be developed as a residential Planned Development (PD) per the provisions of this section.

(.03) Ownership.

A. *The tract or tracts of land included in a proposed Planned Development must be in one (1) ownership or control or the subject of a joint application by the owners of all the property included. The holder of a written option to purchase, with written authorization by the owner to make applications, shall be deemed the owner of such land for the purposes of Section 4.140.*

B. *Unless otherwise provided as a condition for approval of a Planned Development permit, the permittee may divide and transfer units or parcels of any development. The transferee shall use and maintain each such unit or parcel in strict conformance with the approval permit and development plan.*

Response: The properties included in the proposed PD are owned by three separate ownerships. The ownerships have submitted a joint application for the proposal.

(.04) Professional Design.

A. *The applicant for all proposed Planned Developments shall certify that the professional services of the appropriate professionals have been utilized in the planning process for development.*

B. *Appropriate professionals shall include, but not be limited to the following to provide the elements of the planning process set out in Section 4.139:*

   1. *An architect licensed by the State of Oregon;*
   2. *A landscape architect registered by the State of Oregon;*
   3. *An urban planner holding full membership in the American Institute of Certified Planners, or a professional planner with prior experience representing clients before the Development Review Board, Planning Commission, or City Council; or*
   4. *A registered engineer or a land surveyor licensed by the State of Oregon.*

C. *One of the professional consultants chosen by the applicant from either 1, 2, or 3, above, shall be designated to be responsible for conferring with the planning staff with respect to the concept and details of the plan.*

D. *The selection of the professional coordinator of the design team will not limit the owner or the developer in consulting with the planning staff.*

Response: The development team includes Mike Peebles, PE; Matt Klym, PE; Rose Horton, PE; Steven Dixon, PLA; David Haynes, PLA; and Li Alligood, AICP. Li Alligood has been designated as the applicant and party responsible for conferring with the planning staff.

(.05) Planned Development Permit Process.

A. *All parcels of land exceeding two (2) acres in size that are to be used for residential, commercial or industrial development, shall, prior to the issuance of any building permit:*

   1. *Be zoned for planned development;*
   2. *Obtain a planned development permit; and*
   3. *Obtain Development Review Board, or, on appeal, City Council approval.*

Response: The subject site exceeds 2 acres in size and is proposed for residential development. This application includes a zoning map amendment to apply the RN zone to the site; Planned Development Stage I application; and Planning Development Stage II application.

B. Zone change and amendment to the zoning map are governed by the applicable provisions of the Zoning Sections, inclusive of Section 4.197.

Response: The requested zoning map amendment is subject to the applicable provisions of the Zoning Sections and 4.197. These provisions are addressed in Section IV of this narrative.

C. Development Review Board approval is governed by Sections 4.400 to 4.450

D. All planned developments require a planned development permit. The planned development permit review and approval process consists of the following multiple stages, the last two or three of which can be combined at the request of the applicant:

  1. Pre-application conference with Planning Department;
  2. Preliminary (Stage I) review by the Development Review Board. When a zone change is necessary, application for such change shall be made simultaneously with an application for preliminary approval to the Board; and
  3. Final (Stage II) review by the Development Review Board
  4. In the case of a zone change and zone boundary amendment, City Council approval is required to authorize a Stage I preliminary plan.

Response: A pre-application conference was held with the Planning Department on September 28, 2017. Concurrent zoning map amendment, Stage I, and Stage II applications (and a number of additional concurrent applications) have been submitted for review by the DRB.

[…]

(.07) Preliminary Approval (Stage One):

A. Applications for preliminary approval for planned developments shall:

  1. Be made by the owner of all affected property or the owner's authorized agent; and
  2. Be filed on a form prescribed by the City Planning Department and filed with said Department.
  3. Set forth the professional coordinator and professional design team as provided in subsection (.04), above.
  4. State whether the development will include mixed land uses, and if so, what uses and in what proportions and locations.

Response: This submittal includes all of the above information.

B. The application shall include conceptual and quantitatively accurate representations of the entire development sufficient to judge the scope, size, and impact of the development on the community; and, in addition to the requirements set forth in Section 4.035, shall be accompanied by the following information:

  1. A boundary survey or a certified boundary description by a registered engineer or licensed surveyor.
  2. Topographic information as set forth in Section 4.035
  3. A tabulation of the land area to be devoted to various uses, and a calculation of the average residential density per net acre.
  4. A stage development schedule demonstrating that the developer intends receive Stage II approval within two (2) years of receiving Stage I approval, and to commence construction within two (2) years after the approval of the final development plan, and will proceed diligently to completion; unless a phased development schedule has been approved; in which case adherence to that schedule shall be considered to constitute diligent pursuit of project completion.

5. *A commitment by the applicant to provide in the Final Approval (Stage II) a performance bond or other acceptable security for the capital improvements required by the project.*
6. *If it is proposed that the final development plan will be executed in stages, a schedule thereof shall be provided.*
7. *Statement of anticipated waivers from any of the applicable site development standards.*

Response: A boundary survey including topographic information is included as Sheet P1.10. A tabulation of land area and residential density is included in Table 2 within this narrative. Stage I and Stage II approvals are being requested concurrently, and a stage development schedule is not proposed. The applicant is not requesting waivers to any applicable site development standards.

[…]
(.09) Final Approval (Stage Two):
[Note: Outline Number is incorrect.]

A. *Unless an extension has been granted by the Development Review Board, within two (2) years after the approval or modified approval of a preliminary development plan (Stage I), the applicant shall file with the City Planning Department a final plan for the entire development or when submission in stages has been authorized pursuant to Section 4.035 for the first unit of the development, a public hearing shall be held on each such application as provided in Section 4.013.*

Response: A Stage II application has been submitted concurrent with the Stage I application.

B. *After such hearing, the Development Review Board shall determine whether the proposal conforms to the permit criteria set forth in this Code, and shall approve, conditionally approve, or disapprove the application.*
C. *The final plan shall conform in all major respects with the approved preliminary development plan, and shall include all information included in the preliminary plan plus the following:*
   1. *The location of water, sewerage and drainage facilities;*
   2. *Preliminary building and landscaping plans and elevations, sufficient to indicate the general character of the development;*
   3. *The general type and location of signs;*
   4. *Topographic information as set forth in Section 4.035;*
   5. *A map indicating the types and locations of all proposed uses; and*
   6. *A grading plan.*

Response: A Preliminary Utility Plan is included as Sheet P4.00. Preliminary building elevations are included as Appendix I. Preliminary landscaping plans are included as Sheets L2.10, 2.20, and 2.30. A Preliminary Grading Plan is included as Sheet P5.00. Sign locations and permits will be provided under separate application.

D. *The final plan shall be sufficiently detailed to indicate fully the ultimate operation and appearance of the development or phase of development. However, Site Design Review is a separate and more detailed review of proposed design features, subject to the standards of Section 4.400.*

Response: A concurrent Site Design Review application has been submitted. Section 4.400 Site Design Review criteria are addressed in Section VIII of this narrative.

D. *Copies of legal documents required by the Development Review Board for dedication or reservation of public facilities, or for the creation of a non-profit homeowner's association, shall also be submitted.*

Response: A draft Declaration of Protective Covenants, Conditions, Restrictions and Easements is included as Appendix G.

[…]

J. A planned development permit may be granted by the Development Review Board only if it is found that the development conforms to all the following criteria, as well as to the Planned Development Regulations in Section 4.140:

1. The location, design, size and uses, both separately and as a whole, are consistent with the Comprehensive Plan, and with any other applicable plan, development map or Ordinance adopted by the City Council.

Response: The site is located within the Frog Pond West neighborhood of the Frog Pond planning area. The Frog Pond West Master Plan has been incorporated into the Comprehensive Plan, and designates the site for single-family residential development. Consistency with the Comprehensive Plan is addressed in Section III of this narrative. The RN zone is identified as the implementing zone for the Residential Neighborhood RN Comprehensive Plan designation; this zone requires that all development within it be approved as a Planned Development.

2. That the location, design, size and uses are such that traffic generated by the development at the most probable used intersection(s) can be accommodated safely and without congestion in excess of Level of Service D, as defined in the Highway Capacity Manual published by the National Highway Research Board, on existing or immediately planned arterial or collector streets and will, in the case of commercial or industrial developments, avoid traversing local streets. Immediately planned arterial and collector streets are those listed in the City's adopted Capital Improvement Program, for which funding has been approved or committed, and that are scheduled for completion within two years of occupancy of the development or four year if they are an associated crossing, interchange, or approach street improvement to Interstate 5.

a. In determining levels of Service D, the City shall hire a traffic engineer at the applicant's expense who shall prepare a written report containing the following minimum information for consideration by the Development Review Board:

i. An estimate of the amount of traffic generated by the proposed development, the likely routes of travel of the estimated generated traffic, and the source(s) of information of the estimate of the traffic generated and the likely routes of travel; [Added by Ord. 561, adopted 12/15/03.]

ii. What impact the estimate generated traffic will have on existing level of service including traffic generated by (1) the development itself, (2) all existing developments, (3) Stage II developments approved but not yet built, and (4) all developments that have vested traffic generation rights under section 4.140(.10), through the most probable used intersection(s), including state and county intersections, at the time of peak level of traffic. This analysis shall be conducted for each direction of travel if backup from other intersections will interfere with intersection operations. [Amended by Ord 561, adopted 12/15/03.]

b. The following are exempt from meeting the Level of Service D criteria standard:

i. A planned development or expansion thereof which generates three (3) new p.m. peak hour traffic trips or less;

ii. A planned development or expansion thereof which provides an essential governmental service.

c. Traffic generated by development exempted under this subsection on or after Ordinance No. 463 was enacted shall not be counted in determining levels of service for any future applicant. [Added by Ord 561, adopted 12/15/03.]

d. Exemptions under 'b' of this subsection shall not exempt the development or expansion from payment of system development charges or other applicable regulations. [Added by Ord 561, adopted 12/15/03.]

e. In no case will development be permitted that creates an aggregate level of traffic at LOS "F". ([Added by Ord 561, adopted 12/15/03.]

Response: DKS and Associates has conducted a Traffic Impact Analysis (TIA) to evaluate traffic impacts from the proposed development. The TIA addresses the provisions above.

3. *That the location, design, size and uses are such that the residents or establishments to be accommodated will be adequately served by existing or immediately planned facilities and services.*

Response: The proposal will construct transportation infrastructure with site development and will dedicate 10 ft. of public right-of-way to Boeckman Road for future widening and improvement. The site will be adequately served.

[…]

(.10) Early Vesting of Traffic Generation. […]

Response: No early vesting of traffic generation is requested. This standard is not applicable.

V. General Development Regulations

A. Section 4.154. On-site Pedestrian Access and Circulation.

(.01) On-site Pedestrian Access and Circulation

- *A. The purpose of this section is to implement the pedestrian access and connectivity policies of the Transportation System Plan. It is intended to provide for safe, reasonably direct, and convenient pedestrian access and circulation.*
- *B. Standards. Development shall conform to all of the following standards:*
  - *1. Continuous Pathway System. A pedestrian pathway system shall extend throughout the development site and connect to adjacent sidewalks, and to all future phases of the development, as applicable.*
  - *2. Safe, Direct, and Convenient. Pathways within developments shall provide safe, reasonably direct, and convenient connections between primary building entrances and all adjacent parking areas, recreational areas/playgrounds, and public rights-of-way and crosswalks based on all of the following criteria:*
    - *a. Pedestrian pathways are designed primarily for pedestrian safety and convenience, meaning they are free from hazards and provide a reasonably smooth and consistent surface.*
    - *b. The pathway is reasonably direct. A pathway is reasonably direct when it follows a route between destinations that does not involve a significant amount of unnecessary out-of-direction travel.*
    - *c. The pathway connects to all primary building entrances and is consistent with the Americans with Disabilities Act (ADA) requirements.*
    - *d. All parking lots larger than three acres in size shall provide an internal bicycle and pedestrian pathway pursuant to Section 4.155(.03)(B.)(3.)(d.).*

Response: The site is a single-family residential development and includes a network of public sidewalks. In addition to the sidewalk system, 6 bicycle and pedestrian pathways are proposed: Tracts B and C provide connections to the school site to the west; Tract D provides a connection between Street G and Boeckman Road; and Tracts H, J, and K provide connections between Street B and Boeckman Road.

3. *Vehicle/Pathway Separation. Except as required for crosswalks, per subsection 4, below, where a pathway abuts a driveway or street it shall be vertically or horizontally separated from the vehicular lane. For example, a pathway may be vertically raised six inches above the abutting travel lane, or horizontally separated by a row of bollards.*

Response: The proposed pathways do not abut a driveway or a street. This standard is not applicable.

4. *Crosswalks. Where a pathway crosses a parking area or driveway, it shall be clearly marked with contrasting paint or paving materials (e.g., pavers, light-color concrete inlay between asphalt, or similar contrast).*

Response: The proposed pathways do not cross a parking area or driveway. This standard is not applicable.

5. *Pathway Width and Surface. Primary pathways shall be constructed of concrete, asphalt, brick/masonry pavers, or other durable surface, and not less than five (5) feet wide. Secondary pathways and pedestrian trails may have an alternative surface except as otherwise required by the ADA.*

Response: The proposed pedestrian pathways will be constructed of concrete, asphalt, brick/masonry pavers, or other durable surface, and will be at least 5 ft. wide. This standard is met.

6. *All pathways shall be clearly marked with appropriate standard signs.*
[Added by Ord. #719, 6/17/13]

Response: The pedestrian pathways will be signed as required.

B. Section 4.155. General Regulations - Parking, Loading and Bicycle Parking.

[…]

(.03) Minimum and Maximum Off-Street Parking Requirements:

- *A. Parking and loading or delivery areas shall be designed with access and maneuvering area adequate to serve the functional needs of the site and shall:*
  - *1. Separate loading and delivery areas and circulation from customer and/or employee parking and pedestrian areas. Circulation patterns shall be clearly marked.*
  - *2. To the greatest extent possible, separate vehicle and pedestrian traffic.*
- *B. Parking and loading or delivery areas shall be landscaped to minimize the visual dominance of the parking or loading area, as follows:*

Response: There is no off-street loading required or proposed for the proposed detached single-family development. These provisions are not applicable.

- *C. Off Street Parking shall be designed for safe and convenient access that meets ADA and ODOT standards. All parking areas which contain ten (10) or more parking spaces, shall for every fifty (50) standard spaces., provide one ADA-accessible parking space that is constructed to building code standards, Wilsonville Code 9.000.*
- *D. Where possible, parking areas shall be designed to connect with parking areas on adjacent sites so as to eliminate the necessity for any mode of travel of utilizing the public street for multiple accesses or cross movements. In addition, on-site parking shall be designed for efficient on-site circulation and parking.*
- *E. In all multi-family dwelling developments, there shall be sufficient areas established to provide for parking and storage of motorcycles, mopeds and bicycles. Such areas shall be clearly defined and reserved for the exclusive use of these vehicles.*
- *F. On-street parking spaces, directly adjoining the frontage of and on the same side of the street as the subject property, may be counted towards meeting the minimum off-street parking standards.*

Response: There are no parking areas required or proposed for the proposed detached single-family development. These provisions are not applicable.

- *G. Tables 5 shall be used to determine the minimum and maximum parking standards for various land uses. The minimum number of required parking spaces shown on Tables 5 shall be* *determined by rounding to the nearest whole parking space. For example, a use containing 500 square feet, in an area where the standard is one space for each 400 square feet of floor area, is required to provide one off-street parking space. If the same use contained more than 600 square feet, a second parking space would be required. Structured parking and on-street parking are exempted from the parking maximums in Table 5. [Amended by Ordinance No. 538, 2/21/02.]*

Response: Table 5 requires that single units provide 1 parking space per dwelling unit. There is no maximum number listed. Each single-family dwelling unit will be provided with at least 2 parking spaces. This standard is met.

H. Electrical Vehicle Charging Stations:

1. *Parking spaces designed to accommodate and provide one or more electric vehicle charging stations on site may be counted towards meeting the minimum off-street parking standards.*
2. *Modification of existing parking spaces to accommodate electric vehicle charging stations on site is allowed outright.*

Response: No electrical vehicle charging stations are proposed at this time.

I. Motorcycle parking:

1. *Motorcycle parking may substitute for up to 5 spaces or 5 percent of required automobile parking, whichever is less. For every 4 motorcycle parking spaces provided, the automobile parking requirement is reduced by one space.*
2. *Each motorcycle space must be at least 4 feet wide and 8 feet deep. Existing parking may be converted to take advantage of this provision.*

[Amended by Ord. #719, 6/17/13]

Response: No motorcycle parking is proposed.

(.04) Bicycle Parking:

A. Required Bicycle Parking - General Provisions.

1. *The required minimum number of bicycle parking spaces for each use category is shown in Table 5, Parking Standards.[…]*

Response: Table 5 states that there is no minimum bicycle parking requirement for detached single-family homes. These provisions are not applicable.

(.05) Minimum Off-Street Loading Requirements: […]

Response: There is no off-street loading requirement for detached single-family homes. These provisions are not applicable.

(.06) Carpool and Vanpool Parking Requirements: […]

Response: There is no carpool or vanpool parking requirement for detached single-family homes. These provisions are not applicable.

C. Section 4.156. Sign Code Regulations.

Section 4.156.07. Sign Regulations In Residential Zones.

(.01) Ground Mounted Signs for Residential Developments. One ground mounted sign, not exceeding eighteen (18) square feet in area and six (6) feet in height above ground, shall be permitted for each residential subdivision or for any multi-family development.

- A. *Additional ground mounted signs of eighteen (18) square feet or less shall be permitted for additional entrances to the subdivision or development located on a separate street frontage or on the same street frontage located at least two hundred (200) feet apart.*
- B. *For one entrance on a street frontage, an additional ground mounted sign may be placed on opposite side of the street or private drive at the intersection.*
- B. *Planned Development Signs. Up to thirty (32) square feet of the allowed sign area for freestanding signs in a planned development may be used for a separate on-site monument sign or off-site monument sign on an adjacent parcel identifying the Planned Development project.*

Response: No signs are proposed at this time. Future signs will be subject to these regulations.

D. Section 4.167. General Regulations - Access, Ingress and Egress.

(.01) Each access onto streets or private drives shall be at defined points as approved by the City and shall be consistent with the public's health, safety and general welfare. Such defined points of access shall be approved at the time of issuance of a building permit if not previously determined in the development permit. [Amended by Ord. 682, 9/9/10]

Response: Proposed driveway access onto streets and private drives is shown in Sheet P2.00.

E. Section 4.169. General Regulations – Double-Frontage Lots.

(.01) Buildings on double frontage lots (i.e., through lots) and corner lots must meet the front yard setback for principal buildings on both streets or tracts with a private drive. [Amended by Ord. 682, 9/9/10]

(.02) Given that double-frontage lots tend to have one end that is regarded as a rear yard by the owner, the Development Review Board may establish special maintenance conditions to apply to such areas. Such conditions may include the requirement that the subject homeowners association, if any, be responsible for the on-going maintenance of the street frontage areas of double-frontage lots.

Response: One double-frontage lot is proposed. Lot 24 will be developed with a dwelling for the owner of the home on the proposed Lot 27. The lot size is adequate to meet the front yard setback on both Street B and Street C.

F. Section 4.171. General Regulations - Protection of Natural Features and Other Resources.

(.02) General Terrain Preparation:

- A. *All developments shall be planned, designed, constructed and maintained with maximum regard to natural terrain features and topography, especially hillside areas, floodplains, and other significant landforms.*
- B. *All grading, filling and excavating done in connection with any development shall be in accordance with the Uniform Building Code*
- C. *In addition to any permits required under the Uniform Building Code, all developments shall be planned, designed, constructed and maintained so as to:*
  - l. *Limit the extent of disturbance of soils and site by grading, excavation and other land alterations.*
  - 2. *Avoid substantial probabilities of: (l) accelerated erosion; (2) pollution, contamination, or siltation of lakes, rivers, streams and wetlands; (3) damage to vegetation; (4) injury to wildlife and fish habitats.*
  - 3. *Minimize the removal of trees and other native vegetation that stabilize hillsides, retain moisture, reduce erosion, siltation and nutrient runoff, and preserve the natural scenic character.*

Response: The site has been planned and designed to avoid the natural features on the site. Grading, filling, and excavating will be conducted in accordance with the Uniform Building code. The site will be protected with erosion control measures and the SROZ on site will be staked prior to commencement of site work to avoid damage to vegetation or injury to habitat. The removal of trees is necessary for site development, but replacement trees will be planted per the provisions of this code.

(.03) Hillsides: All developments proposed on slopes greater than 25% shall be limited to the extent that: […]

Response: No slopes greater than 25% are present on the site.

(.04) Trees and Wooded Areas.
- *A. All developments shall be planned, designed, constructed and maintained so that:*
  - *I. Existing vegetation is not disturbed, injured, or removed prior to site development and prior to an approved plan for circulation, parking and structure location.*
  - *2. Existing wooded areas, significant clumps/groves of trees and vegetation, and all trees with a diameter at breast height of six inches or greater shall be incorporated into the development plan and protected wherever feasible.*
  - *3. Existing trees are preserved within any right-of-way when such trees are suitably located, healthy, and when approved grading allows.*
- *B. Trees and woodland areas to be retained shall be protected during site preparation and construction according to City Public Works design specifications, by:*
  - *I. Avoiding disturbance of the roots by grading and/or compacting activity.*
  - *2. Providing for drainage and water and air filtration to the roots of trees which will be covered with impermeable surfaces.*
  - *3. Requiring, if necessary, the advisory expertise of a registered arborist/horticulturist both during and after site preparation.*
  - *4. Requiring, if necessary, a special maintenance, management program to insure survival of specific woodland areas of specimen trees or individual heritage status trees.*

Response: Existing vegetation will not be disturbed, injured or removed prior to land use and permit approvals. Existing trees have been retained wherever possible; however, many trees will need to be removed to provide area for home construction.

(.05) High Voltage Powerline Easements and Rights of Way and Petroleum Pipeline Easements:
- *A. Due to the restrictions placed on these lands, no residential structures shall be allowed within high voltage powerline easements and rights of way and petroleum pipeline easements, and any development, particularly residential, adjacent to high voltage powerline easements and rights of way and petroleum pipeline easements shall be carefully reviewed.*
- *B. Any proposed non-residential development within high voltage powerline easements and rights of way and petroleum pipeline easements shall be coordinated with and approved by the Bonneville Power Administration, Portland General Electric Company or other appropriate utility, depending on the easement or right of way ownership.*

Response: No high voltage powerline easements or petroleum pipeline easements are present on site.

(.06) Hazards to Safety: Purpose:
- *A. To protect lives and property from natural or human-induced geologic or hydrologic hazards and disasters.*
- *B. To protect lives and property from damage due to soil hazards.*
- *C. To protect lives and property from forest and brush fires.*
- *D. To avoid financial loss resulting from development in hazard areas.*

Response: No hydrologic, soil, fire, or other hazards have been identified on site.

(.07) Standards for Earth Movement Hazard Areas:

- *A. No development or grading shall be allowed in areas of land movement, slump or earth flow, and mud or debris flow, except under one of the following conditions:*
  - *1. Stabilization of the identified hazardous condition based on established and proven engineering techniques which ensure protection of public and private property. Appropriate conditions of approval may be attached by the City.*
  - *2. An engineering geologic study approved by the City establishing that the site is stable for the proposed use and development. The study shall include the following:*
    - *a. Index map.*
    - *b. Project description, to include: location; topography, drainage, vegetation; discussion of previous work; and discussion of field exploration methods.*
    - *c. Site geology, to include: site geologic map; description of bedrock and superficial materials including artificial fill; location of any faults, folds, etc.; and structural data including bedding, jointing, and shear zones.*
    - *d. Discussion and analysis of any slope stability problems.*
    - *e. Discussion of any off-site geologic conditions that may pose a potential hazard to the site or that may be affected by on-site development.*
    - *f. Suitability of site for proposed development from geologic standpoint.*
    - *g. Specific recommendations for cut slope stability, seepage and drainage control, or other design criteria to mitigate geologic hazards.*
    - *h. Supportive data, to include: cross sections showing subsurface structure; graphic logs of subsurface explorations; results of laboratory tests; and references.*
    - *i. Signature and certification number of engineering geologist registered in the State of Oregon.*
    - *j. Additional information or analyses as necessary to evaluate the site.*
- *B. Vegetative cover shall be maintained or established for stability and erosion control purposes.*
- *C. Diversion of storm water into these areas shall be prohibited.*
- *D. The principal source of information for determining earth movement hazards is the State Department of Geology and Mineral Industries (DOGAMI) Bulletin 99 and any subsequent bulletins and accompanying maps. Approved site specific engineering geologic studies shall be used to identify the extent and severity of the hazardous conditions on the site, and to update the earth movement hazards database.*

Response: Geotechnical investigations have been completed for each of the 4 subject properties, and no earth movement hazards have been identified. See Appendix E for geotechnical reports.

(.08) Standards for Soil Hazard Areas:

- *A. Appropriate siting and design safeguards shall insure structural stability and proper drainage of foundation and crawl space areas for development on land with any of the following soil conditions: wet or high water table; high shrink-swell capability; compressible or organic; and shallow depth-to-bedrock.*
- *B. The principal source of information for determining soil hazards is the State DOGAMI Bulletin 99 and any subsequent bulletins and accompanying maps. Approved site-specific soil studies shall be used to identify the extent and severity of the hazardous conditions on the site, and to update the soil hazards database accordingly.*

Response: Geotechnical investigations have been completed for each of the 4 subject properties, and no soil hazard areas have been identified. See Appendix E for geotechnical reports.

(.09) Historic Protection: Purpose:

- *A. To preserve structures, sites, objects, and areas within the City of Wilsonville having historic, cultural, or archaeological significance.*

Response: No historic, cultural, or archaeological items have been identified on the site.

G. Section 4.175. Public Safety and Crime Prevention.

(.01) All developments shall be designed to deter crime and insure public safety.

(.02) Addressing and directional signing shall be designed to assure identification of all buildings and structures by emergency response personnel, as well as the general public.

(.03) Areas vulnerable to crime shall be designed to allow surveillance. Parking and loading areas shall be designed for access by police in the course of routine patrol duties.

(.04) Exterior lighting shall be designed and oriented to discourage crime.

Response: The Stafford Meadows development has been designed to deter crime and insure public safety. Streets and pedestrian connections will be lit for visibility and safety. Homes will be oriented toward these streets to provide "eyes on the street." All dwellings will be addressed per Building and Fire Department requirements to allow identification for emergency response personnel. No parking and loading areas are proposed. Dwellings will have exterior porch lighting, which will support the street lights to provide safety and visibility.

These standards are met.

H. Section 4.176. Landscaping, Screening, and Buffering.

(.02) Landscaping and Screening Standards.

[…]

C. General Landscaping Standard.

1. *Intent. The General Landscaping Standard is a landscape treatment for areas that are generally open. It is intended to be applied in situations where distance is used as the principal means of separating uses or developments and landscaping is required to enhance the intervening space. Landscaping may include a mixture of ground cover, evergreen and deciduous shrubs, and coniferous and deciduous trees.*
2. *Required materials. Shrubs and trees, other than street trees, may be grouped. Ground cover plants must fully cover the remainder of the landscaped area (see Figure 21: General Landscaping). The General Landscaping Standard has two different requirements for trees and shrubs:*
   - *a. Where the landscaped area is less than 30 feet deep, one tree is required for every 30 linear feet.*
   - *b. Where the landscaped area is 30 feet deep or greater, one tree is required for every 800 square feet and two high shrubs or three low shrubs are required for every 400 square feet.*

Response: The proposed development consists of single-family dwellings, which are generally subject to the General Landscape Standard with the exception of lots abutting Boeckman Road and the pedestrian connections, which are subject to Low Screen Landscaping Standards and the Frog Pond West Master Plan. Sheet P2.1 provides details of proposed landscaping in these areas.

D. Low Screen Landscaping Standard.

1. *Intent. The Low Screen Landscaping Standard is a landscape treatment that uses a combination of distance and low screening to separate uses or developments. It is intended to be applied in situations where low screening is adequate to soften the impact of one use or development on another, or where visibility between areas is more important than a total visual screen. The Low Screen Landscaping Standard is usually applied along street lot lines or in the area separating parking lots from street rights-of-way.*
2. *Required materials. The Low Screen Landscaping Standard requires sufficient low shrubs to form a continuous screen three (3) feet high and 95% opaque, year-round. In addition, one tree is required for every 30 linear feet of landscaped area, or as otherwise required to provide a tree canopy over the landscaped area. Ground cover plants must fully cover the remainder of the landscaped area. A three (3) foot high masonry wall or a berm may be*

substituted for the shrubs, but the trees and ground cover plants are still required. When applied along street lot lines, the screen or wall is to be placed along the interior side of the landscaped area. (See Figure 22: Low Screen Landscaping).

Response: The proposed development consists of single-family dwellings, which are generally subject to the General Landscape Standard with the exception of lots abutting Boeckman Road and the pedestrian connections, which are subject to Low Screen Landscaping Standards and the Frog Pond West Master Plan. Sheet P2.1 provides details of proposed landscaping in these areas.

E. High Screen Landscaping Standard.

1. *Intent. The High Screen Landscaping Standard is a landscape treatment that relies primarily on screening to separate uses or developments. It is intended to be applied in situations where visual separation is required.*
2. *Required materials. The High Screen Landscaping Standard requires sufficient high shrubs to form a continuous screen at least six (6) feet high and 95% opaque, year-round. In addition, one tree is required for every 30 linear feet of landscaped area, or as otherwise required to provide a tree canopy over the landscaped area. Ground cover plants must fully cover the remainder of the landscaped area. A six (6) foot high masonry wall or a berm may be substituted for the shrubs, but the trees and ground cover plants are still required. When applied along street lot lines, the screen or wall is to be placed along the interior side of the landscaped area. (See Figure 23: High Screen Landscaping).*

Response: The proposed residential development is located adjacent to future civic and institutional developments. No screening is required or provided between uses.

F. High Wall Standard.

1. *Intent. The High Wall Standard is intended to be applied in situations where extensive screening to reduce both visual and noise impacts is needed to protect abutting uses or developments from one-another. This screening is most important where either, or both, of the abutting uses or developments can be expected to be particularly sensitive to noise or visual impacts, or where there is little space for physical separation.*
2. *Required materials. The High Wall Standard requires a masonry wall at least six (6) feet high along the interior side of the landscaped area (see Figure 24: High Wall Landscaping). In addition, one tree is required for every 30 linear feet of wall, or as otherwise required to provide a tree canopy over the landscaped area. Ground cover plants must fully cover the remainder of the landscaped area.*

Response: There are no visual or noise impacts anticipated from the proposed development, and high walls are not required or proposed.

G. High Berm Standard.

1. *Intent. The High Berm Standard is intended to be applied in situations where extensive screening to reduce both visual and noise impacts is needed to protect abutting uses or developments from one-another, and where it is desirable and practical to provide separation by both distance and sight-obscuring materials. This screening is most important where either, or both, of the abutting uses or developments can be expected to be particularly sensitive to noise or visual impacts.*
2. *Required materials. The High Berm Standard requires a berm at least four (4) feet high along the interior side of the landscaped area (see Figure 25: High Berm Landscaping). If the berm is less than six (6) feet high, low shrubs meeting the Low Screen Landscaping Standard, above, are to be planted along the top of the berm, assuring that the screen is at least six (6) feet in height In addition, one tree is required for every 30 linear feet of berm, or as otherwise required to provide a tree canopy over the landscaped area. Ground cover plants must fully cover the remainder of the landscaped area.*

Response: There are no visual or noise impacts anticipated from the proposed development, and a high berm is not required or provided.

H. Partially Sight-Obscuring Fence Standard.

1. *Intent. The Partially Sight-Obscuring Fence Standard is intended to provide a tall, but not totally blocked, visual separation. The standard is applied where a low level of screening is adequate to soften the impact of one use or development on another, and where some visibility between abutting areas is preferred over a total visual screen. It can be applied in conjunction with landscape plantings or applied in areas where landscape plantings are not necessary and where nonresidential uses are involved.*
2. *Required materials. Partially Sight-Obscuring Fence Standard are to be at least six (6) feet high and at least 50% sight-obscuring. Fences may be made of wood (other than plywood or particle-board), metal, bricks, masonry or other permanent materials (see Figure 26: Partially Sight-Obscuring Fence).*

I. Fully Sight-Obscuring Fence Standard.

1. *Intent. The Fully Sight-Obscuring Fence Standard is intended to provide a totally blocked visual separation. The standard is applied where full visual screening is needed to reduce the impact of one use or development on another. It can be applied in conjunction with landscape plantings or applied in areas where landscape plantings are not necessary.*
2. *Required materials. Fully sight-obscuring fences are to be at least six (6) feet high and 100% sight-obscuring. Fences may be made of wood (other than plywood or particle-board), metal, bricks, masonry or other permanent materials (see Figure 27: Totally Sight-Obscuring Fence).*

Response: There is no need for partially or totally blocked visual separation. Sight-obscuring fencing is not provided, with the exception of the Boeckman Road frontage as required by the Frog Pond West Master Plan.

(.03) Landscape Area. Not less than fifteen percent (15%) of the total lot area, shall be landscaped with vegetative plant materials. The ten percent (10%) parking area landscaping required by section 4.155.03(B)(1) is included in the fifteen percent (15%) total lot landscaping requirement. Landscaping shall be located in at least three separate and distinct areas of the lot, one of which must be in the contiguous frontage area. Planting areas shall be encouraged adjacent to structures. Landscaping shall be used to define, soften or screen the appearance of buildings and off-street parking areas. Materials to be installed shall achieve a balance between various plant forms, textures, and heights. The installation of native plant materials shall be used whenever practicable. (For recommendations refer to the Native Plant List maintained by the City of Wilsonville). [Amended by Ord. # 674 11/16/09]

Response: At least 15% of the total lot area for each single-family dwelling will be landscaped; conformance with this standard will be reviewed at the time of building permit submittal. There are no parking areas proposed and no parking area landscaping is required. The landscape plan included as Sheets L2.0-L2.2 illustrates the location and type of landscaping within public rights-of-way and tracts.

(.04) Buffering and Screening. Additional to the standards of this subsection, the requirements of the Section 4.137.5 (Screening and Buffering Overlay Zone) shall also be applied, where applicable.

A. All intensive or higher density developments shall be screened and buffered from less intense or lower density developments.

B. Activity areas on commercial and industrial sites shall be buffered and screened from adjacent residential areas. Multi-family developments shall be screened and buffered from single-family areas.

C. All exterior, roof and ground mounted, mechanical and utility equipment shall be screened from ground level off-site view from adjacent streets or properties.

D. All outdoor storage areas shall be screened from public view, unless visible storage has been approved for the site by the Development Review Board or Planning Director acting on a development permit.

E. In all cases other than for industrial uses in industrial zones, landscaping shall be designed to screen loading areas and docks, and truck parking.

F. In any zone any fence over six (6) feet high measured from soil surface at the outside of fenceline shall require Development Review Board approval.

Response: The requirements of 4.137.5 are applicable along the edge of nonresidential zones abutting, or located directly across the street from, residential zones. The proposed development is located within a residential zone and is anticipated to abut residential and/or institutional development in accordance with the Frog Pond Master Plan. These provisions are not applicable.

(.05) Sight-Obscuring Fence or Planting. The use for which a sight-obscuring fence or planting is required shall not begin operation until the fence or planting is erected or in place and approved by the City. A temporary occupancy permit may be issued upon a posting of a bond or other security equal to one hundred ten percent (110%) of the cost of such fence or planting and its installation. (See Sections 4.400 to 4.470 for additional requirements.)

Response: No sight-obscuring fences or planting are required between the proposed residential use and adjacent uses. This standard is not applicable.

(.06) Plant Materials.

A. Shrubs and Ground Cover. All required ground cover plants and shrubs must be of sufficient size and number to meet these standards within three (3) years of planting. Non-horticultural plastic sheeting or other impermeable surface shall not be placed under mulch. Native topsoil shall be preserved and reused to the extent feasible. Surface mulch or bark dust are to be fully raked into soil of appropriate depth, sufficient to control erosion, and are confined to areas around plantings. Areas exhibiting only surface mulch, compost or barkdust are not to be used as substitutes for plant areas. [Amended by Ord. # 674 11/16/09]

1. *Shrubs. All shrubs shall be well branched and typical of their type as described in current AAN Standards and shall be equal to or better than 2-gallon containers and 10" to 12" spread.*
2. *Ground cover. Shall be equal to or better than the following depending on the type of plant materials used: gallon containers spaced at 4 feet on center minimum, 4" pot spaced 2 feet on center minimum, 2-1/4" pots spaced at 18 inch on center minimum. No bare root planting shall be permitted. Ground cover shall be sufficient to cover at least 80% of the bare soil in required landscape areas within three (3) years of planting. Where wildflower seeds are designated for use as a ground cover, the City may require annual re-seeding as necessary.*
3. *Turf or lawn in non-residential developments. Shall not be used to cover more than ten percent (10%) of the landscaped area, unless specifically approved based on a finding that, due to site conditions and availability of water, a larger percentage of turf or lawn area is appropriate. Use of lawn fertilizer shall be discouraged. Irrigation drainage runoff from lawns shall be retained within lawn areas.*
4. *Plant materials under trees or large shrubs. Appropriate plant materials shall be installed beneath the canopies of trees and large shrubs to avoid the appearance of bare ground in those locations.*
5. *Integrate compost-amended topsoil in all areas to be landscaped, including lawns, to help detain runoff, reduce irrigation and fertilizer needs, and create a sustainable, low-maintenance landscape. [Added by Ord. # 674 11/16/09]*

Response: The landscape plan included as Sheets P2.0-P2.2 and P3.0 addresses these requirements.

B. *Trees. All trees shall be well-branched and typical of their type as described in current American Association of Nurserymen (AAN) Standards and shall be balled and burlapped. The trees shall be grouped as follows:*
   1. *Primary trees which define, outline or enclose major spaces, such as Oak, Maple, Linden, and Seedless Ash, shall be a minimum of 2" caliper.*
   2. *Secondary trees which define, outline or enclose interior areas, such as Columnar Red Maple, Flowering Pear, Flame Ash, and Honeylocust, shall be a minimum of 1-3/4" to 2" caliper.*
   3. *Accent trees which, are used to add color, variation and accent to architectural features, such as Flowering Pear and Kousa Dogwood, shall be 1-3/4" minimum caliper.*
   4. *Large conifer trees such as Douglas Fir or Deodar Cedar shall be installed at a minimum height of eight (8) feet.*
   5. *Medium-sized conifers such as Shore Pine, Western Red Cedar or Mountain Hemlock shall be installed at a minimum height of five to six (5 to 6) feet.*

Response: The landscape plan included as Sheets P2.0-P2.2 and P3.0 addresses these requirements.

C. *Where a proposed development includes buildings larger than twenty-four (24) feet in height or greater than 50,000 square feet in footprint area, the Development Review Board may require larger or more mature plant materials:*
   1. *At maturity, proposed trees shall be at least one-half the height of the building to which they are closest, and building walls longer than 50 feet shall require tree groups located no more than fifty (50) feet on center, to break up the length and height of the façade.*
   2. *Either fully branched deciduous or evergreen trees may be specified depending upon the desired results. Where solar access is to be preserved, only solar-friendly deciduous trees are to be used. Where year-round sight obscuring is the highest priority, evergreen trees are to be used.*
   3. *The following standards are to be applied:*
      a. *Deciduous trees:*
         i. *Minimum height of ten (10) feet; and*
         ii. *Minimum trunk diameter (caliper) of 2 inches (measured at four and one-half [4 1/2] feet above grade).*
      b. *Evergreen trees: Minimum height of twelve (12) feet.*

Response: Some of the proposed residential dwellings will exceed 24 ft. in height, but will be far less than 50,000 sq. ft. in footprint area. Requirements for larger or more mature plant materials are not warranted.

D. *Street Trees. In order to provide a diversity of species, the Development Review Board may require a mix of street trees throughout a development. Unless the Board waives the requirement for reasons supported by a finding in the record, different types of street trees shall be required for adjoining blocks in a development.*
   1. *All trees shall be standard base grafted, well branched and typical of their type as described in current AAN Standards and shall be balled and burlapped (b&b). Street trees shall be planted at sizes in accordance with the following standards:*
      a. *Arterial streets - 3" minimum caliper*
      b. *Collector streets - 2" minimum caliper.*
      c. *Local streets or residential private access drives - 1-3/4" minimum caliper. [Amended by Ord. 682, 9/9/10]*
      d. *Accent or median tree -1-3/4" minimum caliper.*

   Response: Willow Creek Drive is classified as a Collector; the other streets within the development are classified as Local Streets or Private Access Drives. As shown in Sheet L2.0, 2-

in. caliper b&b street trees are proposed for all streets within the development, as well as the Willow Creek Drive median.

2. *The following trees and varieties thereof are considered satisfactory street trees in most circumstances; however, other varieties and species are encouraged and will be considered:*
    a. *Trees over 50 feet mature height: Quercus garryana (Native Oregon White Oak), Quercus rubra borealis (Red Oak), Acer Macrophylum (Native Big Leaf Maple), Acer nigrum (Green Column Black Maple), Fraxinus americanus (White Ash), Fraxinus pennsylvannica 'Marshall' (Marshall Seedless Green Ash), Quercus coccinea (Scarlet Oak), Quercus pulustris (Pin Oak), Tilia americana (American Linden).*
    b. *Trees under 50 feet mature height: Acer rubrum (Red Sunset Maple), Cornus nuttallii (Native Pacific Dogwood), Gleditsia triacanthos (Honey Locust), Pyrus calleryana 'Bradford' (Bradford Pear), Tilia cordata (Little Leaf Linden), Fraxinus oxycarpa (Flame Ash).*
    c. *Other street tree species. Other species may be specified for use in certain situations. For instance, evergreen species may be specified where year-round color is desirable and no adverse effect on solar access is anticipated. Water-loving species may be specified in low locations where wet soil conditions are anticipated.*

    [Section 4.176(.06)(D.) amended by Ordinance No. 538, 2/21/02.]

Response: The proposed street trees include a mix of Acer rubrum (Red Sunset Maple), Tilia cordata (Little Leaf Linden), Cercidiphyllum japonicium (Katsura Tree), Oxydendrum arboreum (Sourwood), and Styrax japonicus (Japanese Snowbell). The Red Sunset Maple and Little Leaf Linden varieties are listed above; the Katsura Tree, Sourwood, and Japanese Snowbell are not listed but have been selected for the qualities that cause them to be frequently specified as street trees: predictable form, disease resistance, tidiness, and visual interest.

E. *Types of Plant Species.*
    1. *Existing landscaping or native vegetation may be used to meet these standards, if protected and maintained during the construction phase of the development and if the plant species do not include any that have been listed by the City as prohibited. The existing native and non-native vegetation to be incorporated into the landscaping shall be identified.*
    2. *Selection of plant materials. Landscape materials shall be selected and sited to produce hardy and drought-tolerant landscaping. Selection shall be based on soil characteristics, maintenance requirements, exposure to sun and wind, slope and contours of the site, and compatibility with other vegetation that will remain on the site. Suggested species lists for street trees, shrubs and groundcovers shall be provided by the City of Wilsonville.*
    3. *Prohibited plant materials. The City may establish a list of plants that are prohibited in landscaped areas. Plants may be prohibited because they are potentially damaging to sidewalks, roads, underground utilities, drainage improvements, or foundations, or because they are known to be invasive to native vegetation.*

    [Section 4.176(.06)(E.) amended by Ordinance No. 538, 2/21/02.]

Response: As shown on Sheet L2.2, the proposed landscape materials include a mix of native trees, shrubs, and groundcovers. No prohibited plant materials are proposed.

F. *Tree Credit.*

Existing trees that are in good health as certified by an arborist and are not disturbed during construction may count for landscaping tree credit as follows (measured at four and one-half feet above grade and rounded to the nearest inch):

Existing trunk diameter	***Number of Tree Credits***
18 to 24 inches in diameter	*3 tree credits*
25 to 31 inches in diameter	*4 tree credits*

32 inches or greater 5 tree credits

[Amended by Ord. # 674 11/16/09]

1. *It shall be the responsibility of the owner to use reasonable care to maintain preserved trees. Trees preserved under this section may only be removed if an application for removal permit under Section 4.610.10(01)(H) has been approved. Required mitigation for removal shall be replacement with the number of trees credited to the preserved and removed tree.*
2. *Within five years of occupancy and upon notice from the City, the property owner shall replace any preserved tree that cannot be maintained due to disease or damage, or hazard or nuisance as defined in Chapter 6 of this code. The notice shall be based on complete information provided by an arborist Replacement with the number of trees credited shall occur within one (1) growing season of notice.*

Response: As shown on Sheet L1.0, 11 trees will be protected. Per the calculations above and shown in Table 4, 25 tree credits are provided by protected trees.

Table 4 – Available Tree Credits

Tag #	Existing Trunk Diameter	Number of Tree Credits
50169	28 in.	4
51055	21 in.	3
51056	33 in.	5
51057	26 in.	4
53981	24 in.	3
Total		***19***

[…]

(.07) Installation and Maintenance.

A. *Installation. Plant materials shall be installed to current industry standards and shall be properly staked to assure survival. Support devices (guy wires, etc.) shall not be allowed to interfere with normal pedestrian or vehicular movement.*

B. *Maintenance. Maintenance of landscaped areas is the on-going responsibility of the property owner. Any landscaping installed to meet the requirements of this Code, or any condition of approval established by a City decision-making body acting on an application, shall be continuously maintained in a healthy, vital and acceptable manner. Plants that die are to be replaced in kind, within one growing season, unless appropriate substitute species are approved by the City. Failure to maintain landscaping as required in this Section shall constitute a violation of this Code for which appropriate legal remedies, including the revocation of any applicable land development permits, may result.*

C. *Irrigation. The intent of this standard is to assure that plants will survive the critical establishment period when they are most vulnerable due to a lack of watering and also to assure that water is not wasted through unnecessary or inefficient irrigation. Approved irrigation system plans shall specify one of the following:*
   1. *A permanent, built-in, irrigation system with an automatic controller. Either a spray or drip irrigation system, or a combination of the two, may be specified.*
   2. *A permanent or temporary system designed by a landscape architect licensed to practice in the State of Oregon, sufficient to assure that the plants will become established and drought-tolerant.*
   3. *Other irrigation system specified by a licensed professional in the field of landscape architecture or irrigation system design.*
   4. *A temporary permit issued for a period of one year, after which an inspection shall be conducted to assure that the plants have become established. Any plants that have died, or that appear to the Planning Director to not be thriving, shall be appropriately replaced within one growing season. An inspection fee and a maintenance bond or other security sufficient to cover all costs of replacing the plant materials shall be provided, to the satisfaction of the Community Development Director. Additionally, the applicant shall provide the City with a*

written license or easement to enter the property and cause any failing plant materials to be replaced.

D. *Protection. All required landscape areas, including all trees and shrubs, shall be protected from potential damage by conflicting uses or activities including vehicle parking and the storage of materials.*

Response: As detailed in Note 1 of Sheet L2.0, all landscape areas will be watered by a fully automatic underground irrigation system, except the SROZ. The SROZ will receive establishment irrigation. These standards are met.

(.08) Landscaping on Corner Lots. All landscaping on corner lots shall meet the vision clearance standards of Section 4.177. If high screening would ordinarily be required by this Code, low screening shall be substituted within vision clearance areas. Taller screening may be required outside of the vision clearance area to mitigate for the reduced height within it.

Response: High screening is not required on any corner lots, and is not proposed. This standard is met.

(.09) Landscape Plans. Landscape plans shall be submitted showing all existing and proposed landscape areas. Plans must be drawn to scale and show the type, installation size, number and placement of materials. Plans shall include a plant material list. Plants are to be identified by both their scientific and common names. The condition of any existing plants and the proposed method of irrigation are also to be indicated. Landscape plans shall divide all landscape areas into the following categories based on projected water consumption for irrigation:

A. *High water usage areas (+/- two (2) inches per week): small convoluted lawns, lawns under existing trees, annual and perennial flower beds, and temperamental shrubs;*

B. *Moderate water usage areas (+/- one (1) inch per week): large lawn areas, average water-using shrubs, and trees;*

C. *Low water usage areas (Less than one (1) inch per week, or gallons per hour): seeded fieldgrass, swales, native plantings, drought-tolerant shrubs, and ornamental grasses or drip irrigated areas.*

D. *Interim or unique water usage areas: areas with temporary seeding, aquatic plants, erosion control areas, areas with temporary irrigation systems, and areas with special water–saving features or water harvesting irrigation capabilities. These categories shall be noted in general on the plan and on the plant material list.*

Response: A landscape plan is included as Sheets L2.0-L2.2. The proposed site development plan includes street tree and mitigation plantings, which consist of native vegetation that that requires low water usage. Individual lot landscaping will be proposed at the time of building permit submittal and will likely include grass and ground coverings. These standards are met.

(.10) Completion of Landscaping. The installation of plant materials may be deferred for a period of time specified by the Board or Planning Director acting on an application, in order to avoid hot summer or cold winter periods, or in response to water shortages. In these cases, a temporary permit shall be issued, following the same procedures specified in subsection (.07)(C)(3), above, regarding temporary irrigation systems. No final Certificate of Occupancy shall be granted until an adequate bond or other security is posted for the completion of the landscaping, and the City is given written authorization to enter the property and install the required landscaping, in the event that the required landscaping has not been installed. The form of such written authorization shall be submitted to the City Attorney for review.

Response: Acknowledged. No deferral is requested at this time, but may be requested in the future subject to the scenarios above.

(.11) Street Trees Not Typically Part of Site Landscaping. Street trees are not subject to the requirements of this Section and are not counted toward the required standards of this Section. Except, however, that the Development Review Board may, by granting a waiver or variance, allow for special landscaping within the right-of-way to compensate for a lack of appropriate on-site locations for landscaping. See subsection (.06), above, regarding street trees.

Response: No waiver or variance for on-site landscaping is requested. This standard is not applicable.

(.12) Mitigation and Restoration Plantings. A mitigation plan is to be approved by the City's Development Review Board before the destruction, damage, or removal of any existing native plants. Plantings intended to mitigate the loss of native vegetation are subject to the following standards. Where these standards conflict with other requirements of this Code, the standards of this Section shall take precedence. The desired effect of this section is to preserve existing native vegetation.

A. Plant Sources. Plant materials are to be native and are subject to approval by the City. They are to be non-clonal in origin; seed source is to be as local as possible, and plants must be nursery propagated or taken from a pre-approved transplantation area. All of these requirements are to be addressed in any proposed mitigation plan.

B. Plant Materials. The mitigation plan shall specify the types and installation sizes of plant materials to be used for restoration. Practices such as the use of pesticides, fungicides, and fertilizers shall not be employed in mitigation areas unless specifically authorized and approved.

C. Installation. Install native plants in suitable soil conditions. Plant materials are to be supported only when necessary because of extreme winds at the site. Where support is necessary, all stakes, guy wires or other measures are to be removed as soon as the plants can support themselves. Protect from animal and fowl predation and foraging until establishment.

D. Irrigation. Permanent irrigation systems are generally not appropriate in restoration situations, and manual or temporary watering of new plantings is often necessary. The mitigation plan shall specify the method and frequency of manual watering, including any that may be necessary after the first growing season.

E. Monitoring and Reporting. Monitoring of native landscape areas is the on-going responsibility of the property owner. Plants that die are to be replaced in kind and quantity within one year. Written proof of the survival of all plants shall be required to be submitted to the City's Planning Department one year after the planting is completed.

[Section 4.176 amended by Ordinance No. 536, 1/7/02]

Response: The site is currently in residential and agricultural use, and site plantings consist primarily of grass and plantation trees. The existing grass and plantation trees will be removed for site development, specifically to accommodate the planned street network and desired lotting pattern. Tree removal will be mitigated as detailed in the response to Section 4.610.40. These standards are not applicable.

I. Section 4.177. Street Improvement Standards.

This section contains the City's requirements and standards for pedestrian, bicycle, and transit facility improvements to public streets, or within public easements. The purpose of this section is to ensure that development, including redevelopment, provides transportation facilities that are safe, convenient, and adequate in rough proportion to their impacts.

(.01) Development and related public facility improvements shall comply with the standards in this section, the Wilsonville Public Works Standards, and the Transportation System Plan, in rough proportion to the potential impacts of the development. Such improvements shall be constructed at the time of development or as provided by Section 4.140, except as modified or waived by the City Engineer for reasons of safety or traffic operations.

Response: The proposed public facility improvements are designed to comply with the standards in this section, the Wilsonville Public Works Standards, and the Transportation System Plan as modified by the Frog Pond Master Plan. This standard is met.

(.02) Street Design Standards.

A. All street improvements and intersections shall provide for the continuation of streets through specific developments to adjoining properties or subdivisions.
   1. Development shall be required to provide existing or future connections to adjacent sites through the use of access easements where applicable. Such easements shall be required in addition to required public street dedications as required in Section 4.236(.04).

Response: The street network has been designed per the Frog Pond West Street Demonstration Plan. Future connections to adjacent sites are anticipated to the north and east. This standard is met.

B. The City Engineer shall make the final determination regarding right-of-way and street element widths using the ranges provided in Chapter 3 of the Transportation System Plan and the additional street design standards in the Public Works Standards.

C. Rights-of-way.
   1. Prior to issuance of a Certificate of Occupancy Building permits or as a part of the recordation of a final plat, the City shall require dedication of rights-of-way in accordance with the Transportation System Plan. All dedications shall be recorded with the County Assessor's Office.
   2. The City shall also require a waiver of remonstrance against formation of a local improvement district, and all non-remonstrances shall be recorded in the County Recorder's Office as well as the City's Lien Docket, prior to issuance of a Certificate of Occupancy Building Permit or as a part of the recordation of a final plat.
   3. In order to allow for potential future widening, a special setback requirement shall be maintained adjacent to all arterial streets. The minimum setback shall be 55 feet from the centerline or 25 feet from the right-of-way designated on the Master Plan, whichever is greater.

Response: The site abuts Boeckman Road to the south, which is an arterial street. The project will dedicate 10 ft. of right-of-way to the northern Boeckman Road frontage, which will increase the right-of-way to 81 ft. Per Figure 20 of the Frog Pond West Master Plan, this is the full right-of-way width for the Boeckman Road cross-section. No additional setbacks are required.

D. Dead-end Streets. New dead-end streets or cul-de-sacs shall not exceed 200 feet in length, unless the adjoining land contains barriers such as existing buildings, railroads or freeways, or environmental constraints such as steep slopes, or major streams or rivers, that prevent future street extension and connection. A central landscaped island with rainwater management and infiltration are encouraged in cul-de-sac design. No more than 25 dwelling units shall take access to a new dead-end or cul-de-sac street unless it is determined that the traffic impacts on adjacent streets will not exceed those from a development of 25 or fewer units. All other dimensional standards of dead-end streets shall be governed by the Public Works Standards. Notification that the street is planned for future extension shall be posted on the dead-end street. [Amended by Ord. # 674 11/16/09]

Response: The street network has been designed per the Frog Pond West Master Plan Street Demonstration Plan. This plan includes a dead-end street at the eastern property line of the site, which has been proposed. Street G is a dead-end street. It serves 11 lots and includes a hammerhead for emergency vehicle turnaround between Lots 4 and 5.

E. Corner or clear vision area.
   1. A clear vision area which meets the Public Works Standards shall be maintained on each corner of property at the intersection of any two streets, a street and a railroad or a street and a driveway. However, the following items shall be exempt from meeting this requirement:
      a. Light and utility poles with a diameter less than 12 inches.

b. Trees less than 6" d.b.h., approved as a part of the Stage II Site Design, or administrative review.

c. Except as allowed by b., above, an existing tree, trimmed to the trunk, 10 feet above the curb.

d. Official warning or street sign.

e. Natural contours where the natural elevations are such that there can be no cross-visibility at the intersection and necessary excavation would result in an unreasonable hardship on the property owner or deteriorate the quality of the site.

F. Vertical clearance - a minimum clearance of 12 feet above the pavement surface shall be maintained over all streets and access drives.

Response: Clear vision areas will be maintained at the corner of each property. Site distance easements are proposed along the western frontage of Lot 24 and the southeastern frontage of Lot 20. See Sheet 3.00.

G. Interim improvement standard. It is anticipated that all existing streets, except those in new subdivisions, will require complete reconstruction to support urban level traffic volumes. However, in most cases, existing and short-term projected traffic volumes do not warrant improvements to full Master Plan standards. Therefore, unless otherwise specified by the Development Review Board, the following interim standards shall apply.

1. *Arterials - 24 foot paved, with standard sub-base. Asphalt overlays are generally considered unacceptable, but may be considered as an interim improvement based on the recommendations of the City Engineer, regarding adequate structural quality to support an overlay.*
2. *Half-streets are generally considered unacceptable. However, where the Development Review Board finds it essential to allow for reasonable development, a half-street may be approved. Whenever a half-street improvement is approved, it shall conform to the requirements in the Public Works Standards:*
3. *When considered appropriate in conjunction with other anticipated or scheduled street improvements, the City Engineer may approve street improvements with a single asphalt lift. However, adequate provision must be made for interim storm drainage, pavement transitions at seams and the scheduling of the second lift through the Capital Improvements Plan.*

[Amended by Ord. 610, 5/1/06]

Response: There are no existing streets within the development site. These standards are not applicable.

(.03) Sidewalks. Sidewalks shall be provided on the public street frontage of all development. Sidewalks shall generally be constructed within the dedicated public right-of-way, but may be located outside of the right-of-way within a public easement with the approval of the City Engineer.

A. Sidewalk widths shall include a minimum through zone of at least five feet. The through zone may be reduced pursuant to variance procedures in Section 4.196, a waiver pursuant to Section 4.118, or by authority of the City Engineer for reasons of traffic operations, efficiency, or safety.

B. Within a Planned Development, the Development Review Board may approve a sidewalk on only one side. If the sidewalk is permitted on just one side of the street, the owners will be required to sign an agreement to an assessment in the future to construct the other sidewalk if the City Council decides it is necessary.

Response: As shown on Sheet P2.10, all sidewalks within the development site are at least 5 ft. wide. No adjustments are requested. These standards are met.

(.04) Bicycle Facilities. Bicycle facilities shall be provided to implement the Transportation System Plan, and may include on-street and off-street bike lanes, shared lanes, bike boulevards, and cycle

tracks. The design of on-street bicycle facilities will vary according to the functional classification and the average daily traffic of the facility.

Response: The proposed street cross-sections shown on Sheet P2.10 comply with the street classifications and cross-sections identified in the Frog Pond West Master Plan. The Boeckman Road and Willow Creek Road cross-sections include buffered bike lanes; bikes will share the vehicular lane with vehicles in the local streets. These standards are met.

(.05) Multiuse Pathways. Pathways may be in addition to, or in lieu of, a public street. Paths that are in addition to a public street shall generally run parallel to that street, and shall be designed in accordance with the Public Works Standards or as specified by the City Engineer. Paths that are in lieu of a public street shall be considered in areas only where no other public street connection options are feasible, and are subject to the following standards.

A. Paths shall be located to provide a reasonably direct connection between likely pedestrian and bicyclist destinations. Additional standards relating to entry points, maximum length, visibility, and path lighting are provided in the Public Works Standards.

B. To ensure ongoing access to and maintenance of pedestrian/bicycle paths, the City Engineer will require dedication of the path to the public and acceptance of the path by the City as public right-of-way; or creation of a public access easement over the path.

Response: Pedestrian connections are proposed between Street B and Boeckman Road per the Frog Pond West Master Plan. These pathways are subject to the cross-section design of the Master Plan, which is addressed in more detail below.

(.06) Transit Improvements

Development on sites that are adjacent to or incorporate major transit streets shall provide improvements as described in this section to any bus stop located along the site's frontage, unless waived by the City Engineer for reasons of safety or traffic operations. Transit facilities include bus stops, shelters, and related facilities. Required transit facility improvements may include the dedication of land or the provision of a public easement.[…]

Response: The site is not adjacent to nor incorporates a major transit street. These standards are not applicable.

(.07) Residential Private Access Drives. Residential Private Access Drives shall meet the following standards:

A. Residential Private Access Drives shall provide primary vehicular access to no more than four (4) dwelling units, excluding accessory dwelling units.

Response: Two residential private access drives are proposed: Tract B and Tract C. Tract B provides primary vehicular access to 2 lots, and Tract C provides primary vehicular access to 4 lots. This standard is met.

B. The design and construction of a Residential Private Access Drive shall ensure a useful lifespan and structural maintenance schedule comparable, as determined by the City Engineer or City's Authorized Representative, to a local street constructed in conformance to current public works standards.

1. *The design of residential private access drives shall be stamped by a professional engineer registered in the state of Oregon and shall be approved by the City Engineer or City's Authorized Representative to ensure the above requirement is met.*
2. *Prior to issuing a certificate of occupancy for any residential dwelling unit whose primary vehicular access is from a Residential Private Access Drive the City Engineer or City's Authorized Representative shall certify construction of the Residential Private Access Drive*

substantially conforms the design approved by the City Engineer or City's Authorized Representative.

Response: At the time of construction document submittal, the design shall be stamped by a professional engineer registered in the state of Oregon. These standards will be met.

C. Residential Private Access Drives shall be named for addressing purposes. All Residential Private Access Drives shall use the suffix "Lane", i.e. SW Oakview Lane.
D. Residential Private Access Drives shall meet or exceed the standards for access drives and travel lanes established in Subsection (.08) of this Section.
[Amended by Ord. 682, 9/1/10]

Response: Subsection (.08) provides minimal standards for width and construction of residential private access drives. As shown in the cross-sections of Sheet P2.10, the drives meeting the minimum requirements below.

(.08). Access Drive and Driveway Approach Development Standards.
A. An access drive to any proposed development shall be designed to provide a clear travel lane free from any obstructions.
B. Access drive travel lanes shall be constructed with a hard surface capable of carrying a 23-ton load.
C. Where emergency vehicle access is required, approaches and driveways shall be designed and constructed to accommodate emergency vehicle apparatus and shall conform to applicable fire protection requirements. The City may restrict parking, require signage, or require other public safety improvements pursuant to the recommendations of an emergency service provider.
D. Secondary or emergency access lanes may be improved to a minimum 12 feet with an all-weather surface as approved by the Fire District. All fire lanes shall be dedicated easements.
E. Minimum access requirements shall be adjusted commensurate with the intended function of the site based on vehicle types and traffic generation.
F. The number of approaches on higher classification streets (e.g., collector and arterial streets) shall be minimized; where practicable, access shall be taken first from a lower classification street.
G. The City may limit the number or location of connections to a street, or impose access restrictions where the roadway authority requires mitigation to alleviate safety or traffic operations concerns.
H. The City may require a driveway to extend to one or more edges of a parcel and be designed to allow for future extension and inter-parcel circulation as adjacent properties develop. The City may also require the owner(s) of the subject site to record an access easement for future joint use of the approach and driveway as the adjacent property(ies) develop(s).
I. Driveways shall accommodate all projected vehicular traffic on-site without vehicles stacking or backing up onto a street.
J. Driveways shall be designed so that vehicle areas, including but not limited to drive-up and drive-through facilities and vehicle storage and service areas, do not obstruct any public right-of-way.
K. Approaches and driveways shall not be wider than necessary to safely accommodate projected peak hour trips and turning movements, and shall be designed to minimize crossing distances for pedestrians.
L. As it deems necessary for pedestrian safety, the City, in consultation with the roadway authority, may require traffic-calming features, such as speed tables, textured driveway surfaces, curb extensions, signage or traffic control devices, or other features, be installed on or in the vicinity of a site.
M. Approaches and driveways shall be located and designed to allow for safe maneuvering in and around loading areas, while avoiding conflicts with pedestrians, parking, landscaping, and buildings.

N. *Where a proposed driveway crosses a culvert or drainage ditch, the City may require the developer to install a culvert extending under and beyond the edges of the driveway on both sides of it, pursuant applicable Public Works standards.*

O. *Except as otherwise required by the applicable roadway authority or waived by the City Engineer, temporary driveways providing access to a construction site or staging area shall be paved or graveled to prevent tracking of mud onto adjacent paved streets.*

Response: Subsection (.08) provides minimal standards for width and construction of residential private access drives. As shown in the cross-sections of Sheet P2.10, the drives meeting the minimum requirements above.

P. *Unless constrained by topography, natural resources, rail lines, freeways, existing or planned or approved development, or easements or covenants, driveways proposed as part of a residential or mixed-use development shall meet local street spacing standards and shall be constructed to align with existing or planned streets, if the driveway.*

1. *Intersects with a public street that is controlled, or is to be controlled in the planning period, by a traffic signal;*
2. *Intersects with an existing or planned arterial or collector street; or*
3. *Would be an extension of an existing or planned local street, or of another major driveway.*

Response: The driveways are designed to meet local spacing standards, as shown in Sheet P2.00.

(.09) Minimum street intersection spacing standards.

A. *New streets shall intersect at existing street intersections so that centerlines are not offset. Where existing streets adjacent to a proposed development do not align properly, conditions shall be imposed on the development to provide for proper alignment.*

B. *Minimum intersection spacing standards are provided in Transportation System Plan Table 3-2.*

Response: The streets within the development are local streets, with the exception of Willow Creek Drive, a Collector. Per Table 3-2 of the TSP, minimum access spacing standards along a Collector is 100 ft., and the desired access spacing is 300 ft. Access is permitted to each lot from a local street.

No accesses are proposed to Willow Creek Drive, and access to each lot is proposed from local streets. These standards are met.

(.10) Exceptions and Adjustments. The City may approve adjustments to the spacing standards of subsections (.08) and (.09) above through a Class II process, or as a waiver per Section 4.118(.03)(A.), where an existing connection to a City street does not meet the standards of the roadway authority, the proposed development moves in the direction of code compliance, and mitigation measures alleviate all traffic operations and safety concerns. Mitigation measures may include consolidated access (removal of one access), joint use driveways (more than one property uses same access), directional limitations (e.g., one-way), turning restrictions (e.g., right in/out only), or other mitigation.[Section 4.177 amended by Ord. 719, 6/17/13]

Response: No exceptions or adjustments are requested.

J. *Section 4.180. Exceptions and Modifications - Projections into Required Yards.*

(.01) Certain non-structural architectural features are permitted to project into required yards or courts, without requiring the approval of a Variance or Reduced Setback Agreement, as follows:

A. *Into any required yard:*

1. *Architectural features may project into the required yard not more than two (2) inches for each foot of required setback.*
2. *Open, unenclosed fire escapes may project a distance not exceeding forty-eight (48) inches.*

B. Into any required yard, adjoining a street or tract with a private drive: [Amended by Ord. 682, 9/9/10]
  1. Architectural features may project a distance not exceeding forty (40) inches.
  2. An uncovered porch, terrace, or patio extending no more than two and one-half (2 1/2) feet above the finished elevation may extend within three (3) feet of an interior side lot line, or within ten (10) feet of a front lot line or of an exterior side lot line.

Response: No buildings are proposed with this application. These provisions are not applicable.

K. Section 4.181. Exceptions & Modifications - Height Limits.

Except as stipulated in Sections 4.800 through 4.804, height limitations specified elsewhere in this Code shall not apply to barns, silos or other farm buildings or structures on farms; to church spires; belfries; cupolas; and domes; monuments; water towers; windmills; chimneys; smokestacks; fire and hose towers; flag poles; above-ground electric transmission, distribution, communication and signal lines, towers and poles; and properly screened mechanical and elevator structures.

Response: No listed structures are proposed at this time. These provisions are not applicable.

L. Section 4.182. Exceptions and Modifications - Setback Modifications.

In any residential zone where the average depth of at least two (2) existing front yards on adjoining lots or within one hundred fifty (150) feet of the lot in question and within the same block front is less or greater than the minimum or maximum front yard depth prescribed elsewhere in this Code, the required depth of the front yard on such lot shall be modified. In such case, the front yard depth shall not be less than the average depth, nor more than the greater depth, of existing front yards on at least two (2) adjoining lots within one hundred and fifty (150) feet. In the case of a corner lot, the depth of the front yard may be reduced to that of the lot immediately adjoining, provided, however, that the depth of a front yard on any corner lot shall be at least ten (10) feet.

Response: No setback modifications are requested. These provisions are not applicable.

M. Section 4.197. Zone Changes and Amendments To This Code – Procedures.

(.01) The following procedure shall be followed in applying for an amendment to the text of this Chapter:[…]

Response: No zoning text amendments are proposed. This procedure is not applicable.

(.02) In recommending approval or denial of a proposed zone map amendment, the Planning Commission or Development Review Board shall at a minimum, adopt findings addressing the following criteria:
  A. That the application before the Commission or Board was submitted in accordance with the procedures set forth in Section 4.008, Section 4.125 (.18)(B)(2) or, in the case of a Planned Development, Section 4.140; and [Amended by Ord 557, adopted 9/5/03]

Response: The zone map amendment is being requested concurrent with a Planned Development. The application has been submitted in accordance with the procedures set forth in Section 4.140. This criterion is met.

  B. That the proposed amendment is consistent with the Comprehensive Plan map designation and substantially complies with the applicable goals, policies and objectives, set forth in the Comprehensive Plan text; and

Response: The Comprehensive Plan map designation for the site is Residential Neighborhood RN, which is implemented by the requested Residential Neighborhood RN zone. The applicable goals, policies, and objectives of the Comprehensive Plan text are addressed in Section III of this narrative. This criterion is met.

C. *In the event that the subject property, or any portion thereof, is designated as "Residential" on the City's Comprehensive Plan Map; specific findings shall be made addressing substantial compliance with Implementation Measures 4.1.4.b, d, e, q, and x of Wilsonville's Comprehensive Plan text; and [Amended by Ordinance No. 538, 2/21/02.]*

Response: The subject site is designated “Residential” on the City’s Comprehensive Plan Map. Compliance with Implementation Measures 4.1.4.b, d, e, q, and x is addressed in Section III of this narrative. This criterion is met.

D. *That the existing primary public facilities, i.e., roads and sidewalks, water, sewer and storm sewer are available and are of adequate size to serve the proposed development; or, that adequate facilities can be provided in conjunction with project development. The Planning Commission and Development Review Board shall utilize any and all means to insure that all primary facilities are available and are adequately sized; and*

Response: As addressed elsewhere in this narrative, the development will extend roads and sidewalks, water, sewer, and storm sewer to serve the proposed development. This criterion is met.

E. *That the proposed development does not have a significant adverse effect upon Significant Resource Overlay Zone areas, an identified natural hazard, or an identified geologic hazard. When Significant Resource Overlay Zone areas or natural hazard, and/or geologic hazard are located on or abut the proposed development, the Planning Commission or Development Review Board shall use appropriate measures to mitigate and significantly reduce conflicts between the development and identified hazard or Significant Resource Overlay Zone and*

Response: The site contains an SROZ area. The proposed development is a single-family residential development and conforms with the Frog Pond West Master Plan and requested RN zoning. Impacts to the SROZ will result from a planned roadway crossing as identified in the Frog Pond West Master Plan and will be mitigated per the regulations of Section 4.139. This criterion is met.

F. *That the applicant is committed to a development schedule demonstrating that development of the property is reasonably expected to commence within two (2) years of the initial approval of the zone change; and*

Response: The zone change request is being submitted concurrently with a planned development, subdivision, and site plan review application. The applicant is committed to develop the property as soon as these applications and related site development permits are approved, which is expected to occur by the end of 2018. This criterion is met.

G. *That the proposed development and use(s) can be developed in compliance with the applicable development standards or appropriate conditions are attached that insure that the project development substantially conforms to the applicable development standards.*

Response: The proposed development and use is single-family in accordance with the Frog Pond West Master Plan. Compliance with the applicable development standards of the RN zone is addressed Section IV.C of this narrative.

H. *Adequate public facilities, services, and transportation networks are in place, or are planned to be provided concurrently with the development of the property. The applicant shall demonstrate* *compliance with the Transportation Planning Rule, specifically by addressing whether the proposed amendment has a significant effect on the transportation system pursuant to OAR 660-012-0060. A Traffic Impact Analysis (TIA) shall be prepared pursuant to the requirements in Section 4.133.05.(01).*

Response: Adequate public facilities, services, and transportation networks are in place, or are planned to be provided concurrently with the proposed development. The development will extend sewer and water infrastructure into the development from existing lines in Boeckman Road, and will provide storm drainage facilities to serve the development. See Sheet P4.00 and Appendix B Preliminary Drainage Report.
SMART routes 6 and 4 serve the site along Boeckman Road. The proposed development includes an internal roadway network per the Frog Pond Area Plan, which includes a Collector connection to Boeckman Road (Willow Road) and internal local streets. The development will provide frontage improvements along Boeckman Road in coordination with the City's planned design and reconstruction of the roadway along the project boundary. A Traffic Impact Analysis was prepared by DKS Engineering at the direction of the City of Wilsonville and is included as Appendix C.

Compliance with the TPR is included in the Frog Pond Area Plan, and assumes full development of the Frog Pond area. The Frog Pond Area Plan determined that the anticipated development within Frog Pond would comply with the TPR with the addition of a traffic signal at the intersection of Stafford Road and Frog Pond Lane.

This criterion is met.

(.03) If affirmative findings cannot be made for all applicable criteria listed above the Planning Commission or Development Review Board shall recommend that the proposed text or map amendment, as the case may be, be denied.
(.04) City Council action approving a change in zoning shall be in the form of a Zoning Order.
(.05) In cases where a property owner or other applicant has requested a change in zoning and the City Council has approved the change subject to conditions, the owner or applicant shall sign a statement accepting, and agreeing to complete the conditions of approval before the zoning shall be changed.

Response: The proposed development meets the applicable criteria as described above.

VI. Land Divisions

A. Section 4.210. Application Procedure.

(.01) Pre-application conference. Prior to submission of a tentative condominium, partition, or subdivision plat, a person proposing to divide land in the City shall contact the Planning Department to arrange a pre-application conference as set forth in Section 4.010.

A. Preparation of Tentative Plat. The Planning staff shall provide information regarding procedures and general information having a direct influence on the proposed development, such as elements of the Comprehensive Plan, existing and proposed streets, roads and public utilities. The applicant shall cause to be prepared a tentative plat, together with improvement plans and other supplementary material as specified in this Section. The Tentative Plat shall be prepared by an Oregon licensed professional land surveyor or engineer. An affidavit of the services of such surveyor or engineer shall be furnished as part of the submittal.

B. Tentative Plat Submission. The purpose of the Tentative Plat is to present a study of the proposed subdivision to the Planning Department and Development Review Board and to receive approval or recommendations for revisions before preparation of a final Plat. The design and layout of this plan plat shall meet the guidelines and requirements set forth in this Code. The Tentative Plat shall be submitted to the Planning Department with the following information:

1. *Site development application form completed and signed by the owner of the land or a letter of authorization signed by the owner. A preliminary title report or other proof of ownership is to be included with the application form.*
2. *Application fees as established by resolution of the City Council.*
3. *Ten (10) copies and one (1) sepia or suitable reproducible tracing of the Tentative Plat shall be submitted with the application. Paper size shall be eighteen inch (18") by twenty-four inch (24"), or such other size as may be specified by the City Engineer.*
4. *Name of the subdivision. No subdivision name shall duplicate or resemble the name of any other subdivision in Clackamas or Washington County. Names may be checked through the county offices.*
5. *Names, addresses, and telephone numbers of the owners and applicants, and engineer or surveyor.*
6. *Date, north point and scale of drawing.*
7. *Location of the subject property by Section, Township, and Range.*
8. *Legal road access to subject property shall be indicated as City, County, or other public roads.*
9. *Vicinity map showing the relationship to the nearest major highway or street.*
10. *Lots: Dimensions of all lots, minimum lot size, average lot size, and proposed lot and block numbers.*
11. *Gross acreage in proposed plat.*
12. *Proposed uses of the property, including sites, if any, for multi-family dwellings, shopping centers, churches, industries, parks, and playgrounds or other public or semi-public uses.*
13. *Improvements: Statement of the improvements to be made or installed including streets, private drives, sidewalks, lighting, tree planting, and times such improvements are to be made or completed. [Amended by Ord. 682, 9/9/10]*
14. *Trees. Locations, types, sizes, and general conditions of all existing trees, as required in Section 4.600.*
15. *Utilities such as electrical, gas, telephone, on and abutting the tract.*
16. *Easements: Approximate width, location, and purpose of all existing and proposed easements on, and known easements abutting the tract.*
17. *Deed Restrictions: Outline of proposed deed restrictions, if any.*
18. *Written Statement: Information which is not practical to be shown on the maps may be shown in separate statements accompanying the Tentative Plat.*
19. *If the subdivision is to be a "Planned Development," a copy of the proposed Home Owners Association By-Laws must be submitted at the time of submission of the application. The Tentative Plat shall be considered as the Stage I Preliminary Plan. The proposed By-Laws must address the maintenance of any parks, common areas, or facilities.*
20. *Any plat bordering a stream or river shall indicate areas subject to flooding and shall comply with the provisions of Section 4.172.*
21. *Proposed use or treatment of any property designated as open space by the City of Wilsonville.*
22. *A list of the names and addresses of the owners of all properties within 250 feet of the subject property, printed on self-adhesive mailing labels. The list shall be taken from the latest available property ownership records of the Assessor's office of the affected county.*
23. *A completed "liens and assessments" form, provided by the City Finance Department.*
24. *Locations of all areas designated as a Significant Resource Overlay Zone by the City, as well as any wetlands shall be shown on the tentative plat.*
25. *Locations of all existing and proposed utilities, including but not limited to domestic water, sanitary sewer, storm drainage, and any private utilities crossing or intended to serve the site. Any plans to phase the construction or use of utilities shall be indicated. [Amended by Ord. 682, 9/9/10]*
26. *A traffic study, prepared under contract with the City, shall be submitted as part of the tentative plat application process, unless specifically waived by the Community Development Director.*

C. Action on proposed tentative plat:
[…]

D. Land division phases to be shown. Where the applicant intends to develop the land in phases, the schedule of such phasing shall be presented for review at the time of the tentative plat. In acting on an application for tentative plat approval, the Planning Director or Development Review Board may set time limits for the completion of the phasing schedule which, if not met, shall result in an expiration of the tentative plat approval.

E. Remainder tracts to be shown as lots or parcels. Tentative plats shall clearly show all affected property as part of the application for land division. All remainder tracts, regardless of size, shall be shown and counted among the parcels or lots of the division.

[…]

Response: The information described above is included with this submittal. A Preliminary Plat is included as Sheet 3.00; a Preliminary Utility Plan is included as Sheet P4.00; a Tree Removal and Protection Plan is included as Sheet L1.0; Preliminary Street Cross-Sections are included as Sheet P2.10; a TIA is included as Appendix C; and draft Homeowner Association Bylaws are included as Appendix H. The boundaries of the SROZ on site and proposed development/mitigation are shown in Figures 11 and 12 of Appendix E Significant Resource Impact Report.

B. Section 4.236. General Requirements - Streets.

(.01) Conformity to the Transportation System Plan. Land divisions shall conform to and be in harmony with the Transportation Systems Plan, the Bicycle and Pedestrian Master Plan, and the Parks and Recreation Master Plan. [Amended by Ord. #719, 6/17/13]

Response: As confirmed by the TIA, the proposed street plan conforms to the Transportation System Plan and the Frog Pond West Master Plan.

The 2006 Bicycle and Pedestrian Master Plan identifies an improvement, Community Walkway/Bikeway C10, within the site area. The 2017 Frog Pond West Master Plan incorporates a Bicycle and Pedestrian Framework (Figure 17), which identifies bicycle lanes and sidewalks along the new Willow Creek Drive and Boeckman Road adjacent to the project frontage. The development will construct Willow Creek Drive and the bicycle/pedestrian facilities associated with it. The Boeckman Road facilities will be constructed as part of the City's Boeckman Road project.

The 2007 Parks and Recreation Master Plan identifies 3 potential neighborhood parks in the Frog Pond area – P15, P16, and P17. The 2017 Frog Pond West Master Plan defines the types of parks and open space anticipated within the Frog Pond West area. Proposed street improvements will provide access to the future neighborhood park location, identified north of the site.

(.02) Relation to Adjoining Street System.

A. A land division shall provide for the continuation of the principal streets existing in the adjoining area, or of their proper projection when adjoining property is not developed, and shall be of a width not less than the minimum requirements for streets set forth in these regulations. Where, in the opinion of the Planning Director or Development Review Board, topographic conditions make such continuation or conformity impractical, an exception may be made. In cases where the Board or Planning Commission has adopted a plan or plat of a neighborhood or area of which the proposed land division is a part, the subdivision shall conform to such adopted neighborhood or area plan.

B. Where the plat submitted covers only a part of the applicant's tract, a sketch of the prospective future street system of the unsubmitted part shall be furnished and the street system of the part submitted shall be considered in the light of adjustments and connections with the street system of the part not submitted.

C. At any time when an applicant proposes a land division and the Comprehensive Plan would allow for the proposed lots to be further divided, the city may require an arrangement of lots and streets *such as to permit a later resubdivision in conformity to the street plans and other requirements specified in these regulations.*

Response: As shown in Sheet P3.00, the proposed street network is designed for future continuation per the Frog Pond West Master Plan. These standards are met.

(.03) All streets shall conform to the standards set forth in Section 4.177 and the block size requirements of the zone.

Response: The standards of Section 4.177 are addressed in Section V.I of this narrative. These standards are met.

(.04) Creation of Easements: The Planning Director or Development Review Board may approve an easement to be established without full compliance with these regulations, provided such an easement is the only reasonable method by which a portion of a lot large enough to allow partitioning into two (2) parcels may be provided with vehicular access and adequate utilities. If the proposed lot is large enough to divide into more than two (2) parcels, a street dedication may be required. [Amended by Ord. 682, 9/9/10]

Response: No street easements are proposed. This standard is not applicable.

(.05) Topography: The layout of streets shall give suitable recognition to surrounding topographical conditions in accordance with the purpose of these regulations.

Response: The street layout recognizes topographical conditions, including the location of the SROZ on site. This standard is met.

(.06) Reserve Strips: The Planning Director or Development Review Board may require the applicant to create a reserve strip controlling the access to a street. Said strip is to be placed under the jurisdiction of the City Council, when the Director or Board determine that a strip is necessary:

A. To prevent access to abutting land at the end of a street in order to assure the proper extension of the street pattern and the orderly development of land lying beyond the street; or
B. To prevent access to the side of a street on the side where additional width is required to meet the right-of-way standards established by the City; or
C. To prevent access to land abutting a street of the land division but not within the tract or parcel of land being divided; or
D. To prevent access to land unsuitable for building development.

Response: No reserve strip is proposed. The applicant acknowledges that the DRB may require that the applicant create a reserve strip. This standard is met.

(.07) Future Expansion of Street: When necessary to give access to, or permit a satisfactory future division of, adjoining land, streets shall be extended to the boundary of the land division and the resulting dead-end street may be approved without a turn-around. Reserve strips and street plugs shall be required to preserve the objective of street extension. Notification that the street is planned for future extension shall be posted on the stub street. [Amended by Ord. #719, 6/17/13]

Response: Streets A, B, and F have been extended to the boundary of the site and are intended for future extension. For that reason, no turnarounds are proposed for these streets. The applicant will comply with any requirements related to signage street extension objectives. This standard is met.

(.08) Existing Streets: Whenever existing streets adjacent to or within a tract are of inadequate width, additional right-of-way shall conform to the designated width in this Code or in the Transportation Systems Plan.

Response: Boeckman Road adjacent to the site is of inadequate width. The project will dedicate 10 ft. of additional right-of-way to the street. This standard is met.

(.09) Street Names: No street names will be used which will duplicate or be confused with the names of existing streets, except for extensions of existing streets. Street names and numbers shall conform to the established name system in the City, and shall be subject to the approval of the City Engineer.

Response: Street A has been identified by the Frog Pond West Master Plan as Willow Creek Drive. Other proposed streets will conform to the City's established name system and will be subject to approval by the City Engineer. This standard is met.

C. Section 4.237. General Requirements – Other.

(.01) Blocks:

- *A. The length, width, and shape of blocks shall be designed with due regard to providing adequate building sites for the use contemplated, consideration of needs for convenient access, circulation, control, and safety of pedestrian, bicycle, and motor vehicle traffic, and recognition of limitations and opportunities of topography.*
- *B. Sizes: Blocks shall not exceed the sizes and lengths specified for the zone in which they are located unless topographical conditions or other physical constraints necessitate larger blocks. Larger blocks shall only be approved where specific findings are made justifying the size, shape, and configuration.*

Response: The length, width, and shape of blocks have been designed to accommodate the development established by the Frog Pond West Master Plan and to comply with the standards of Section 4.177. These standards are addressed in section V.I of this narrative. The site is located within the RN zone and is also subject to the block, access, and connectivity standards of Section 4.127(.10). Those standards are addressed in Section IV.C of this narrative. These standards are met.

(.02) Easements:

- *A. Utility lines. Easements for sanitary or storm sewers, drainage, water mains, electrical lines or other public utilities shall be dedicated wherever necessary. Easements shall be provided consistent with the City's Public Works Standards, as specified by the City Engineer or Planning Director. All of the public utility lines within and adjacent to the site shall be installed within the public right-of-way or easement; with underground services extending to the private parcel constructed in conformance to the City's Public Works Standards. All franchise utilities shall be installed within a public utility easement. All utilities shall have appropriate easements for construction and maintenance purposes. [Amended by Ord. 682, 9/9/10]*
- *B. Water courses. Where a land division is traversed by a water course, drainage way, channel or stream, there shall be provided a storm water easement or drainage right-of-way conforming substantially with the lines of the water course, and such further width as will be adequate for the purposes of conveying storm water and allowing for maintenance of the facility or channel. Streets or parkways parallel to water courses may be required.*

Response: Public utilities are placed within public rights-of-way or within public utility easements (PUE) adjacent to the public streets. There are proposed stormwater facility easements where these facilities are located on private property and are intended to be shared between more than one lot. The Willow Creek stream and SROZ area has been placed with Tract F and Tract G contains stormwater facilities.

(.03) Pedestrian and bicycle pathways. An improved public pathway shall be required to transverse the block near its middle if that block exceeds the length standards of the zone in which it is located.

- *A. Pathways shall be required to connect to cul-de-sacs or to pass through unusually shaped blocks.*

B. *Pathways required by this subsection shall have a minimum width of ten (10) feet unless they are found to be unnecessary for bicycle traffic, in which case they are to have a minimum width of six (6) feet.*

Response: Per Section 4.124(.06), the maximum block length for new Planned Development land divisions is 330 ft. Each of the proposed blocks exceeds this length. Pedestrian connections are proposed in three locations between Street B and Boeckman Road; per the Frog Pond West Master Plan, these connections are 26 ft. wide with 10 ft. of paving. The Private Drive Tracts B and C can provide pedestrian access to the future school site to the west.

(.04) Tree planting. Tree planting plans for a land division must be submitted to the Planning Director and receive the approval of the Director or Development Review Board before the planting is begun. Easements or other documents shall be provided, guaranteeing the City the right to enter the site and plant, remove, or maintain approved street trees that are located on private property.

Response: Tree planting plans are included as Sheets L2.0 and L2.1. Proposed street trees are located within public right-of-way and additional easements should not be needed. This standard is met.

(.05) Lot Size and shape. The lot size, width, shape and orientation shall be appropriate for the location of the land division and for the type of development and use contemplated. Lots shall meet the requirements of the zone where they are located.

A. *In areas that are not served by public sewer, an on-site sewage disposal permit is required from the City. If the soil structure is adverse to on-site sewage disposal, no development shall be permitted until sewer service can be provided.*

B. *Where property is zoned or deeded for business or industrial use, other lot widths and areas may be permitted at the discretion of the Development Review Board. Depth and width of properties reserved or laid out for commercial and industrial purposes shall be adequate to provide for the off-street service and parking facilities required by the type of use and development contemplated.*

C. *In approving an application for a Planned Development, the Development Review Board may waive the requirements of this section and lot size, shape, and density shall conform to the Planned Development conditions of approval.*

Response: The site is served by public sewer, and no on-site sewage disposal is proposed. The property is zoned for residential purposes and is subject to an application for a Planned Development. The site is located within the RN zone and is subject to the standards of that zone. The proposed lots meet the dimensional standards of the RN zone and the R-10 and R-7 sub-districts, and no waivers to the lot size, shape, and density requirements is requested. These standards are met.

(.06) Access. The division of land shall be such that each lot shall have a minimum frontage on a street or private drive, as specified in the standards of the relative zoning districts. This minimum frontage requirement shall apply with the following exceptions:

A. *A lot on the outer radius of a curved street or tract with a private drive, or facing the circular end of a cul-de-sac shall have frontage of not less than twenty-five (25) feet upon a street or tract with a private drive, measured on the arc.*

B. *The Development Review Board may waive lot frontage requirements where in its judgment the waiver of frontage requirements will not have the effect of nullifying the intent and purpose of this regulation or if the Board determines that another standard is appropriate because of the characteristics of the overall development.*

[Section 4.237(.06) amended by Ord. 682, 9/9/10]

Response: The minimum lot width in the RN zone/R-10 subdistrict is 40 ft., and the minimum lot width in the RN zone/R-7 subdistrict is 35 ft. As detailed in the response to Section 4.127 and shown on Sheet

P3.00, each lot has frontage on a public street or private drive of at least 60 ft. Lots 1-6 have frontage on private drives (Tracts B and C) and Lots 7-46 have frontage on public streets. These standards are met.

(.07) Through lots. Through lots shall be avoided except where essential to provide separation of residential development from major traffic arteries or adjacent non-residential activity or to overcome specific disadvantages of topography and orientation. A planting screen easement of at least ten (10) feet, across which there shall be no access, may be required along the line of lots abutting such a traffic artery or other disadvantageous use. Through lots with planting screens shall have a minimum average depth of one hundred (100) feet. The Development Review Board may require assurance that such screened areas be maintained as specified in Section 4.176.

Response: One through-lot is proposed. Lot 22 is 30,248 sq. ft. in area and has frontage on both Street B and Street C, which are local streets. This lot will be developed with a new home for the property owner and will replace the existing home located on Lot 25. The block perimeter standards and the minimum lot size desired by the future resident require a through lot. No planting screen easement is proposed but it can be accommodated if the DRB desires. This standard is met.

(.08) Lot side lines. The side lines of lots, as far as practicable for the purpose of the proposed development, shall run at right angles to the street or tract with a private drive upon which the lots face. [Amended by Ord. 682, 9/9/10]

Response: With the exception of the western side lot line of Lot 22, all side lot lines run at right angles to the street or the tract upon which they face. This standard is met.

(.09) Large lot land divisions. In dividing tracts which at some future time are likely to be re-divided, the location of lot lines and other details of the layout shall be such that re-division may readily take place without violating the requirements of these regulations and without interfering with the orderly development of streets. Restriction of buildings within future street locations shall be made a matter of record if the Development Review Board considers it necessary.

Response: Three future development tracts are proposed: Tract A; Tract L, and Tract M. Tract A will become public right-of-way upon development of the site to the north; Tract L is expected to be developed once the property to its west is developed; and Tract M is identified as a future development tract. Two options for the disposition of Tract M are proposed: development with two single-family homes and extension of a public street, or transfer of ownership and removal from the Stafford Meadows site area.

As shown in Sheet P3.00, these tracts can be divided in the future, in coordination with adjacent property owners, without violating the requirements of these regulations or interfering with the orderly development of streets. Lot 22 is large enough in area that future land division could occur. If land division were to occur in the future, it could readily take place. This standard is met.

(.10) Building line. The Planning Director or Development Review Board may establish special building setbacks to allow for the future redivision or other development of the property or for other reasons specified in the findings supporting the decision. If special building setback lines are established for the land division, they shall be shown on the final plat.

Response: No special building setbacks are proposed.

(.11) Build-to line. The Planning Director or Development Review Board may establish special build-to lines for the development, as specified in the findings and conditions of approval for the decision. If special build-to lines are established for the land division, they shall be shown on the final plat.

Response: There is no maximum setback in the RN zones, and no build-to-lines are proposed.

(.12) Land for public purposes. The Planning Director or Development Review Board may require property to be reserved for public acquisition, or irrevocably offered for dedication, for a specified period of time.

Response: The City has not identified any requirements for property to be reserved for public acquisition. The development will dedicate right-of-way for the public street network.

(.13) Corner lots. Lots on street intersections shall have a corner radius of not less than ten (10) feet.

Response: As shown on Sheet P3.00, lots on street intersections have corner radii of at least 20 ft. This standard is met.

[…]

Section 4.262. Improvements - Requirements.

(.01) Streets. Streets within or partially within the development shall be graded for the entire right-of-way width, constructed and surfaced in accordance with the Transportation Systems Plan and City Public Works Standards. Existing streets which abut the development shall be graded, constructed, reconstructed, surfaced or repaired as determined by the City Engineer.

(.02) Curbs. Curbs shall be constructed in accordance with standards adopted by the City.

(.03) Sidewalks. Sidewalks shall be constructed in accordance with standards adopted by the City.

Response: As shown on Sheets P2.10 and P5.00, streets will be graded, constructed, and surfaced according to the TSP, the cross-sections incorporated into the Frog Pond West Master Plan, and the City's Public Works Standards. These standards are met.

(.04) Sanitary sewers. When the development is within two hundred (200) feet of an existing public sewer main, sanitary sewers shall be installed to serve each lot or parcel in accordance with standards adopted by the City. When the development is more than two hundred (200) feet from an existing public sewer main, the City Engineer may approve an alternate sewage disposal system.

(.05) Drainage. Storm drainage, including detention or retention systems, shall be provided as determined by the City Engineer.

Response: The proposed development will be served by public sanitary sewer. Storm drainage systems are being provided as outlined in the City's Site Assessment and Planning standards. See Appendix B and Sheet P4.00. These standards are met.

(.06) Underground utility and service facilities. All new utilities shall be subject to the standards of Section 4.300 (Underground Utilities). The developer shall make all necessary arrangements with the serving utility to provide the underground services in conformance with the City's Public Works Standards.

Response: The standards of Section 4.300 are addressed in Section VII of this narrative. These standards are met.

(.07) Streetlight standards. Streetlight standards shall be installed in accordance with regulations adopted by the City.

Response: The Frog Pond West Master Plan identifies key intersections, including the intersection of Willow Creek Drive and Boeckman Road. The intersection of Boeckman Road/Willow Creek Drive is located at the southern boundary of the Stafford Meadows development. The following general recommendations apply to the Willow Creek Dr and Boeckman Rd intersection:

- These three areas act as transition zones between urban-scale arterial lighting and more neighborhood-scale lighting types.
- Placement of fixtures should be carefully considered to ensure the two types do not conflict visually

- The intersections should be more brightly-lit, acting as a wayfinding ‘beacon’ when approaching them
- Coordinate lighting with future landscaped gateway features at the intersections

As shown in Sheets 4.00 and 4.20, the proposed street lighting equipment and layout are consistent with the guidelines of the Frog Pond West Master Plan and standards identified in the *City of Wilsonville 2015 Public Works Standards - Chapter 201.9.01 Roadway and Intersection Lighting*. The current design assumes the Westbrooke fixture at the Boeckman Road/Willow Creek Drive intersection and is consistent with the proposed lights along Willow Creek Drive (local street).

Figure 42 of the Frog Pond Master Plan identifies Boeckman Road as an Arterial and Willow Creek Drive as a Local Street. Per page 78 of the Frog Pond West Master Plan, the City’s Cobrahead light standard will be installed along Boeckman Rd at the time of construction, and Phillips Hadco Westbrooke fixtures should be used on local streets.

Using Westbrooke fixture at this key intersection and along Willow Creek Drive helps achieve the goals within this transition zone, including minimizing visual conflicts between the different styles of lighting equipment. Because the street lighting has been designed to meet the guidelines established in the American National Standard Practice for Roadway Lighting (RP-8-00) per the City’s 2015 Public Works Standards, the intersection with Boeckman Rd will be more brightly-lit than Willow Creek Dr, therefore acting as a wayfinding ‘beacon’ for all travelers.

Lastly, the placement of light poles at the intersection and along Willow Creek Dr has been coordinated with the landscape gateway features. The pole placement will not interfere the proposed gateway landscaping shown in Sheet L2.1.

(.08) Street signs. Street name signs shall be installed at all street intersections and dead-end signs at the entrance to all dead-end streets and cul-de-sacs in accordance with standards adopted by the City. Other signs may be required by the City Engineer.

Response: Street signs will be installed per City standards. The Frog Pond West Master Plan also identifies unique “sign caps” for street signs within the Frog Pond West area. The project team is coordinating with the Wolfston development project team to prepare a design for sign toppers, which will be produced by the City for purchase by developers.

(.09) Monuments. Monuments shall be placed at all lot and block corners, angle points, points of curves in streets, at intermediate points and shall be of such material, size and length as required by State Law. Any monuments that are disturbed before all improvements are completed by the developer and accepted by the City shall be replaced to conform to the requirements of State Law.

Response: Monuments will be placed per State, Clackamas County, and City requirements.

(.10) Water. Water mains and fire hydrants shall be installed to serve each lot in accordance with City standards.

Response: Water mains and fire hydrants are proposed to serve each lot in accordance with City and Fire Department standards. See Sheet P4.00.

VII. Underground Utilities

A. Section 4.320. Requirements.

(.01) The developer or subdivider shall be responsible for and make all necessary arrangements with the serving utility to provide the underground services (including cost of rearranging any existing overhead facilities). All such underground facilities as described shall be constructed in compliance

with the rules and regulations of the Public Utility Commission of the State of Oregon relating to the installation and safety of underground lines, plant, system, equipment and apparatus.

(.02) The location of the buried facilities shall conform to standards supplied to the subdivider by the City. The City also reserves the right to approve location of all surface-mounted transformers.

(.03) Interior easements (back lot lines) will only be used for storm or sanitary sewers, and front easements will be used for other utilities unless different locations are approved by the City Engineer. Easements satisfactory to the serving utilities shall be provided by the developer and shall be set forth on the plat.

Response: New utilities will be installed underground in accordance with City and other agency requirements. Existing overhead power lines will be relocated with the City's Boeckman Road project. These standards are met.

VIII. Site Design Review

A. Section 4.400. Purpose.

(.01) Excessive uniformity, inappropriateness or poor design of the exterior appearance of structures and signs and the lack of proper attention to site development and landscaping in the business, commercial, industrial and certain residential areas of the City hinders the harmonious development of the City, impairs the desirability of residence, investment or occupation in the City, limits the opportunity to attain the optimum use in value and improvements, adversely affects the stability and value of property, produces degeneration of property in such areas and with attendant deterioration of conditions affecting the peace, health and welfare, and destroys a proper relationship between the taxable value of property and the cost of municipal services therefor.

(.02) The City Council declares that the purposes and objectives of site development requirements and the site design review procedure are to:

- *A. Assure that Site Development Plans are designed in a manner that insures proper functioning of the site and maintains a high quality visual environment.*
- *B. Encourage originality, flexibility and innovation in site planning and development, including the architecture, landscaping and graphic design of said development;*
- *C. Discourage monotonous, drab, unsightly, dreary and inharmonious developments;*
- *D. Conserve the City's natural beauty and visual character and charm by assuring that structures, signs and other improvements are properly related to their sites, and to surrounding sites and structures, with due regard to the aesthetic qualities of the natural terrain and landscaping, and that proper attention is given to exterior appearances of structures, signs and other improvements;*
- *E. Protect and enhance the City's appeal and thus support and stimulate business and industry and promote the desirability of investment and occupancy in business, commercial and industrial purposes;*
- *F. Stabilize and improve property values and prevent blighted areas and, thus, increase tax revenues;*
- *G. Insure that adequate public facilities are available to serve development as it occurs and that proper attention is given to site planning and development so as to not adversely impact the orderly, efficient and economic provision of public facilities and services.*
- *H. Achieve the beneficial influence of pleasant environments for living and working on behavioral patterns and, thus, decrease the cost of governmental services and reduce opportunities for crime through careful consideration of physical design and site layout under defensible space guidelines that clearly define all areas as either public, semi-private, or private, provide clear identity of structures and opportunities for easy surveillance of the site that maximize resident control of behavior -- particularly crime;*
- *I. Foster civic pride and community spirit so as to improve the quality and quantity of citizen participation in local government and in community growth, change and improvements;*

J. Sustain the comfort, health, tranquility and contentment of residents and attract new residents by reason of the City's favorable environment and, thus, to promote and protect the peace, health and welfare of the City.

Response: The City Council recently adopted the Frog Pond West Master Plan to guide development in this area. The Master Plan addresses visual appeal, infrastructure provisions, and protection of the natural areas within the development site. The proposed development is intended to advance the vision for Frog Pond West by incorporating the natural areas on site, providing attractive streetscapes, and enhancing the existing neighborhood to the south and the future school and park to the west and north. The intent of this purpose statement is incorporated into the proposed site design.

Per City staff, the project elements subject to the standards of this section include: tracts and their landscaping; landscaping in the public right-of-way; and the brick wall along Boeckman Road.

B. Section 4.421. Criteria and Application of Design Standards.

(.01) The following standards shall be utilized by the Board in reviewing the plans, drawings, sketches and other documents required for Site Design Review. These standards are intended to provide a frame of reference for the applicant in the development of site and building plans as well as a method of review for the Board. These standards shall not be regarded as inflexible requirements. They are not intended to discourage creativity, invention and innovation. The specifications of one or more particular architectural styles is not included in these standards. (Even in the Boones Ferry Overlay Zone, a range of architectural styles will be encouraged.)

A. Preservation of Landscape. The landscape shall be preserved in its natural state, insofar as practicable, by minimizing tree and soils removal, and any grade changes shall be in keeping with the general appearance of neighboring developed areas.

Response: Tract F includes the existing Willow Creek drainage and riparian area, and Tract G includes a mature Douglas Fir tree. No grade changes are proposed for Tract F; Tract G will be graded to provide a stormwater detention facility, which will be planted with attractive native plants that will complement the Willow Creek natural area and the Boeckman Road frontage.

This standard is met.

B. Relation of Proposed Buildings to Environment. Proposed structures shall be located and designed to assure harmony with the natural environment, including protection of steep slopes, vegetation and other naturally sensitive areas for wildlife habitat and shall provide proper buffering from less intensive uses in accordance with Sections 4.171 and 4.139 and 4.139.5. The achievement of such relationship may include the enclosure of space in conjunction with other existing buildings or other proposed buildings and the creation of focal points with respect to avenues of approach, street access or relationships to natural features such as vegetation or topography.

Response: Structures proposed for the site include a brick wall along the Boeckman Road frontage; a monument sign at the northeast corner of the Boeckman Road and Willow Creek Drive intersection, and retaining walls.

Sheet L3.1 provides design details for the Boeckman Road wall and monument sign. The brick wall along Boeckman Road was designed in accordance with the Frog Pond Master Plan and consists of a 4-ft. brick wall with a 2-ft. wrought iron fence on top. Brick columns with concrete caps are placed at 25-ft. intervals along the site frontage, with gateways at Tracts D, H, J, and K to allow pedestrian and bicycle access between Boeckman Road and the development.

A red brick monument sign is proposed. The sign will be integrated into the brick wall along Boeckman Road and will curve into the site along Willow Creek Drive.

Sheet P5.00 identifies the locations of the proposed retaining walls; Sheet P5.10 includes retaining wall profiles. Retaining walls A, B, and C are proposed within the public right-of-way. Walls A and B are located to the north and south of Street G as it crosses the Willow Creek drainage and SROZ; Wall C is located on the eastern side of Street E midway between Streets B and C. Retaining wall elevations will consist of Keystone Compac, Keystone Century, or Allan Block. These treatments were selected to provide a visually attractive surface and to reflect the natural areas they abut.

This standard is met.

C. Drives, Parking and Circulation. With respect to vehicular and pedestrian circulation, including walkways, interior drives and parking, special attention shall be given to location and number of access points, general interior circulation, separation of pedestrian and vehicular traffic, and arrangement of parking areas that are safe and convenient and, insofar as practicable, do not detract from the design of proposed buildings and structures and the neighboring properties.

Response: The drives, parking, and circulation within the development is subject to the requirements of the RN Zone, the Planned Development overlay, and Land Division requirements and are not subject to Site Design Review. This standard is not applicable.

D. Surface Water Drainage. Special attention shall be given to proper site surface drainage so that removal of surface waters will not adversely affect neighboring properties of the public storm drainage system.

Response: See Sheet P2.00 for the location of LIDA facilities within the planter strips of the public streets and within the front yards of Lots 1 to 26 and potential lots 45 and 46. Tract G will contain a stormwater detention pond and stormwater will be directed to the Willow Creek drainage contained in Tract F.

See Sheet L2.2 for Tract G stormwater pond planting; see Sheet L2.4 for details of LIDA facility planting; and see Appendix B for the Preliminary Drainage Plan.

This standard is met.

E. Utility Service. Any utility installations above ground shall be located so as to have a harmonious relation to neighboring properties and site. The proposed method of sanitary and storm sewage disposal from all buildings shall be indicated.

Response: As shown on Sheet P4.00, each lot will be served by a sanitary sewer line. Storm sewage disposal is provided by a storm drain system connecting to each on-site stormwater facility. This standard is met.

F. Advertising Features. In addition to the requirements of the City's sign regulations, the following criteria should be included: the size, location, design, color, texture, lighting and materials of all exterior signs and outdoor advertising structures or features shall not detract from the design of proposed buildings and structures and the surrounding properties.

Response: No signs are proposed with this application. This standard is not applicable.

G. Special Features. Exposed storage areas, exposed machinery installations, surface areas, truck loading areas, utility buildings and structures and similar accessory areas and structures shall be subject to such setbacks, screen plantings or other screening methods as shall be required to prevent their being incongruous with the existing or contemplated environment and its surrounding properties. Standards for screening and buffering are contained in Section 4.176.

Response: The proposed development is a single-family residential development, and no storage areas, machinery installations, surface areas, truck loading areas, or utility buildings or structures are proposed. This standard is not applicable.

(.02) The standards of review outlined in Sections (a) through (g) above shall also apply to all accessory buildings, structures, exterior signs and other site features, however related to the major buildings or structures.

Response: No accessory buildings, signs, or other site features are proposed. Proposed structures are addressed above.

(.03) The Board shall also be guided by the purpose of Section 4.400, and such objectives shall serve as additional criteria and standards.

Response: The purpose of Section 4.400 is addressed earlier in this section. This standard is met.

(.04) Conditional application. The Planning Director, Planning Commission, Development Review Board or City Council may, as a Condition of Approval for a zone change, subdivision, land partition, variance, conditional use, or other land use action, require conformance to the site development standards set forth in this Section.

Response: This application includes a zone change and planned development, among other applications, and includes responses to the site development standards of those sections. Per City staff, the project elements subject to Site Design Review and the standards of this chapter are tracts and their landscaping; landscaping in the public right-of-way, and the Boeckman Road wall.

(.05) The Board may attach certain development or use conditions in granting an approval that are determined necessary to insure the proper and efficient functioning of the development, consistent with the intent of the Comprehensive Plan, allowed densities and the requirements of this Code. In making this determination of compliance and attaching conditions, the Board shall, however, consider the effects of this action on the availability and cost of needed housing. The provisions of this section shall not be used in such a manner that additional conditions either singularly or accumulatively have the effect of unnecessarily increasing the cost of housing or effectively excluding a needed housing type.

Response: The development has been designed in accordance with the Frog Pond West Master Plan, which is part of and consistent with the Comprehensive Plan. The proposed development plan is consistent with the densities and other requirements established by the Frog Pond West Master Plan and the implementing RN zone. No additional conditions are needed to ensure that the development remains consistent with the City's adopted policies.

(.06) The Board or Planning Director may require that certain paints or colors of materials be used in approving applications. Such requirements shall only be applied when site development or other land use applications are being reviewed by the City.

A. Where the conditions of approval for a development permit specify that certain paints or colors of materials be used, the use of those paints or colors shall be binding upon the applicant. No Certificate of Occupancy shall be granted until compliance with such conditions has been verified.

B. Subsequent changes to the color of a structure shall not be subject to City review unless the conditions of approval under which the original colors were set included a condition requiring a subsequent review before the colors could be changed.

Response: The proposed development is detached single-family residential development. No paints or colors of materials are identified in the design standards of the Frog Pond West Master Plan. It is anticipated that building elevations, including paint and material colors, will be evaluated at the time of building permit review

C. Section 4.460. Procedure.

(.01) Submission of Documents. A prospective applicant for a building or other permit who is subject to site design review shall submit to the Planning Department, in addition to the requirements of Section 4.035, the following:

A. A site plan, drawn to scale, showing the proposed layout of all structures and other improvements including, where appropriate, driveways, pedestrian walks, landscaped areas, fences, walls, off-street parking and loading areas, and railroad tracks. The site plan shall indicate the location of entrances and exits and direction of traffic flow into and out of off-street parking and loading areas, the location of each parking space and each loading berth and areas of turning and maneuvering vehicles. The site plan shall indicate how utility service and drainage are to be provided.

Response: Sheet P2.00 shows the proposed layout of improvements, driveways, pedestrian walks, fences, and walls. Sheets L1.0 – L3.0 shows landscaped areas. Sheet P5.00 shows retaining walls. Sheet L3.1 shows the Boeckman Road wall and monument sign.

B. A Landscape Plan, drawn to scale, showing the location and design of landscaped areas, the variety and sizes of trees and plant materials to be planted on the site, the location and design of landscaped areas, the varieties, by scientific and common name, and sizes of trees and plant materials to be retained or planted on the site, other pertinent landscape features, and irrigation systems required to maintain trees and plant materials. An inventory, drawn at the same scale as the Site Plan, of existing trees of 4" caliper or more is required. However, when large areas of trees are proposed to be retained undisturbed, only a survey identifying the location and size of all perimeter trees in the mass in necessary.

Response: Sheets L1.0 – L1.3 provide an inventory of existing trees. Sheets L2.0 – L3.0 shows landscaped areas and landscape schedules.

C. Architectural drawings or sketches, drawn to scale, including floor plans, in sufficient detail to permit computation of yard requirements and showing all elevations of the proposed structures and other improvements as they will appear on completion of construction. Floor plans shall also be provided in sufficient detail to permit computation of yard requirements based on the relationship of indoor versus outdoor living area, and to evaluate the floor plan's effect on the exterior design of the building through the placement and configuration of windows and doors.

Response: Example building elevations are included as Appendix I.

D. A Color Board displaying specifications as to type, color, and texture of exterior surfaces of proposed structures. Also, a phased development schedule if the development is constructed in stages.

E. A sign Plan, drawn to scale, showing the location, size, design, material, color and methods of illumination of all exterior signs.

F. The required application fee.

Response: A color board is not included, as exterior dwelling design will be evaluated at the time of building permit review. No signs are proposed at this time. The required application fee has been submitted with this application.

IX. Tree Preservation and Protection

A. Section 4.600.20. Applicability of Subchapter

(.01) The provisions of this subchapter apply to the United States and the State of Oregon, and to their agencies and subdivisions, including the City of Wilsonville, and to the employees and agents thereof.

(.02) By this subchapter, the City of Wilsonville regulates forest practices on all lands located within its urban growth boundary, as provided by ORS 527.722.

(.03) The provisions of this subchapter apply to all land within the City limits, including property designated as a Significant Resource Overlay Zone or other areas or trees designated as protected by the Comprehensive Plan, City zoning map, or any other law or ordinance; except that any tree activities in the Willamette River Greenway that are regulated by the provisions of WC 4.500 - 4.514 and requiring a conditional use permit shall be reviewed by the DRB under the application and review procedures set forth for Tree Removal Permits.

Response: The site contains the Willow Creek SROZ area and this chapter is applicable.

Section 4.600.30. Tree Removal Permit Required

(.01) Requirement Established. No person shall remove any tree without first obtaining a Tree Removal Permit (TRP) as required by this subchapter.

(.02) Tree Removal Permits will be reviewed according to the standards provided for in this subchapter, in addition to all other applicable requirements of Chapter 4.

(.03) Although tree activities in the Willamette River Greenway are governed by WC 4.500 - 4.514, the application materials required to apply for a conditional use shall be the same as those required for a Type B or C permit under this subchapter, along with any additional materials that may be required by the Planning Department. An application for a Tree Removal Permit under this section shall be reviewed by the Development Review Board.

Response: As shown on Sheet L1.0 and described in Appendix F, the development will remove trees and a Tree Removal Permit is required.

Section 4.600.40. Exceptions

(.01) Exception from requirement. Notwithstanding the requirement of WC 4.600.30(1), the following activities are allowed without a Tree Removal Permit, unless otherwise prohibited:

- *A. Agriculture, Commercial Tree Farm or Orchard. Tree removal or transplanting occurring during use of land for commercial purposes for agriculture, orchard(s), or tree farm(s), such as Christmas tree production.*
- *B. Emergencies. Actions made necessary by an emergency, such as tornado, windstorm, flood, freeze, utility damage or other like disasters, in order to prevent imminent injury or damage to persons or property or restore order and it is impractical due to circumstances to apply for a permit.*
  - *1. When an emergency has occurred, a Tree Removal Permit must be applied for within thirty (30) days following the emergency tree removal under the application procedures established in this subchapter.*
  - *2. In addition to complying with the permit application requirements of this subchapter, an applicant shall provide a photograph of any tree removed and a brief description of the conditions that necessitated emergency removal. Such photograph shall be supplied within seven days of application for a permit. Based on good cause shown arising out of the emergency, the Planning Director may waive any or all requirements of this section.*
  - *3. Where a Type A Permit is granted for emergency tree removal, the permitee is encouraged to apply to the City Tree Fund for replanting assistance.*
- *C. City utility or road work in utility or road easements, in utility or road right-of-ways, or in public lands. However, any trees removed in the course of utility work shall be mitigated in accordance with the standards of this subchapter.*
- *D. Nuisance abatement. The City is not required to apply for a Tree Removal Permit to undertake nuisance abatement as provided in WC 6.200 et seq. However, the owner of the property subject to nuisance abatement is subject to all the provisions of this subchapter in addition to the requirements of WC 6.200 et seq.*
- *E. The removal of filbert trees is exempt from the requirements of this subchapter.*

F. The Charbonneau District, including its golf course, is exempt from the requirements of WC 4.600.30(1) on the basis that by and through the current CC&R's of the Charbonneau Country Club, the homeowners' association complies with all requirements of WC 4.610.30(1)(C)(1). This exception has been based upon the Tree Maintenance and Protection Plan that has been submitted by the Charbonneau Country Club and approved by the Planning Director. Tree removal activities remain subject to all applicable standards of this subchapter. Unless authorized by the City, this exception does not include tree removal upon any public easements or public property within the district. In the event that the CC&R's are changed relative to the effect of the Tree Maintenance and Protection Plan, then the Planning Director shall review whether such effect is material, whether it can be mitigated, and if not, may disallow the exemption.

Response: The proposed tree removal is not listed as exempt. The provisions of this chapter are applicable.

Section 4.600.50. Application For Tree Removal Permit

(.01) Application for Permit. A person seeking to remove one or more trees shall apply to the Director for a Tree Removal Permit for a Type A, B, C, or D permit, depending on the applicable standards as provided in this subchapter.

A. An application for a tree removal permit that does not meet the requirements of Type A may be submitted as a Type B application.

(.02) Time of Application. Application for a Tree Removal Permit shall be made before removing or transplanting trees, except in emergency situations as provided in WC 4.600.40 (1)(B) above. Where the site is proposed for development necessitating site plan or plat review, application for a Tree Removal Permit shall be made as part of the site development application as specified in this subchapter.

(.03) Fees. A person applying for a Tree Removal Permit shall pay a non-refundable application fee; as established by resolution of the City Council.

A. By submission of an application, the applicant shall be deemed to have authorized City representatives to have access to applicant's property as may be needed to verify the information provided, to observe site conditions, and if a permit is granted, to verify that terms and conditions of the permit are followed.

Response: The site is proposed for development necessitating site plan and plat review, and this application includes a request for a Type C Tree Removal Permit. The application fee has been submitted with this application.

B. Section 4.610.00. Application Review Procedure

(.01) The permit applicant shall provide complete information as required by this subchapter in order for the City to review the application.

(.02) Departmental Review. All applications for Tree Removal Permits must be deemed complete by the City Planning Department before being accepted for review. When all required information has been supplied, the Planning Department will verify whether the application is complete. Upon request of either the applicant or the City, the City may conduct a field inspection or review meeting. City departments involved in the review shall submit their report and recommendations to the Planning Director who shall forward them to the appropriate reviewing authority.

(.03) Reviewing Authority.

A. Type A or B. Where site plan review or plat approval by the Development Review Board is not required by City ordinance, the grant or denial of the Tree Removal Permit application shall be the responsibility of the Planning Director. The Planning Director has the authority to refer a Type B permit application to the DRB under the Class II administrative review procedures of this Chapter. The decision to grant or deny a permit shall be governed by the applicable review standards enumerated in WC 4.610.10

B. Type C. Where the site is proposed for development necessitating site plan review or plat approval by the Development Review Board, the Development Review Board shall be responsible for granting or denying the application for a Tree Removal Permit, and that decision may be subject to affirmance, reversal or modification by the City Council, if subsequently reviewed by the Council.

C. Type D. Type D permit applications shall be subject to the standards and procedures of Class I administrative review and shall be reviewed for compliance with the Oregon Forest Practice Rules and Statutes. The Planning Director shall make the decision to grant or deny an application for a Type D permit.

D. Review period for complete applications. Type A permit applications shall be reviewed within 10 (ten) working days. Type B permit applications shall be reviewed by the Planning Director within thirty (30) calendar days, except that the DRB shall review any referred application within sixty (60) calendar days. Type C permit applications shall be reviewed within the time frame established by this Chapter. Type D permit applications shall be reviewed within 15 calendar days.

Response: The application is for a Type C Tree Removal Permit and is subject to review and approval by the DRB.

[…]

Section 4.610.10. Standards For Tree Removal, Relocation Or Replacement

(.01) Except where an application is exempt, or where otherwise noted, the following standards shall govern the review of an application for a Type A, B, C or D Tree Removal Permit:

A. Standard for the Significant Resource Overlay Zone. The standard for tree removal in the Significant Resource Overlay Zone shall be that removal or transplanting of any tree is not inconsistent with the purposes of this Chapter.

Response: No trees are proposed for removal within the SROZ. This standard is not applicable.

B. Preservation and Conservation. No development application shall be denied solely because trees grow on the site. Nevertheless, tree preservation and conservation as a design principle shall be equal in concern and importance to other design principles.

Response: As detailed in Sheets L1.1-L1.3, most of the trees currently located on the site are plantation trees, or trees grown for sale. These trees will be removed to allow for construction of Streets C and D, and development of Lots 27-44.

As shown on Sheet L1.0, the majority of the trees to be removed are located within the grading limits of public streets (Streets B, C, D, E, and F). The locations of those streets were determined by the Frog Pond West Master Plan and the city's block length and perimeter standards. The remainder of the trees to be removed is located within the building footprint of the individual lots, as determined by minimum setbacks and driveway depth requirements.

Eleven trees will be preserved. Four of those trees (2 Ponderosa Pine and 2 Kwanzan Cherry) are located adjacent to the existing Wehler home on Lots 22 and 25. A Douglas Fir located northwest of the Willow Creek Drive and Boeckman Road intersection. Six Douglas Firs are proposed for protection along the western boundary of Tract L. It is likely that future development will require the removal of these trees, but they will be retained with the proposed development.

See the memo dated August 18, 2018, for additional information.

This standard is met.

C. *Developmental Alternatives. Preservation and conservation of wooded areas and trees shall be given careful consideration when there are feasible and reasonable location alternatives and design options on-site for proposed buildings, structures or other site improvements.*

Response: The Frog Pond West Master Plan provides clear direction for street connections, residential densities, and preservation of the SROZ. Preservation and conservation of the tree plantation on site, while addressing the requirements of the Frog Pond West Master Plan, is not feasible. The future dwelling on Lot 22 will be sited to avoid impacts to the Ponderosa Pine and Kwanzan Cherry trees on site, and the stormwater facility within Tract G has been sited to allow retention of a Douglas Fir tree. This standard is met.

D. *Land Clearing. Where the proposed activity requires land clearing, the clearing shall be limited to designated street rights-of-way and areas necessary for the construction of buildings, structures or other site improvements.*

Response: The proposed land clearing is limited to designated street rights-of-way and areas necessary for the construction of single-family homes. This standard is met.

E. *Residential Development. Where the proposed activity involves residential development, residential units shall, to the extent reasonably feasible, be designed and constructed to blend into the natural setting of the landscape.*

Response: The proposed development is a single-family residential development. The units will be designed and constructed, as much as possible, to blend into the natural areas on the site. This standard is met.

F. *Compliance With Statutes and Ordinances. The proposed activity shall comply with all applicable statutes and ordinances.*

Response: Applicable statutes and ordinances include the City's Development Code. The proposed activity will comply with this code and any other applicable statutes and ordinances. This standard is met.

G. *Relocation or Replacement. The proposed activity shall include necessary provisions for tree relocation or replacement, in accordance with WC 4.620.00, and the protection of those trees that are not to be removed, in accordance with WC 4.620.10.*

Response: As shown in Sheet L1.0 and described in Appendix F, trees to be retained will be protected per the provisions of 4.620.10 and trees will be replaced in accordance with 4.620.00. Those provisions are addressed in the responses to Section 4.620.00 later in this narrative. This standard is met.

H. *Limitation. Tree removal or transplanting shall be limited to instances where the applicant has provided completed information as required by this Chapter and the reviewing authority determines that removal or transplanting is necessary based on the criteria of this subsection.*
   1. *Necessary For Construction. Where the applicant has shown to the satisfaction of the reviewing authority that removal or transplanting is necessary for the construction of a building, structure or other site improvement, and that there is no feasible and reasonable location alternative or design option on-site for a proposed building, structure or other site improvement; or a tree is located too close to existing or proposed buildings or structures, or creates unsafe vision clearance.*

   Response: Per the arborist's report included as Appendix F, there are 570 trees on site. Of those trees, 292 are plantation trees and 37 are dead, dying, or declining. The remaining 241 trees are a combination of orchard fruit trees, hedgerows, and conifer trees. In total, 565 trees will be removed from the site and 5 trees will be retained.

Removal of the trees on site is necessary for construction of site improvements, including utilities, streets, and detached residential dwellings. As shown on Sheet L1.0, significant numbers of trees are located within street and pedestrian connection rights-of-way. The location of these streets and connections was determined by the Frog Pond West Master Plan and the block perimeter requirements of the RN zone. In addition, the designation of the site as a lower-density single-family area requires the grading of each lot to accommodate a single-family dwelling and associated site improvements (driveways and walkways, stormwater management, outdoor yard areas, etc.). Reducing building footprints by increasing height is not a viable alternative as the height limit in the RN zone is 35 ft., or 2.5 stories.

This standard is met.

2. *Disease, Damage, or Nuisance, or Hazard. Where the tree is diseased, damaged, or in danger of falling, or presents a hazard as defined in WC 6.208, or is a nuisance as defined in WC 6.200 et seq., or creates unsafe vision clearance as defined in this Code.*
   (a) *As a condition of approval of Stage II development, filbert trees must be removed if they are no longer commercially grown or maintained.*

Response: The arborist's report identifies 14 dead or hazardous trees and 121 declining trees on the site (135 total). These trees will be removed. No filbert trees were identified. This standard is met.

3. *Interference. Where the tree interferes with the healthy growth of other trees, existing utility service or drainage, or utility work in a previously dedicated right-of-way, and it is not feasible to preserve the tree on site.*

Response: As shown on Sheet L1.2, many of the trees proposed for removal are located within right-of-way to be dedicated with the plat. The construction of Streets C, D, E, and F and associated sidewalks and utilities require removal of many of the trees proposed for removal. These trees cannot be preserved while providing the street network required by the Frog Pond West Master Plan.

4. *Other. Where the applicant shows that tree removal or transplanting is reasonable under the circumstances.*

Response: The proposed development is anticipated by the Frog Pond West Master Plan. While the development requires removal of many of the trees on site, the Willow Creek SROZ is protected and enhanced by the development and 5 mature trees are retained on site. The trees removed will be mitigated, and street trees appropriate for the size and location of the planter strips within the public right-of-way will be planted. These trees will serve to soften the urban environment, contribute to stormwater management, and provide shade and protection for pedestrians.

I. *Additional Standards for Type C Permits.*
   1. *Tree survey. For all site development applications reviewed under the provisions of Chapter 4 Planning and Zoning, the developer shall provide a Tree Survey before site development as required by WC 4.610.40, and provide a Tree Maintenance and Protection plan, unless specifically exempted by the Planning Director or DRB, prior to initiating site development.*

Response: A tree survey has been completed and incorporated into the Tree Removal and Protection Plan includes as Sheet L1.0. This standard is met.

2. *Platted Subdivisions. The recording of a final subdivision plat whose preliminary plat has been reviewed and approved after the effective date of Ordinance 464 by the City and that conforms with this subchapter shall include a Tree Survey and Maintenance and Protection Plan, as required by this subchapter, along with all other conditions of approval.*

Response: A tree survey has been completed and incorporated into the Tree Removal and Protection Plan includes as Sheet L1.0. This standard is met.

3. *Utilities. The City Engineer shall cause utilities to be located and placed wherever reasonably possible to avoid adverse environmental consequences given the circumstances of existing locations, costs of placement and extensions, the public welfare, terrain, and preservation of natural resources. Mitigation and/or replacement of any removed trees shall be in accordance with the standards of this subchapter.*

Response: The utilities will be located and placed within rights-of-way or adjacent PUEs whenever possible. Trees removed from the site will be mitigated and/or replaced per the provisions of 4.620.00. This standard is met.

[…]

Section 4.610.40. Type C Permit

(.01) Approval to remove any trees on property as part of a site development application may be granted in a Type C permit. A Type C permit application shall be reviewed by the standards of this subchapter and all applicable review criteria of Chapter 4. Application of the standards of this section shall not result in a reduction of square footage or loss of density, but may require an applicant to modify plans to allow for buildings of greater height. If an applicant proposes to remove trees and submits a landscaping plan as part of a site development application, an application for a Tree Removal Permit shall be included. The Tree Removal Permit application will be reviewed in the Stage II development review process, and any plan changes made that affect trees after Stage II review of a development application shall be subject to review by DRB. Where mitigation is required for tree removal, such mitigation may be considered as part of the landscaping requirements as set forth in this Chapter. Tree removal shall not commence until approval of the required Stage II application and the expiration of the appeal period following that decision. If a decision approving a Type C permit is appealed, no trees shall be removed until the appeal has been settled.

Response: The proposed development requires removal of trees; a landscaping plan has been submitted as part of the site development application, and the application includes a request for a Tree Removal Permit. Mitigation is required and addressed in the responses to Section 4.620.00.

(.02) The applicant must provide ten copies of a Tree Maintenance and Protection Plan completed by an arborist that contains the following information:

A. A plan, including a topographical survey bearing the stamp and signature of a qualified, registered professional containing all the following information:

1. *Property Dimensions. The shape and dimensions of the property, and the location of any existing and proposed structure or improvement.*

Response: See Sheet P1.10 Existing Conditions for the location of existing structures and improvements; See Sheet 2.00 Preliminary Site Plan for the location of proposed improvements.

2. *Tree survey. The survey must include:*
   a. *An accurate drawing of the site based on accurate survey techniques at a minimum scale of one inch (1”) equals one hundred feet (100’) and which provides a) the location of all*

trees having six inches (6") or greater d.b.h. likely to be impacted, b) the spread of canopy of those trees, (c) the common and botanical name of those trees, and d) the approximate location and name of any other trees on the property.

- *b. A description of the health and condition of all trees likely to be impacted on the site property. In addition, for trees in a present or proposed public street or road right-of-way that are described as unhealthy, the description shall include recommended actions to restore such trees to full health. Trees proposed to remain, to be transplanted or to be removed shall be so designated. All trees to remain on the site are to be designated with metal tags that are to remain in place throughout the development. Those tags shall be numbered, with the numbers keyed to the tree survey map that is provided with the application.*
- *c. Where a stand of twenty (20) or more contiguous trees exist on a site and the applicant does not propose to remove any of those trees, the required tree survey may be simplified to accurately show only the perimeter area of that stand of trees, including its drip line. Only those trees on the perimeter of the stand shall be tagged, as provided in "b," above.*
- *d. All Oregon white oaks, native yews, and any species listed by either the state or federal government as rare or endangered shall be shown in the tree survey.*

Response: See Sheet L1.0 for a tree survey indicating the location of trees greater than 6-in DBH. See Appendix F Tree Plan and Sheets L1.1-L1.3 for information about the condition of the trees, crown diameter, and proposed action for each tree.

No Oregon white oaks, native yews, or other species identified as rare or endangered were identified on site.

3. Tree Protection. A statement describing how trees intended to remain will be protected during development, and where protective barriers are necessary, that they will be erected before work starts. Barriers shall be sufficiently substantial to withstand nearby construction activities. Plastic tape or similar forms of markers do not constitute "barriers."

Response: See Appendix F page 1 for a description of activities permitted and prohibited within the root protection zone of trees to be protected. See also the Tree Protection Detail and note on Sheet L1.0.

4. Easements and Setbacks. Location and dimension of existing and proposed easements, as well as all setbacks required by existing zoning requirements.

Response: See Sheet P2.00 Preliminary Site Plan for setbacks required by zoning requirements. See Sheet P3.00 for the location and dimensions of proposed easements.

5. Grade Changes. Designation of grade changes proposed for the property that may impact trees.

Response: Sheet L1.0 Tree Removal and Protection Plan includes proposed grading contours.

6. Cost of Replacement. A cost estimate for the proposed tree replacement program with a detailed explanation including the number, size and species.

Response: See response to Section 4.620.00 (.06) below for a calculation of payment into the City Tree Fund.

7. *Tree Identification. A statement that all trees being retained will be identified by numbered metal tags, as specified in subsection "A," above in addition to clear identification on construction documents.*

Response: The Tree Plan Legend on Sheet L1.0 includes a statement identifying the purpose of the tree tags.

C. Section 4.620.00. Tree Relocation, Mitigation, Or Replacement

(.01) Requirement Established. A Type B or C Tree Removal Permit grantee shall replace or relocate each removed tree having six (6) inches or greater d.b.h. within one year of removal.

(.02) Basis For Determining Replacement. The permit grantee shall replace removed trees on a basis of one (1) tree replanted for each tree removed. All replacement trees must measure two inches (2") or more in diameter. Alternatively, the Planning Director or Development Review Board may require the permit grantee to replace removed trees on a per caliper inch basis, based on a finding that the large size of the trees being removed justifies an increase in the replacement trees required. Except, however, that the Planning Director or Development Review Board may allow the use of replacement Oregon white oaks and other uniquely valuable trees with a smaller diameter.

Response: The proposed tree removal requires replacement of each tree having 6 inches or greater dbh within one year of removal. As noted in the tree plan, 565 trees of 6 inches or greater dbh will be removed. There is inadequate space on site to plant all of the replacement trees, and 264 street and site trees are proposed to be planted.

(.03) Replacement Tree Requirements. A mitigation or replacement tree plan shall be reviewed by the City prior to planting and according to the standards of this subsection.

A. Replacement trees shall have shade potential or other characteristics comparable to the removed trees, shall be appropriately chosen for the site from an approved tree species list supplied by the City, and shall be state Department of Agriculture Nursery Grade No. 1 or better.

B. Replacement trees must be staked, fertilized and mulched, and shall be guaranteed by the permit grantee or the grantee's successors-in-interest for two (2) years after the planting date.

C. A "guaranteed" tree that dies or becomes diseased during that time shall be replaced.

D. Diversity of tree species shall be encouraged where trees will be replaced, and diversity of species shall also be maintained where essential to preserving a wooded area or habitat.

Response: There are 264 replacement trees proposed, including street trees and site trees. There replacement street trees have been selected from the City's street tree list. Replacement trees will be maintained and replaced if they die within the 2 year establishment period.

(.04) All trees to be planted shall consist of nursery stock that meets requirements of the American Association of Nurserymen (AAN) American Standards for Nursery Stock (ANSI Z60.1) for top grade.

(.05) Replacement Tree Location.

A. City Review Required. The City shall review tree relocation or replacement plans in order to provide optimum enhancement, preservation and protection of wooded areas. To the extent feasible and desirable, trees shall be relocated or replaced on-site and within the same general area as trees removed.

B. Relocation or Replacement Off-Site. When it is not feasible or desirable to relocate or replace trees on-site, relocation or replacement may be made at another location approved by the City.

Response: The tree replacement plan/landscaping plan is included as Sheet L2.0. Replacement trees consist primarily of street trees. Trees will likely be planted on the individual dwelling lots at the time of site development, but are not proposed to be included in the replacement tree plans. It is not feasible to replace all of the trees on site, and the applicant does not have another location for replacement plantings. The applicant requests payment into the City Tree Fund.

(.06) City Tree Fund. Where it is not feasible to relocate or replace trees on site or at another approved location in the City, the Tree Removal Permit grantee shall pay into the City Tree Fund, which fund is hereby created, an amount of money approximately the value as defined by this subchapter, of the replacement trees that would otherwise be required by this subchapter. The City shall use the City Tree Fund for the purpose of producing, maintaining and preserving wooded areas and heritage trees, and for planting trees within the City.

A. The City Tree Fund shall be used to offer trees at low cost on a first-come, first-serve basis to any Type A Permit grantee who requests a tree and registers with the City Tree Fund.

B. In addition, and as funds allow, the City Tree Fund shall provide educational materials to assist with tree planting, mitigation, and relocation.

Response: It is not feasible to replace all trees on site, and the applicant requests payment into the City Tree Fund for 282 trees. Eleven trees are proposed for retention, although is anticipated that 6 of those trees will be removed as part of future development; therefore 5 trees are anticipated for long-term retention. These trees identified as tag numbers 51055, 51056, 51057, 50169, and 53981 on Sheet L1.0.

Per Table 4 above, the 5 trees being retained provide 19 tree credits. The applicant requests payment into the City Tree Fund in lieu of replacement of 282 trees (565-264-19=282). The estimated cost of each replacement tree is $300. The estimate is based on the number of trees removed and a replacement ratio of 1:1. The landscape architect assumed a 2" cal. deciduous / 6 ft ht. conifer replacement tree with an average install cost of $300 based on current bid prices, which include contractor markup. The tree size was selected for generally above-average survival rates.

The applicant proposes payment of $84,600 (282*300=84,600) into the City Tree Fund in lieu of replacing 282 trees.

(.07) Exception. Tree replacement may not be required for applicants in circumstances where the Director determines that there is good cause to not so require. Good cause shall be based on a consideration of preservation of natural resources, including preservation of mature trees and diversity of ages of trees. Other criteria shall include consideration of terrain, difficulty of replacement and impact on adjacent property.

Response: The applicant is not requesting an exception to the tree replacement requirement.

Section 4.620.10. Tree Protection During Construction

(.01) Where tree protection is required by a condition of development under Chapter 4 or by a Tree Maintenance and Protection Plan approved under this subchapter, the following standards apply:

A. All trees required to be protected must be clearly labeled as such.

B. Placing Construction Materials Near Tree. No person may conduct any construction activity likely to be injurious to a tree designated to remain, including, but not limited to, placing solvents, building material, construction equipment, or depositing soil, or placing irrigated landscaping, within the drip line, unless a plan for such construction activity has been approved by the Planning Director or Development Review Board based upon the recommendations of an arborist.

C. Attachments to Trees During Construction. Notwithstanding the requirement of WC 4.620.10(1)(A), no person shall attach any device or wire to any protected tree unless needed for tree protection.

D. Protective Barrier. Before development, land clearing, filling or any land alteration for which a Tree Removal Permit is required, the developer shall erect and maintain suitable barriers as identified by an arborist to protect remaining trees. Protective barriers shall remain in place until the City authorizes their removal or issues a final certificate of occupancy, whichever occurs first. Barriers shall be sufficiently substantial to withstand nearby construction activities. Plastic tape or similar forms of markers do not constitute "barriers." The most appropriate and protective barrier *shall be utilized. Barriers are required for all trees designated to remain, except in the following cases:*

1. *Right-of-Ways and Easements. Street right-of-way and utility easements may be cordoned by placing stakes a minimum of fifty (50) feet apart and tying ribbon, plastic tape, rope, etc., from stake to stake along the outside perimeters of areas to be cleared.*
2. *Any property area separate from the construction or land clearing area onto which no equipment will venture may also be cordoned off as described in paragraph (D) of this subsection, or by other reasonable means as approved by the reviewing authority.*

Response: Sheet L1.0 and the Tree Plan included as Appendix F provide direction regarding the protection of trees on the site.

[…]

X. Annexations and Urban Growth Boundary Amendments

A. *Section 4.700. Procedures Relating To The Processing Of Requests For Annexation And Urban Growth Boundary Amendments.*

(.01) The City of Wilsonville is located within the Portland Metropolitan Area, and is therefore subject to regional government requirements affecting changes to the city limits and changes to the Urban Growth Boundary (UGB) around Wilsonville. The City has the authority to annex properties as prescribed in State law, but the City's role in determining the UGB is primarily advisory to Metro, as provided in Oregon Revised Statutes. The following procedures will be used to aid the City Council in formulating recommendations to those regional entities. [Amended by Ordinance No. 538, 2/21/02.]

A. Proponents of such changes shall provide the Planning Director with all necessary maps and written information to allow for review by city decision-makers. The Planning Director, after consultation with the City Attorney, will determine whether each given request is quasi-judicial or legislative in nature and will make the necessary arrangements for review based upon that determination.

Response: The applicant has provided the required information. The Planning Director has determined that the annexation request is subject to quasi-judicial review.

B. Written information submitted with each request shall include an analysis of the relationship between the proposal and the City's Comprehensive Plan, applicable statutes, as well as the Statewide Planning Goals and any officially adopted regional plan that may be applicable.

Response: See Section III of this narrative for a discussion of the relationship between the proposed annexation and the City's Comprehensive Plan.

XI. Conclusion

The request for the Stafford Meadows Planned Development and related approvals has been shown to be consistent with the applicable standards of the City of Wilsonville. West Hills Land Development LLC respectfully requests approval of the applications.

Appendix A

PETITION SIGNERS

NOTE: This petition may be signed by qualified persons even though they may not know their property description or precin

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
Thelma J Roethe, Trustee	Thelma J. Roethe, The Killinger Trust	X			6651 SW Boeckman Rd, Wilsonville, OR	2001			

Verify signing authority

* PO =Property Owner
RV =Registered Voter
OV =Owner And Registered Voter

PETITION SIGNERS

NOTE: **This petition may be signed by qualified persons even though they may not know their property description or precinct number.**

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION				PRECINCT #	DATE
		PO	RV	OV		LOT #	¼ SEC	T	R		
	Dale Krielkamp			x	6875 SW Boeckman Rd	2201					
Verla Krielkamp	Verla Krielkamp			x	6875 SW Boeckman Rd	2201					

* PO =Property Owner

RV =Registered Voter

OV =Owner And Registered Voter

PETITION SIGNERS

NOTE: This petition may be signed by qualified persons even though they may not know their property description or precin

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
	Louie Pike			x	7025 SW Boeckman Rd	2202			
Gayla Cushman Pike	Gayla Cushman-Pike			x					
	Amy Pike		x						

* PO =Property Owner
RV =Registered Voter
OV =Owner And Registered Voter

CERTIFICATION OF LEGAL DESCRIPTION AND MAP

I hereby certify that the description of the property included within the attached petition (located on Assessor's Map 31W12D) has been checked by me and it is a true and exact description of the property under consideration, and the description corresponds to the attached map indicating the property under consideration.

NAME DJ STORM
TITLE GIS CARTOGRAPHER 2
DEPARTMENT A&T
COUNTY OF CLACKAMAS
DATE: 1-30-18

EXHIBIT A

LEGAL DESCRIPTION
STAFFORD MEADOWS PROPERTIES

January 30, 2018 (Otak #17868)

Those properties described in Bargain and Sale Deed to Louie M. Pike and Gayla D. Cushman-Pike recorded as Document Number 89-06039, in Bargain and Sale Deeds to Doris A. Wehler recorded as Document Numbers 2012-0160063 and 2012-016064, in Statutory Bargain and Sale Deed to Dale I. Kreilkamp and Verla S. Kreilkamp, recorded as Document Number 2015-045034, and in Warranty Deed to Donald E. Killinger and Elva C. Killinger recorded as Document Number 95-068541, all of Clackamas County Records, in the southeast one-quarter of Section 12, Township 3 South, Range 1 West, Willamette Meridian, Clackamas County, Oregon, the exterior boundary of said properties being described as follows:

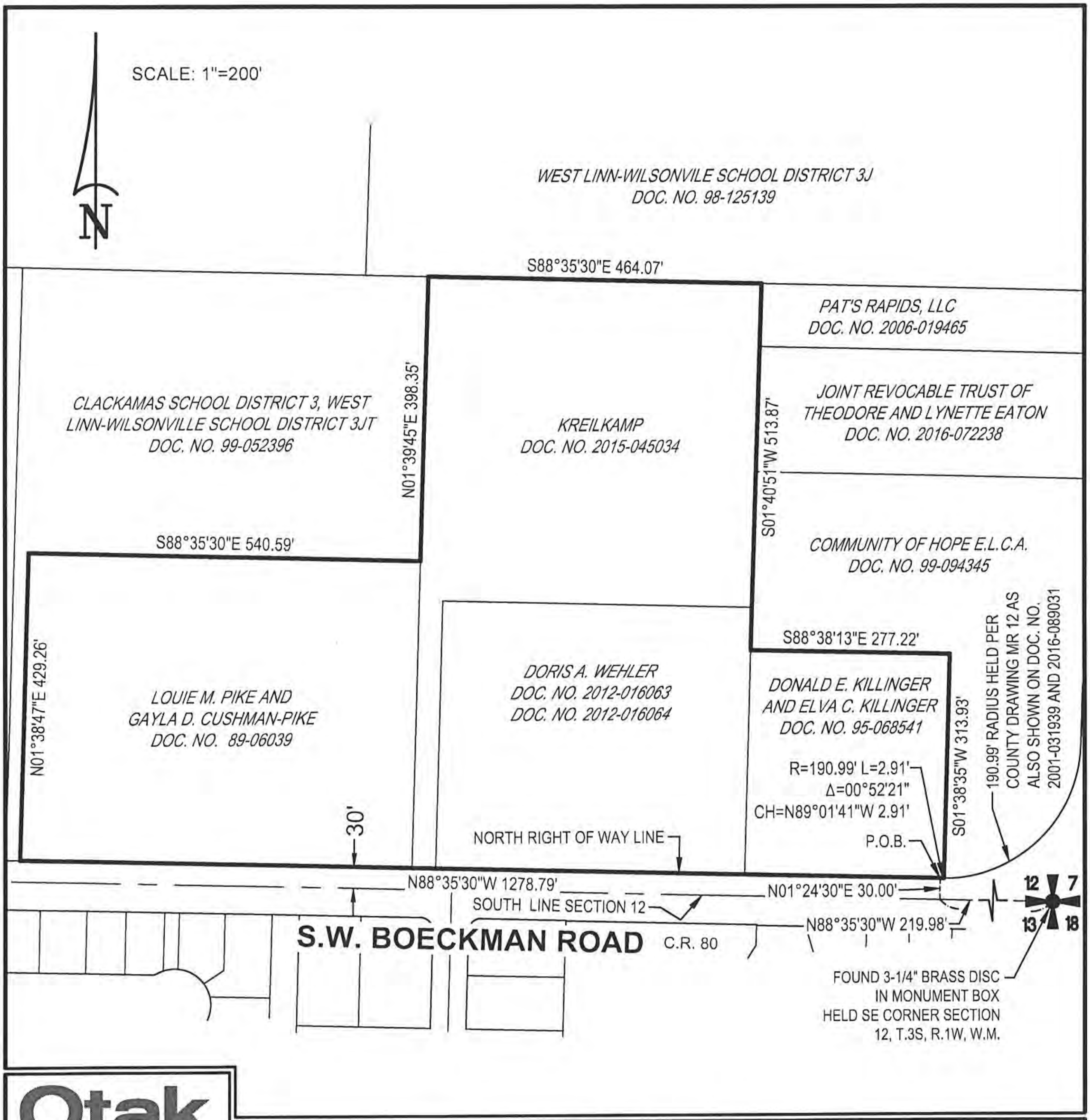
BEGINNING at a point on the north right of way line of S.W. Boeckman Road being North 01°24'30" East a distance of 30.00 feet from a point on the centerline thereof, said centerline also being the south line of said Section 12, said point on centerline being North 88°35'30" West a distance of 219.98 feet from a 3-1/4 inch brass disk found in a monument box at the southeast corner of said Section 12;
thence along said north right of way line being parallel with and 30.00 feet north of the south line of said Section 12, North 88°35'30" West a distance of 1278.79 feet to the most southerly east line of that property described in Warranty Deed to Clackamas County School District 3, West Linn-Wilsonville School District 3JT recorded as Document Number 99-052396, Clackamas County Records;
thence along the east and south lines of said Clackamas County School property through the following three courses:
North 01°38'47" East a distance of 429.26 feet;
South 88°35'30" East a distance of 540.59 feet;
and North 01°39'45" East a distance of 398.35 feet to a point on the south line of that property described in Statutory Warranty Deed to West Linn-

Wilsonville School District 3J recorded as Document Number 98-125139, Clackamas County Records;
thence along said last said south line, South 88°35'30" East a distance of 464.07 feet to the northwest corner of that property described in Warranty Deed to Pat's Rapids, LLC recorded as Document Number 2006-019465, Clackamas County Records;
thence along the west line of said Pat's Rapids LLC property, and along the west lines of those properties described in General Warranty Deed for Oregon to Joint Revocable Trust of Theodore and Lynette Eaton recorded as Document Number 2016-072238, and in Statutory Warranty Deed to Community of Hope E.L.C.A. recorded as Document Number 99-094345, both of Clackamas County Records, South 01°40'51" West a distance of 513.87 feet;
thence along the most westerly south line and most southerly west line of said Community of Hope E.L.C.A. property through the following two courses:
South 88°38'13" East a distance of 277.22 feet;
and South 01°38'35" West a distance of 313.93 feet to a point on a curve in said north right of way line;
thence westerly along the arc of a non-tangent 190.99 foot radius curve to the right (radius point bears North 00°32'09" East), through a central angle of 00°52'21", an arc length of 2.91 feet (chord bears North 89°01'41" West a distance of 2.91 feet) to the POINT OF BEGINNING.

Contains 16.14 acres, more or less.

Bearings based on the Oregon State Plane Coordinate System, NAD'83, North Zone.

NOVEMBER 12, 2013
MICHAEL D. SPELTS
87475PLS
RENEWS: 6/30/18



Otak

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Portland, Oregon 97204
Phone: (503) 287-6825
www.otak.com
project: 17868

EXHIBIT A

SHEET 3 OF 3

STAFFORD MEADOWS PROJECT
IN THE SOUTHEAST ONE-QUARTER OF SECTION 12
TOWNSHIP 3 SOUTH, RANGE 1 WEST, WILLAMETTE MERIDIAN
CLACKAMAS COUNTY, OREGON

JANUARY 30 , 2018

RECEIVED
JAN 31 2018

CERTIFICATION OF PROPERTY OWNERSHIP OF 100% OF LAND AREA

I hereby certify that the attached petition contains the names of the owners[1] (as shown on the last available complete assessment roll) of 100% of the land area of the territory proposed for annexation as described in the attached petition.

NAME DJ STORM
TITLE GIS CARTOGRAPHER 2
DEPARTMENT A & T
COUNTY OF CLACKAMAS
DATE 1-30-18

JAN 2018
RECEIVED
CLACKAMAS
COUNTY
ASSESSOR

---

[1] Owner means the legal owner of record or, where there is a recorded land contract which is in force, the purchaser thereunder. If a parcel of land has multiple owners, each consenting owner shall be counted as a percentage of their ownership interest in the land. That same percentage shall be applied to the parcel's land mass and assessed value for purposes of the consent petition. If a corporation owns land in territory proposed to be annexed, the corporation shall be considered the individual owner of that land.

PETITION SIGNERS

NOTE: This petition may be signed by qualified persons even though they may not know their property description or precir

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
Thelma J Roethe, Trustee	Thelma J. Roethe, The Killinger Trust	X			6651 SW Boeckman Rd, Wilsonville, OR	2001	12D	31	W

* PO =Property Owner
RV =Registered Voter
OV =Owner And Registered Voter

PETITION SIGNERS

NOTE: **This petition may be signed by qualified persons even though they may not know their property description or precinct number.**

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
Doris A. Wehler	Doris A. Wehler			X	6855 SW Boeckman Rd	2100	12D	31	W

* PO =Property Owner
RV =Registered Voter

PETITION SIGNERS

NOTE: **This petition may be signed by qualified persons even though they may not know their property description or precinct number.**

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION				PRECINCT #	DATE
		PO	RV	OV		LOT #	¼ SEC	T	R		
✓	Dale Krielkamp			x	6875 SW Boeckman Rd	2201	12D	3	W		
✓ Verla Krielkamp	Verla Krielkamp			x	6875 SW Boeckman Rd	2201					

* PO =Property Owner

RV =Registered Voter

OV =Owner And Registered Voter

PETITION SIGNERS

NOTE: This petition may be signed by qualified persons even though they may not know their property description or preci

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
✓	Louie Pike			x	7025 SW Boeckman Rd	2202	12D	3 1	W
✓ Gayla Cushman Pike	Gayla Cushman-Pike			x			12D	3 1	W
✓	Amy Pike		x				12D		

* PO =Property Owner
RV =Registered Voter
OV =Owner And Registered Voter

PETITION SIGNERS

NOTE: This petition may be signed by qualified persons even though they may not know their property description or precinct number.

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
Matt Wi	Matthew Wingard		X		6855 SW Wilsonville Rd.	2100	12D	31	W

* PO =Property Owner
RV =Registered Voter

CERTIFICATION OF REGISTERED VOTERS

I hereby certify that the attached petition contains the names of at least 50% of the electors registered in the territory proposed for annexation as described in the attached petition.

NAME Rebekah St Doll
TITLE Deputy Clerk
DEPARTMENT Elections
COUNTY OF Clackamas County
DATE 1/29/18

PETITION SIGNERS

NOTE: **This petition may be signed by qualified persons even though they may not know their property description or precinct number.**

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
Doris A. Wehler	Doris A. Wehler			X	6855 SW Boeckman Rd	2100			

* PO =Property Owner
RV =Registered Voter

PETITION SIGNERS

NOTE: This petition may be signed by qualified persons even though they may not know their property description or precinct number.

SIGNATURE	PRINTED NAME	I AM A: *			PROPERTY ADDRESS	PROPERTY DESCRIPTION			
		PO	RV	OV		LOT #	¼ SEC	T	R
Matt Wi	Matthew Wingard		X		6855 SW Wilsonville Rd.	2100			

* PO =Property Owner
RV =Registered Voter

Appendix B

Preliminary Drainage Report

Stafford Meadows

City of Wilsonville, Oregon

February 9, 2018

Submitted to:
City of Wilsonville
29799 SW Town Center Loop East
Wilsonville, OR 97070

Prepared by:
Otak, Inc.
808 SW 3rd Ave, Suite 300
Portland, OR 97204

Otak Project No. 17868

Table of Contents

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Tables

Figures

Appendices

Introduction

The Stafford Meadows site is a proposed residential development located within the West Neighborhood of the Frog Pond Area Plan boundary. The 16.13 acre site is comprised of 4 separate properties (6651, 6855, 6875 and 7025 SW Boeckman Road) in unincorporated Clackamas County within the City of Wilsonville Urban Growth Boundary (UGB) (see Vicinity Map). The Stafford Meadows development will consist of 46 single-family residential dwellings as well as associated infrastructure improvements.

The purpose of this document is to outline compliance of the Stafford Meadows stormwater management system with the City of Wilsonville *Stormwater and Surface Water Design and Construction Standards (2015)* and the National Marine Fisheries Services (NMFS) *SLOPES V for Stormwater, Transportation or Utilities* (USACOE, 2014). Descriptions of the existing and proposed hydrologic conditions, as well as preliminary documentation showing the proposed onsite stormwater management system's compliance with City of Wilsonville and SLOPES V standards for water quality and quantity are included in this report.

Vicinity Map

Project Description

The Stafford Meadows proposed residential development consists of 46 new single-family lots, a new north-south collector roadway, as well as sidewalks, public roadway improvements, utilities, and a stormwater management system located north of SW Boeckman Road. Stormwater management will be included in these improvements in the form of water quality treatment and control. Additionally, a facet of this project will also provide additional right-of-way dedication for future frontage improvements on SW Boeckman Road.

Permitting

The following permit applications will be required for this project:

- City of Wilsonville Development Permit
- State removal/fill permit through DSL
- Section 401 water quality certification from DEQ

Project Size and Location

The 16.13 acre proposed project will be located on the following four properties: Township 3S, R1W, Section 12, Tax Lots 2001, 2100, 2201 and 2202. Zoning within the project limits is for large and medium lot single-family residential. A significant resource overlay zone (SROZ) runs north-south through the site along Willow Creek.

Existing Conditions

The existing project site slopes at about 3% toward Willow Creek which drains from north to south through the site. The project site is currently primarily agricultural land including a tree farm. The existing 1.17 acres of impervious area on the site consists of four homes, associated outbuildings, and driveways (see Figure 1).

This proposed project will discharge to Willow Creek, which joins Meridian Creek further downstream and ultimately drains to the Willamette River. Willow Creek is conveyed from the project site in an existing pair of 18-inch concrete culverts under SW Boeckman Road.

Proposed Conditions

Site improvements will include construction of approximately 6.68 acres of new impervious surfaces in the form of roof, roadway and sidewalk area. Stormwater facilities are proposed to be constructed in the planter areas between the streets and sidewalks to provide low impact development treatment and detention throughout the proposed residential development. A detention pond will be included in the open space adjacent to Willow Creek (see Figure 2). These facilities will provide water quality treatment and detention, and will be planted to City standards specific to each type of facility.

Twenty-eight feet along the property frontage (0.85 acres) will be dedicated as right of way (but remain undeveloped with this project) for the future widening of SW Boeckman Road.

Surrounding land use is projected to develop into mainly medium and small lot residential area. While the adjacent site will not be developed in the immediate future, the detention facility will be designed with the capacity to accommodate the projected future land uses north of the site (see Figure 3).

Hydrology

Rainfall Depth

The following rainfall depths listed in Table 1 are provided in the *City of Wilsonville Public Works Standards (2015)*. These depths correspond to design recurrence intervals which are used in hydrologic calculations for various aspects of stormwater management design.

Table 1 – 24-Hour Precipitation Depths

Recurrence Interval (Years)	Total Precipitation Depth (inches)
2	2.50
10	3.45
25	3.90
100	4.50

Pollutants of Concern

The pollutants of concern are those typically found in roadway runoff. These include sediment, oil and grease, polycyclic aromatic hydrocarbons (PAHs), metals such as Copper, Zinc, and Lead as well as pesticides and other nutrients (DEQ, 2016).

Table 2 lists each waterway affected by this project and DEQ listing status.

Table 2 – Pollutants of Concern

Waterway	Parameter	Listing Status
Willow Creek	N/A	None
Meridian Creek	N/A	None
Willamette River (Middle)	Chlorophyll a	303(d), TMDL needed
Willamette River (Middle)	E. Coli	TMDL approved
Willamette River (Middle)	Mercury	303(d), TMDL needed
Willamette River (Middle)	Temperature	TMDL approved

Wetlands

Wetlands exist along Willow Creek within the project site boundary and in the ditch that runs along the north side of SW Boeckman Road. The wetland will be impacted in the construction of Street C. A discussion of the impacts to sensitive areas will be included in the report by the environmental consultant, Anchor QEA.

Soils

The Web Soil Survey published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was referenced to determine the soil names, symbols, and hydrologic soil groups found on the project site. The USDA soil survey map and the corresponding hydrologic soil group (HSG) for the area of interest are provided in Appendix A.

The site and surrounding areas are comprised mainly of silt loams. Soil types identified within the project corridor were identified as primarily Aloha silt loam (1A and 1B). A portion of the area to the east of Willow Creek is identified to have Concord silt loam (21). These soils are classified as hydrologic soil type D in an undrained condition, which generally exhibit very slow infiltration rates when thoroughly wet. A geotechnical investigation was conducted to more accurately determine the site strata and infiltration rates. See Appendix A for the soils map and soils descriptions for the project and surrounding areas. The Geotechnical Memorandum for by Hardman Geotechnical Services is included in Appendix B. Observed infiltration rates at the site vary between 0.1 in/hr and 0.5 in/hr.

Flood Hazard

The proposed development for this site is located outside the 100-year floodplain boundary designated by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Clackamas County, Oregon, Incorporated Areas, Panel 243, June 17, 2008 and in non-printed Flood Map Boundary Area. See Appendix A for the FIRMette of the proposed site.

Methodology

The stormwater system for the Stafford Meadows Development will be modeled using the following methods and design standards:

- *Water Quality*: The City of Wilsonville requires capture and treatment of 80 percent of the average annual runoff (approximately 1-inch in 24 hours). SLOPES V guidelines require treatment of a volume equal to 50 percent of the rainfall produced by a 2-year, 24-hour storm. The City of Wilsonville BMP Sizing Tool was used to size minimum facility footprint areas to meet the water quality treatment standard.
- *Detention*: The City of Wilsonville has adopted a BMP Sizing Tool that was developed to aid in the design of detention and water quality low impact development facilities. This tool provides the necessary calculations to design a facility to meet City flow duration matching standards whereby the "*duration of peak flow rates from post development conditions shall be less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42% of the 2-year storm peak flow rate up to the 10-year peak flow rate*." SLOPES V requires flow duration and frequency matching for 50% of the 2-year

through the 10-year event. Therefore, the more conservative City standard will be implemented using the BMP Sizing Tool.

- *Conveyance*: The Santa Barbara Urban Hydrograph (SBUH) method in XP-SWMM software will be used to size the project conveyance system. The City's design event for conveyance is the 25-year, 24-hour storm, requiring 1-foot of freeboard between the hydraulic grade line and finished grade at structure rims.

BMP Sizing Tool Hydrology

The BMP Sizing Tool was created to aid in designing low impact development facilities for both treating stormwater runoff and detaining runoff by matching flow durations between target conditions and developed conditions. Both City standards and SLOPES V requirements consider target conditions to be pre-development, prior to any human settlement (forested, with respect to model input parameters). Proposed conditions were set to paved conditions for roof, roadway, and sidewalk and set to landscaped conditions for landscaped and other pervious areas within the project boundary.

Filtration planters and a detention pond function to provide both water quality and quantity mitigation. The BMP Sizing Tool provides minimum facility footprint areas for treatment and detention. The BMP Sizing Tool also provides the corresponding orifice sizes for incorporating the flow control component for detention facilities. It is Otak's understanding that by providing the footprint area and orifice calculated by the model and constructing facilities using the standard LID details adopted by the city, the facilities will meet City and SLOPES V requirements.

Drainage

The site drains to Willow Creek approximately 1.2 miles north of its discharge point at the Willamette River. Development will maintain current drainage patterns, utilizing new and existing storm pipe infrastructure to convey flows south to Willow Creek, which ultimately drains to the Willamette River. Otak has conducted a downstream impact analysis on the downstream storm conveyance system for the proposed Stafford Meadows development per City of Wilsonville standards. The downstream impact analysis is included in Appendix E.

Developed Conditions

Development of this site will include new roadway, single family lots, stormwater facilities, and landscaping. Adjacent properties are expected to remain intact until they are developed based on planned zoning. Planter and pond facilities are designed to treat and detain onsite runoff, which will minimize impacts to corresponding receiving waters. New outfalls will be located where new runs of pipe daylight at Willow Creek. Grading will be designed to direct offsite runoff around the project site to avoid trapping water at the project limits boundary.

Culvert Hydraulics

A proposed roadway will cross the existing drainage way. At this crossing, a proposed 36-inch culvert will be designed to safely pass the 100-year design storm flow. The design storm headwater elevation will not exceed 1.5 times the pipe diameter and the headwater will be at least one foot below the road subgrade. Culvert design calculations will be provided during final design.

Conveyance

Proposed development will include a piped conveyance network that will convey flows to Willow Creek. Pipes draining the project site to these locations will be designed to meet City of Wilsonville conveyance standards.

The Santa Barbara Urban Hydrograph (SBUH) method will be used to calculate runoff rates generated under proposed conditions for contributing areas. The *City of Wilsonville Public Works Standards (2015)* identifies the 25-year, 24-hour storm to be used for conveyance design, maintaining 1-foot of clearance between the hydraulic grade line and conveyance structure rim elevations. The City also requires an assessment of the 100-year storm event impacts to the proposed system. Flow rates during the 100-year may be conveyed overland, but shall not inundate existing structures. The stormwater conveyance network will be sized during final design.

Water Quality Treatment

Low Impact Development

The City of Wilsonville promotes the use of Low Impact Development (LID) approaches to meet water quality treatment standards. Locations of LID facilities for water quality treatment for the Stafford Meadows project site are shown on Figure 2.

Water Quality Facilities

Water quality treatment will be provided through filtration planters and a detention pond. The BMP Sizing Tool was used to calculate minimum facility sizes to satisfy water quality requirements. This tool does not calculate a water quality flow rate through the facility; however it was developed to design facilities that meet the City’s water quality design standards. By sizing a facility with the output parameters produced by the sizing tool, it is expected to be designed appropriately to meet water quality treatment criteria by both the City and SLOPES V standards. Facility sizing calculation reports from the BMP Sizing Tool are provided in Appendix C.

Water Quantity

City of Wilsonville Public Works Standards (2015) requires the use of flow attenuation when a proposed development increases impervious surface area by more than 5,000 square feet. Therefore, this project site will require detention mitigation prior to discharging site runoff to downstream receiving conveyances (open or closed channels or conduits). Per City requirements, the “post-development conditions shall be less than or equal to the duration of peak flow rates from pre-development conditions for all peak flows between 42% of the 2-year storm peak flow rate up to the 10-year peak flow rate.”

Flow control structures are proposed immediately downstream of filtration planters and detention pond, per the City's standard detail. Filtration planters and detention pond facilities provide detention using flow control structures with orifices at the end of corresponding underdrain pipes to backwater flows into the available storage within the facility soils and allow for a slow, calculated release of flows. Orifice sizes are provided for preliminary detention sizing purposes only; construction details of the flow control manholes will be provided during final design.

Operations and Maintenance

Vegetated and proprietary facilities will be maintained by the private development. Operations and Maintenance requirements are included in Appendix D in conjunction with corresponding standard details for each type of facility. The following representative will be responsible for ongoing maintenance of onsite facilities:

Dan Grimberg
503-641-7342

Conclusion

The proposed Stafford Meadows development will include a stormwater management system designed to follow the standards set forth by the City of Wilsonville and SLOPES V. The proposed development will create 6.68 acres of impervious area. Impervious areas will be treated through the use of LID facilities, including planters and a detention pond. Water quantity requirements will also be met using the planters and detention pond. The BMP Sizing Tool was used to calculate minimum facility sizes to satisfy water quality and water quantity requirements. By sizing a facility with the output parameters produced by the BMP sizing tool, it is expected to be designed appropriately to meet water quality treatment criteria by both the City and SLOPES V standards. The conveyance system will be sized during the final design phase to meet standards set by the City of Wilsonville.

References

City of Wilsonville, 2015. *City of Wilsonville Public Works Standards. Section 3, Stormwater & Surface Water Design and Construction Standards 2015*; Revised December 2015.

DEQ, 2016. *Section 401 Water Quality Certification*, State of Oregon Department of Environmental Quality, May 2016.

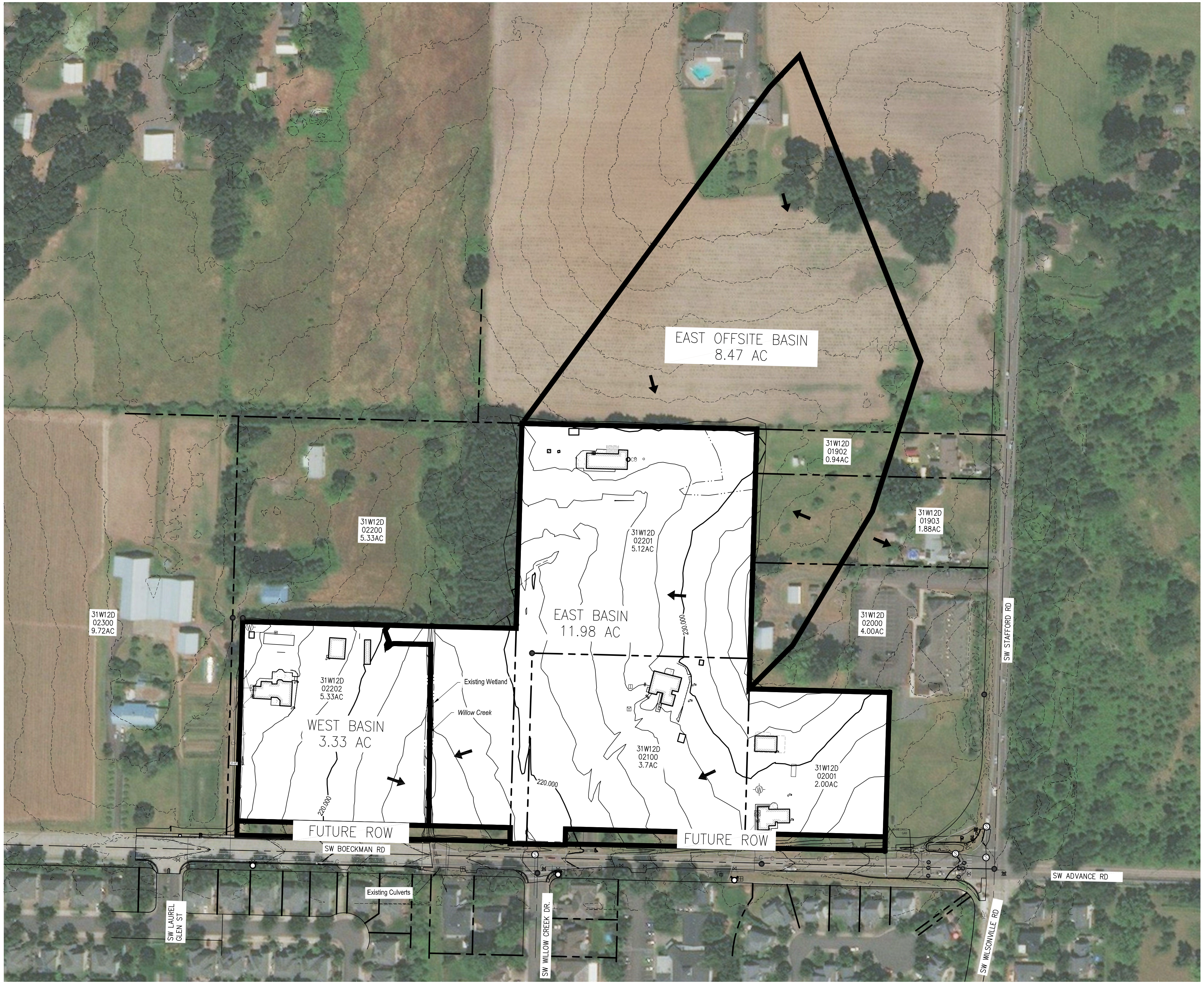
FEMA, 2017 . *FEMA Map Service Center*. <http://msc.fema.gov/> Accessed: October 20, 2017.

National Resource Conservation Services, 2016. *United States Department of Agriculture. Web Soil Survey*. <http://websoilsurvey.nrcs.usda.gov/> Accessed: October 12, 2016.

SCS, 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, United States Department of Agriculture Soil Conservation Service, June 1986.

USACE, 2014. *SLOPES V for Stormwater, Transportation or Utilities*, United States Army Corps of Engineers, March 14, 2014.

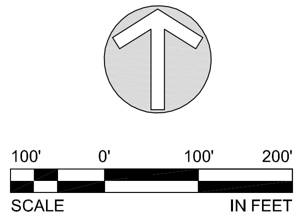
Figures



LEGEND

SITE

PROPERTY LINE	— — — —
PROJECT BOUNDARY	▬ ▬ ▬ ▬
EXISTING 10' CONTOUR	------ 230 ------
OVERHEAD LINE	—— OHL ——
COM. CABLE LINE	—— C ——
GAS LINE	—— G ——
WATER LINE	— W — W — W — W —
ELECTRIC LINE	—— P ——
SANITARY SEWER LINE	—— SS ——
WETLAND AREAS	— ·· — ·· — ·· —
CULVERT PIPE	==========
BASIN BOUNDARY	▬▬▬▬
FLOW ARROW	➔



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Portland, OR 97204
503. 287. 6825
www.otak.com

STAMP

WEST HILLS
LAND DEVELOPMENT

CONSULTANT

STAFFORD MEADOWS

LAND USE
WILSONVILLE, OREGON

EXISTING DRAINAGE CONDITIONS

TITLE

#	DATE	DESCRIPTION

REVISIONS

DRAWN BY CHECKED BY

LAND USE SUBMITTAL
STATUS

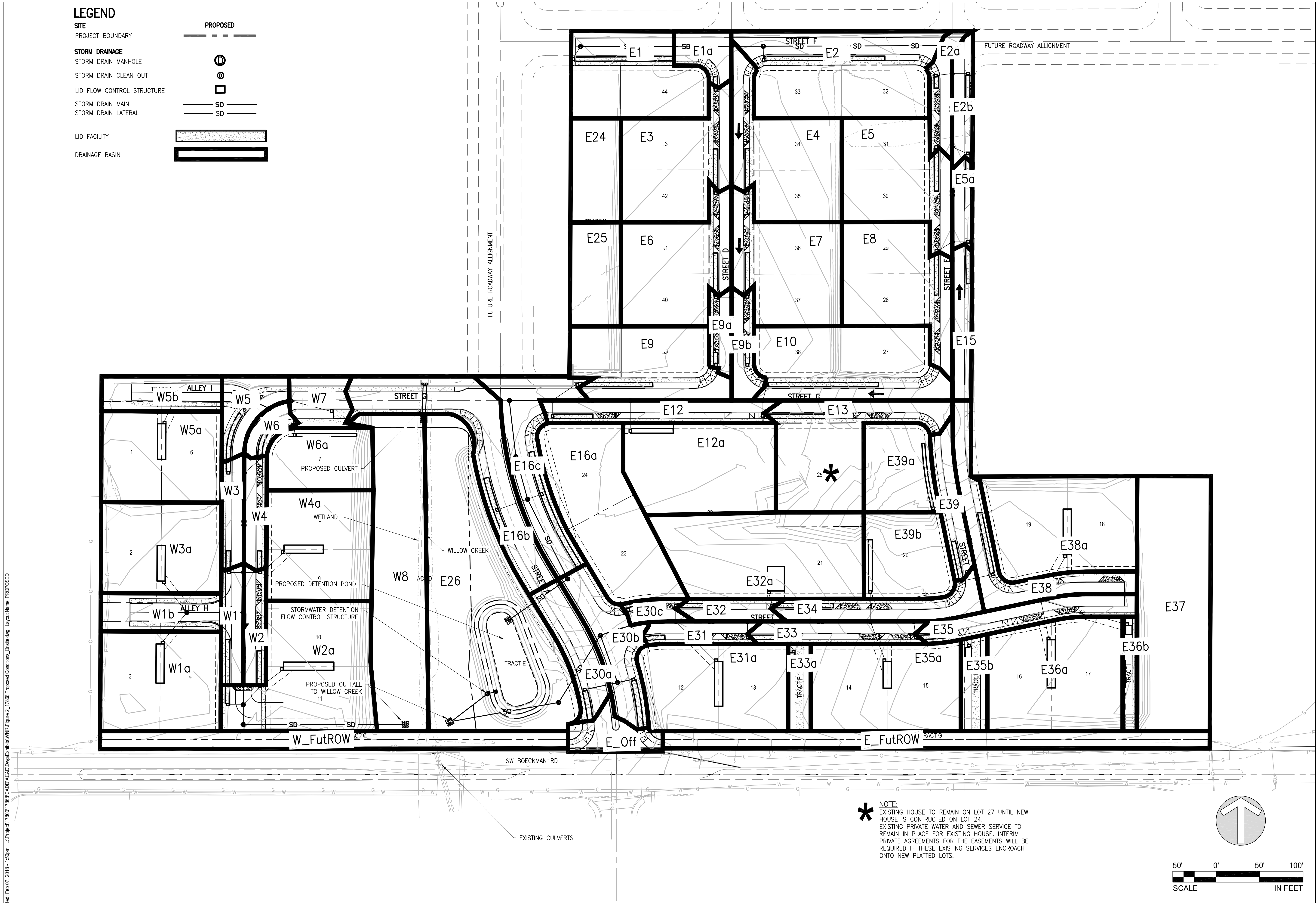
JANUARY 19, 2018
DATE

P17868
PROJECT NUMBER

FIG 1

If this drawing is not 22" x 34", it has been reduced/enlarged. Scale accordingly.

Plotted: Jan 23, 2018 - 1:52pm L:\Project\17800\17868\CADD\ACAD\Dwg\Exhibits\WNR\Figure 1_17868 Existing Conditions.dwg Layout Name: EXISTING



* NOTE:
EXISTING HOUSE TO REMAIN ON LOT 27 UNTIL NEW HOUSE IS CONTRUCTED ON LOT 24. EXISTING PRIVATE WATER AND SEWER SERVICE TO REMAIN IN PLACE FOR EXISTING HOUSE. INTERIM PRIVATE AGREEMENTS FOR THE EASEMENTS WILL BE REQUIRED IF THESE EXISTING SERVICES ENCROACH ONTO NEW PLATTED LOTS.

Plotted: Feb 07, 2018 - 1:50pm L:\Project\17800\17868\CADD\ACAD\Dwg\Exhibits\WNR\Figure 2_17868 Proposed Conditions_Onsite.dwg Layout Name: PROPOSED

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LAND DEVELOPMENT

CONSULTANT

STAFFORD MEADOWS

LAND USE
WILSONVILLE, OREGON

PROPOSED DRAINAGE CONDITIONS - ONSITE

TITLE

#	DATE	DESCRIPTION

REVISIONS

DRAWN BY
CHECKED BY

LAND USE SUBMITTAL
STATUS

JANUARY 19, 2018
DATE

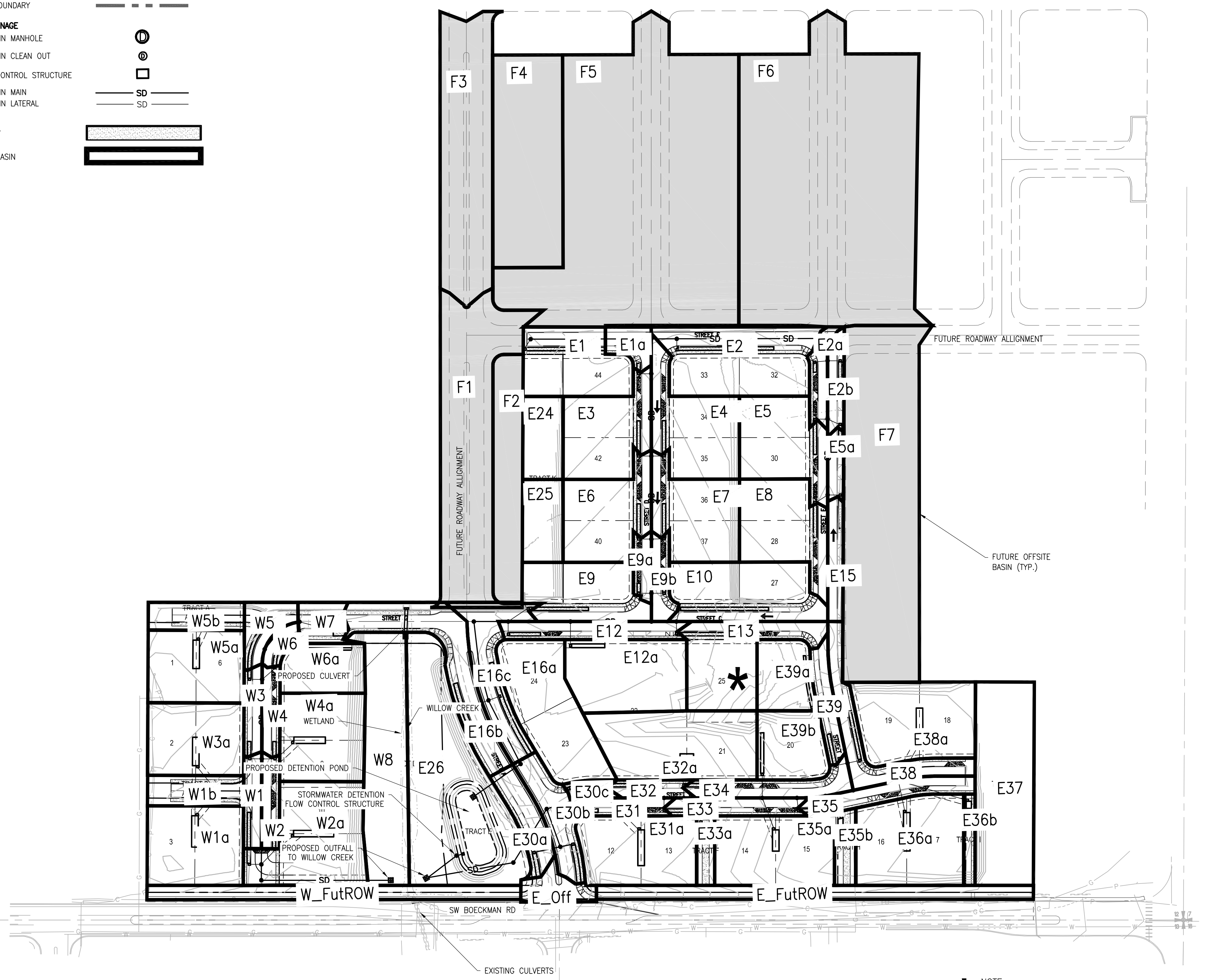
P17868
PROJECT NUMBER

FIG 2

If this drawing is not 22" x 34", it has been reduced/enlarged. Scale accordingly.

LEGEND

	PROPOSED
SITE	
PROJECT BOUNDARY	— — —
STORM DRAINAGE	
STORM DRAIN MANHOLE	Ⓓ
STORM DRAIN CLEAN OUT	ⓓ
LID FLOW CONTROL STRUCTURE	☐
STORM DRAIN MAIN	—— SD ——
STORM DRAIN LATERAL	—— SD ——
LID FACILITY	▨
DRAINAGE BASIN	▭



* NOTE:
EXISTING HOUSE TO REMAIN ON LOT 27 UNTIL NEW HOUSE IS CONTRUCTED ON LOT 24.
EXISTING PRIVATE WATER AND SEWER SERVICE TO REMAIN IN PLACE FOR EXISTING HOUSE. INTERIM PRIVATE AGREEMENTS FOR THE EASEMENTS WILL BE REQUIRED IF THESE EXISTING SERVICES ENCROACH ONTO NEW PLATTED LOTS.

80' 0' 80' 160'
SCALE IN FEET

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STAMP

WEST HILLS
LAND DEVELOPMENT

CONSULTANT

STAFFORD MEADOWS

LAND USE
WILSONVILLE, OREGON

PROPOSED DRAINAGE CONDITIONS - OFFSITE

TITLE

#	DATE	DESCRIPTION

REVISIONS

DRAWN BY
CHECKED BY

LAND USE SUBMITTAL
STATUS

JANUARY 19, 2018
DATE

P17868
PROJECT NUMBER

FIG 3

Plotted: Feb 07, 2018 - 1:52pm L:\Project\17800\17868\CADD\ACAD\Dwg\Exhibits\WNR\Figure 3_17868 Proposed Conditions_Offsite.dwg Layout Name: PROPOSED

Appendices

Appendix A — Hydrology

MAP SCALE 1" = 500'

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0234D

FIRM
FLOOD INSURANCE RATE MAP
CLACKAMAS COUNTY, OREGON
AND INCORPORATED AREAS

PANEL 234 OF 1175

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLACKAMAS COUNTY	415588	0234	D
WILSONVILLE, CITY OF	410025	0234	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
41005C0234D

EFFECTIVE DATE
JUNE 17, 2008

Federal Emergency Management Agency

Hydrologic Soil Group—Clackamas County Area, Oregon

Map Scale: 1:2,320 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- ⬜ Area of Interest (AOI)

Soils

Soil Rating Polygons

- 🟪 A
- 🟩 A/D
- 🟦 B
- 🟫 B/D
- 🟦 C
- 🟨 C/D
- 🟥 D
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- 🟪 A
- 🟩 A/D
- 🟦 B
- 🟫 B/D
- 🟦 C
- 🟨 C/D
- 🟥 D
- ⬜ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- 🟩 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 11, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2015—Sep 13, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	C/D	14.4	81.7%
1B	Aloha silt loam, 3 to 6 percent slopes	C/D	0.7	3.7%
21	Concord silt loam	C/D	2.6	14.6%
Totals for Area of Interest			**17.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Drainage Basin Areas

17868 Stafford Meadows

Existing Conditions:

		Impervious Area		Pervious Area		Total Area	
Basin Name	Drains to	Total (sf)	Total (ac)	Total (sf)	Total (ac)	(sf)	(ac)
West		20,065	0.46	124,796	2.86	144,861	3.33
East		30,685	0.70	490,946	11.27	521,631	11.98
East Offsite		0	0.00	369,114	8.47	369,114	8.47
Future ROW		0	0.00	521,631	11.98	32,943	0.76
TOTAL	-	**50,750**	**1.17**	**1,506,487**	**34.58**	**1,068,549**	**24.53**

Impervious Area per Lot	2,750	SF
Driveway approach per lot	156	SF

Proposed Conditions:

		Impervious Area					Pervious Area		Total Area	
Basin	Drains To (Manhole)	Sidewalk (sf)	Roadway (sf)	Roof (sf)	Total (sf)	Total (ac)	(sf)	(ac)	(sf)	(ac)
Site Total		40,036	113,731	137,050	290,817	6.68	416,729	9.57	702,291	16.12
West Total		6,455	18,766	32,902	58,123	1.33	102,803	2.36	160,926	3.69
W1		683	1,994	0	2,677	0.06	851	0.02	3,528	0.08
W1a		0	0	5,812	5,812	0.13	10,171	0.23	15,983	0.37
W1b		1,091	2,873	624	4,588	0.11	1,529	0.04	6,117	0.14
W2		678	1,974	312	2,964	0.07	547	0.01	3,511	0.08
W2a		532	1,321	5,500	7,353	0.17	13,855	0.32	21,208	0.49
W3		564	1,651	0	2,215	0.05	733	0.02	2,948	0.07
W3a		0	0	5,812	5,812	0.13	8,788	0.20	14,600	0.34
W4		654	1,849	312	2,815	0.06	538	0.01	3,353	0.08
W4a		0	0	5,500	5,500	0.13	10,379	0.24	15,879	0.36
W5		711	1,624	156	2,491	0.06	2,510	0.06	5,001	0.11
W5a		0	0	5,812	5,812	0.13	8,785	0.20	14,597	0.34
W5b		617	2,868	312	3,797	0.09	1,808	0.04	5,605	0.13

Basin	Drains To (Manhole)	Impervious Area					Pervious Area		Total Area	
		Sidewalk (sf)	Roadway (sf)	Roof (sf)	Total (sf)	Total (ac)	(sf)	(ac)	(sf)	(ac)
W6		306	1,153	0	1,459	0.03	607	0.01	2,066	0.05
W6a		0	0	2,750	2,750	0.06	5,575	0.13	8,325	0.19
W7		619	1,459	0	2,078	0.05	1,983	0.05	4,061	0.09
W8		0	0	0	0	0.00	23,123	0.53	23,123	0.53
W_FutROW		0	0	0	0	0.00	11,021	0.25	11,021	0.25
East Total		33,581	94,965	104,148	232,694	5.34	313,926	7.21	541,365	12.43
E1		596	2,397	2,750	5,743	0.13	8,611	0.20	14,354	0.33
E1a		489	1,997	0	2,486	0.06	736	0.02	3,222	0.07
E2		1,198	5,047	5,500	11,745	0.27	9,588	0.22	21,333	0.49
E2a		604	2,232	312	3,148	0.07	402	0.01	3,550	0.08
E2b		701	1,942	0	2,643	0.06	651	0.01	3,294	0.08
E3		576	1,764	5,812	8,152	0.19	7,147	0.16	15,299	0.35
E4		784	2,474	5,812	9,070	0.21	7,228	0.17	16,298	0.37
E5		578	1,697	5,812	8,087	0.19	7,124	0.16	15,211	0.35
E5a		517	1,404	0	1,921	0.04	343	0.01	2,264	0.05
E6		610	1,723	5,812	8,145	0.19	7,167	0.16	15,312	0.35
E7		586	1,720	5,812	8,118	0.19	7,149	0.16	15,267	0.35
E8		630	2,010	5,812	8,452	0.19	7,224	0.17	15,676	0.36
E9		912	2,825	2,750	6,487	0.15	7,660	0.18	14,147	0.32
E9a		450	1,417	0	1,867	0.04	558	0.01	2,425	0.06
E9b		771	2,211	0	2,982	0.07	557	0.01	3,539	0.08
E10		1,204	3,636	5,656	10,496	0.24	7,550	0.17	18,046	0.41
E12		1,415	3,872	468	5,755	0.13	1,081	0.02	6,836	0.16
E12a		0	0	5,500	5,500	0.13	12,384	0.28	17,884	0.41
E13		1,155	3,353	5,812	10,320	0.24	5,803	0.13	16,123	0.37
E15		858	2,555	0	3,413	0.08	519	0.01	3,932	0.09
E16a		0	0	5,812	5,812	0.13	13,923	0.32	19,735	0.45
E16b		2,812	8,481	0	11,293	0.26	2,893	0.07	14,186	0.33
E16c		1,628	6,727	0	8,355	0.19	2,398	0.06	10,753	0.25
E24		0	0	0	0	0.00	6,984	0.16	6,984	0.16
E25		0	0	0	0	0.00	7,044	0.16	7,044	0.16

		Impervious Area					Pervious Area		Total Area	
Basin	Drains To (Manhole)	Sidewalk (sf)	Roadway (sf)	Roof (sf)	Total (sf)	Total (ac)	(sf)	(ac)	(sf)	(ac)
E26		0	0	0	0	0.00	38,546	0.88	38,546	0.88
E30a		1,352	3,278	0	4,630	0.11	1,364	0.03	5,994	0.14
E30b		1,970	4,766	0	6,736	0.15	3,288	0.08	10,024	0.23
E30c		375	954	0	1,329	0.03	412	0.01	1,741	0.04
E31		627	1,813	312	2,752	0.06	479	0.01	3,231	0.07
E31a		0	0	5,500	5,500	0.13	11,302	0.26	16,802	0.39
E32		555	1,572	156	2,283	0.05	560	0.01	2,843	0.07
E32a		0	0	5,500	5,500	0.13	16,996	0.39	22,496	0.52
E33		969	2,803	312	4,084	0.09	961	0.02	5,045	0.12
E33a		1,005	0	0	1,005	0.02	1,608	0.04	2,613	0.06
E34		1,280	4,093	312	5,685	0.13	1,020	0.02	6,705	0.15
E35		1,460	3,447	312	5,219	0.12	1,322	0.03	6,541	0.15
E35a		0	0	5,500	5,500	0.13	12,000	0.28	17,500	0.40
E35b		1,091	0	0	1,091	0.03	2,246	0.05	3,337	0.08
E36a		0	0	5,500	5,500	0.13	14,141	0.32	19,641	0.45
E36b		660	0	0	660	0.02	1,482	0.03	2,142	0.05
E37		0	0	0	0	0.00	24,965	0.57	24,965	0.57
E38		1,512	5,911	312	7,735	0.18	2,201	0.05	9,936	0.23
E38a		0	0	5,500	5,500	0.13	13,936	0.32	19,436	0.45
E39		857	2,517	0	3,374	0.08	1,104	0.03	4,478	0.10
E39a		0	0	2,750	2,750	0.06	5,478	0.13	8,228	0.19
E39b		0	0	2,750	2,750	0.06	7,011	0.16	9,761	0.22
E_FutROW		0	0	0	0	0.00	17,887	0.41	12,632	0.29
E_Off		794	2,327	0	3,121	0.07	893	0.02	4,014	0.09
Future Basins		22,752	64,113	119,302	206,167	4.73	178,378	4.09	384,545	8.83
F1		5,748	19,500	936	26,184	0.60	11,577	0.27	37,761	0.87
F2		0	0	13,750	13,750	0.32	1,613	0.04	15,363	0.35
F3		4,159	17,100	936	22,195	0.51	8,769	0.20	30,964	0.71
F4		0	0	13,750	13,750	0.32	17,444	0.40	31,194	0.72
F5		6,156	11,794	31,810	49,760	1.14	59,080	1.36	108,840	2.50
F6		6,101	12,397	34,872	53,370	1.23	50,180	1.15	103,550	2.38

Basin	Drains To (Manhole)	Impervious Area					Pervious Area		Total Area	
		Sidewalk (sf)	Roadway (sf)	Roof (sf)	Total (sf)	Total (ac)	(sf)	(ac)	(sf)	(ac)
F7		588	3,322	23,248	27,158	0.62	29,715	0.68	56,873	1.31
TOTAL		**62,788**	**177,844**	**256,352**	**496,984**	**11.41**	**595,107**	**13.66**	**1,086,836**	**24.95**

Appendix B — Geotechnical Memorandum

HGSI | HARDMAN GEOTECHNICAL SERVICES INC.
Practical, Cost-Effective Geotechnical Solutions

November 17, 2017
Project No. 17-2248

Dan Grimberg / Miriam Wilson
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, Oregon 97210

Copy: Mike Peebles / Matt Klym / Rose Horton, Otak, Inc.

Via email (pdf format); hard copies provided on request

Subject: **Supplemental Infiltration Testing**
Frog Pond
Wilsonville, Clackamas County, Oregon

References:

1. *Geotechnical Engineering Report, Pike Property, 7025 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* Hardman Geotechnical Services Inc. (HGSI) report dated January 13, 2017.
2. *Geotechnical Engineering Report, Krielkamp Property, 6875 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* HGSI report dated October 26, 2016.
3. *Geotechnical Engineering Report, Wehler Property, 6855 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* HGSI report dated October 26, 2016.
4. *Geotechnical Engineering Report, Killinger Property, 6651 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* HGSI report dated February 2, 2017.

As requested, Hardman Geotechnical Services Inc. (HGSI) performed supplemental soil infiltration testing for the property currently referred to as “Frog Pond.” This property is an assemblage of separate properties that have had geotechnical reports prepared for them, as listed in the above References 1-4. Figure 1 shows the approximate extent of the original separate properties, and the overall project boundary. The previous report areas and geotechnical report dates are also shown on Figure 1, at the bottom.

The purpose of this supplemental work was to evaluate infiltration rates for subsurface disposal of storm water. We understand that design of the stormwater infiltration system is to be completed by others. Results of the infiltration testing are summarized below.

SITE AND PROJECT DESCRIPTION

The four properties comprising the site total about 16.2 acres based on information obtained from the Clackamas County GIS website. There is an existing home on each of the four properties, and numerous barns and outbuildings. The site is flat to gently sloping.

We understand the proposed development will consist of a residential subdivision with new streets, underground utilities, stormwater facilities and other appurtenant facilities. The site grading plan has not yet been completed; although we anticipate relatively short / high cuts and fills due to the relatively flat relief of the site.

Figure 1 shows preliminary locations of LIDA facilities that may be planned as part of the project. Based on conversations with the project design team, target infiltration depth of about 4 feet below ground surface (bgs) was selected for the infiltration testing, which is consistent with the bottom depth of LIDA structures and the stormwater swale planned in the central portion of the site (see Figure 1).

FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Previously, HGSI excavated multiple exploratory test pits on the various properties, as reported in References 1-4. Dynamic cone penetrometer (DCP) testing was also performed at various locations on the properties, to provide subgrade soil strength for pavement section design. To provide a more complete picture of subsurface conditions as they are presently characterized for the site, the logs of the previous explorations are attached to this report. For each of the four properties, the Site and Exploration Plan from the previous geotechnical reports (References 1-4) is attached, followed by the test pit logs from those previous reports.

For the current study, HGSI drilled six exploratory hand auger borings for infiltration testing to approximate depths of 4 feet bgs. The hand auger / infiltration test locations are designated IT-1 through IT-6. The test holes were drilled using hand auger tools, at the approximate locations shown on the attached site plan (Figure 1). Hand auger boring logs are attached to this report, immediately following Figure 1.

It should be noted that exploration locations were determined in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided and should therefore be considered approximate. During the exploration, HGSI observed and recorded pertinent soil information such as color, stratigraphy, strength, and soil moisture. Soils were classified in general accordance with the Unified Soil Classification System (USCS). At the completion of each infiltration test, the excavation was backfilled using the excavated soils, and tamped into place.

SOIL CONDITIONS

Results of the previous test pits, and the hand auger borings conducted for the current study, indicate the on-site soils to consist of topsoil, clayey silt, and clay, as described below.

> ***Topsoil –*** From the ground surface, all test pits and hand auger borings encountered 1.5 to 2 feet of topsoil, comprised of moist silt. The upper about 1 foot of the topsoil was highly organic.
>
> ***Gray Clay –*** Directly beneath the top soil in several of the test pits we encountered gray clay. The clay was encountered in IT-5 (Current Study); TP-2 (Pike Property); TP-5 and TP-6 (Krielkamp and Wehler Properties); and was not encountered at the Killinger Property. The clay ranged from medium stiff to stiff and dry to very moist. The clay was highly plastic and extended to roughly depths of about 2 to 3.5 feet bgs.
>
> ***Clayey Silt –*** Beneath the topsoil and clay (where encountered) in the test pits and hand auger borings, we encountered very stiff to hard, moist to dry, brown clayey silt with orange and gray mottling. All of the hand auger borings and test pits terminated in the clayey silt unit, at depths of about 4 feet bgs (hand auger borings), and 7 to 10 feet bgs (excavator test pits).

GROUNDWATER

During the field exploration, no static groundwater table was encountered in any of the explorations. Perched surface water / seepage was encountered at shallow depths in several of the hand auger borings and test pits, as summarized on the following table.

Table 1. Summary of Perched Surface Water / Seepage in Explorations

Test Pit	Property / Former Study	Seepage Depth (feet bgs)	Date of Exploration (MM-DD-YY)
HA-6	Current	2	11-10-17
TP-1	Pike	7	12-28-16
TP-3	Pike	2	12-28-16
TP-4	Pike	2	12-28-16
TP-1	Krielkamp / Wehler	3	10-18-16
TP-3	Krielkamp / Wehler	3.5	10-18-16
TP-1	Killinger	3 and 7	01-27-17
TP-2	Killinger	3	01-27-17
TP-3	Killinger	3 and 6.5	01-27-17
TP-4	Killinger	3 and 8	01-27-17

Perched surface water or seepage was not encountered in any of the other explorations, at the time of exploration. Perched water conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. When using the above information it is important to take into account the time of year of the particular exploration. For example, the Killinger Property test pits were conducted during a period of historic, heavy rainfall last winter, while the Pike Property test pits were conducted at the end of the dry season in 2016.

It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. The groundwater conditions reported above are for the specific date and locations indicated, and therefore may not necessarily be indicative of other times and/or locations.

INFILTRATION TESTING

Soil infiltration testing was performed using the open hole, falling head method in hand auger borings IT-1 through IT-7, on November 9 and 10, 2017. Soils in the boring were pre-saturated overnight, a minimum of 12 hours prior to testing. Following the soil saturation, the infiltration test was conducted. The water level was measured to the nearest 0.1 inch from a fixed point. The change in water level was recorded at intervals for a total period of at least 2 hours. Table 2 presents the results of the falling head infiltration tests.

Table 2. Summary of Infiltration Test Results

Test Pit	Depth (feet bgs)	Soil Type	Infiltration Rate (in/hr)	Approx. Average Hydraulic Head Range (inches)
HA-1	4	Clayey Silt	**0.1**	15.5
HA-2	4	Clayey Silt	**0.15**	11.6
HA-3	4	Clayey Silt	**0.5**	9.5
HA-4	4	Clayey Silt	**0.5**	16.5
HA-5	4	Clayey Silt	**0.2**	17.5
HA-6	4	Clayey Silt	Not Tested – Perched Water	N/A

CONCLUSIONS AND RECOMMENDATIONS
INFILTRATION RATES AND STORMWATER SYSTEM DESIGN

Based on results of the soil infiltration testing, soils on site exhibit low infiltration rate where test holes did not encounter perched water. Infiltration rates ranged from 0.1 to 0.5 inches/hour as tabulated. We recommend shallow systems in the range of 2 to 5 feet bgs be designed using an infiltration rate of **<u>0.2 inches/hour</u>**. This is slightly less than the average test value of 0.29 inches/hour, but we feel 0.2 inches/hour is more representative of overall site conditions. Also, please note that the potential for infiltration of stormwater will be reduced during the wet season due to saturated soils / perched water conditions over much of the site. We do not believe the site is well suited for use of deeper infiltration facilities such as dry wells due to the very low-permeability site soils, and perched water conditions.

The designer should select an appropriate infiltration value based on our test results and the location of the proposed infiltration facility. The recommended infiltration rates do not incorporate a factor of safety. For the design infiltration rate, the system designer should incorporate an appropriate factor of safety against slowing of the rate over time due to biological and sediment clogging.

Infiltration test methods and procedures attempt to simulate the as-built conditions of the planned disposal system. However, due to natural variations in soil properties, actual infiltration rates may vary from the measured and/or recommended design rates. All systems should be constructed such that potential overflow is discharged in a controlled manner away from structures, and all systems should include an adequate factor of safety. Infiltration rates presented in this report should not be applied to inappropriate or complex hydrological models such as a closed basin without extensive further studies.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and his/her consultants for use in design of this project only. The conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HGSI should be notified for review of the recommendations of this report, and revision of such if necessary.

Within the limitations of scope, schedule and budget, HGSI executed these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

HARDMAN GEOTECHNICAL SERVICES INC.

64,422PE
SEPTEMBER 26, 2000
SCOTT L. HARDMAN

11-17-17

EXPIRES: 06-30-2019

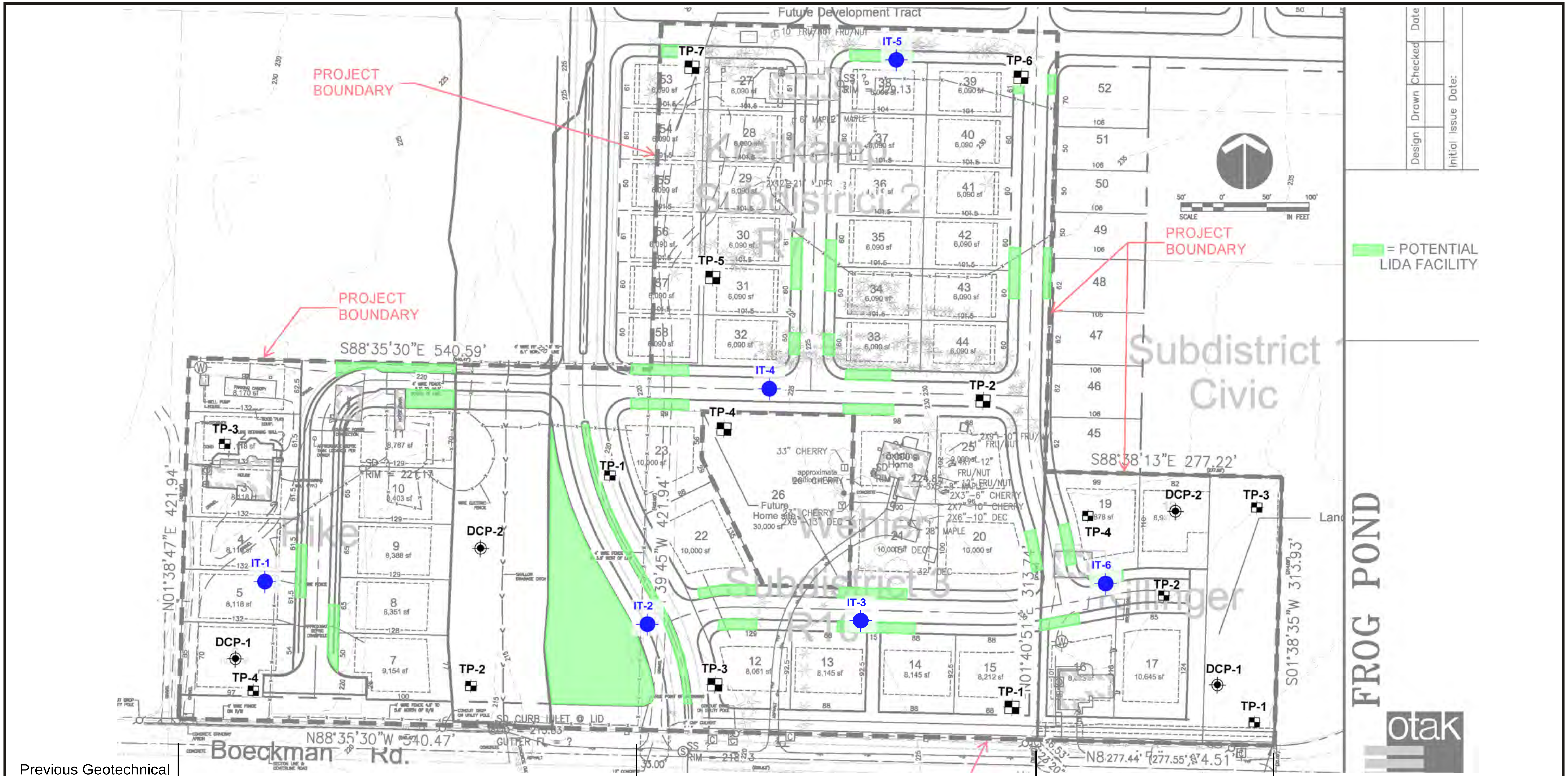
Scott L. Hardman, P.E., G.E.
Geotechnical Engineer

Attachments:	Figure 1 - Site and Exploration Plan
	Logs of Hand Auger Borings HA-1 through HA-6 (Current Study)
	Figure 2 and Previous Test Pit Logs, Pike Property (Reference 1)
	Figure 2 and Previous Test Pit Logs, Krielkamp and Wehler Properties (References 2 and 3)
	Figure 2 and Previous Test Pit Logs, Killinger Property (Reference 4)

HARDMAN GEOTECHNICAL SERVICES INC.
Practical, Cost-Effective Geotechnical Solutions

10110 SW Nimbus Avenue, Suite B-5
Portland, Oregon 97223
Tel: (503) 530-8076

EXPLORATION LOCATIONS



Previous Geotechnical Report Area:	Pike Property	Krielkamp & Wehler Properties	Killinger Property
HGSI Report Date:	January 13, 2017	October 26, 2016	February 2, 2017

LEGEND

TP-5 ▣ Previous Test Pit Location

DCP-2 ⊕ Previous Dynamic Cone Penetrometer (DCP) Test Location

IT-6 ● Infiltration Test (Hand Auger Boring) Approx. Location

Project No. 17-2248

Frog Pond
Wilsonville, Oregon

FIGURE 1

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 1

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1						
2						Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3						
4						Auger boring terminated at 4 feet No seepage encountered
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

HARDMAN GEOTECHNICAL SERVICES INC.
Practical Cost-Effective Geotechnical Solutions
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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11-10-17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2						Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
3						
4						
5						Auger boring terminated at 4 feet No seepage encountered
6						
7						
8						
9						
10						
11						
12						
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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11-10-17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 3

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2						Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
3						
4						
5						Auger boring terminated at 4 feet No seepage encountered
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11- 9 -17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 4

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1						
2						Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
3						
4						Auger boring terminated at 4 feet No seepage encountered
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 11- 9 -17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 5

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2						Medium stiff, Clay, gray, moist
3						Stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4						
5						Auger boring terminated at 4 feet No seepage encountered
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 11- 9 -17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 6

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1						
2					▽	Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3						
4						
5						Auger boring terminated at 4 feet Wet soils / seepage encountered at 2 feet
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1
Soil Sample Depth Interval and Designation

▽
Water Level at Time of Excavation

Date Excavated: 11-10-17

Logged By: EAH

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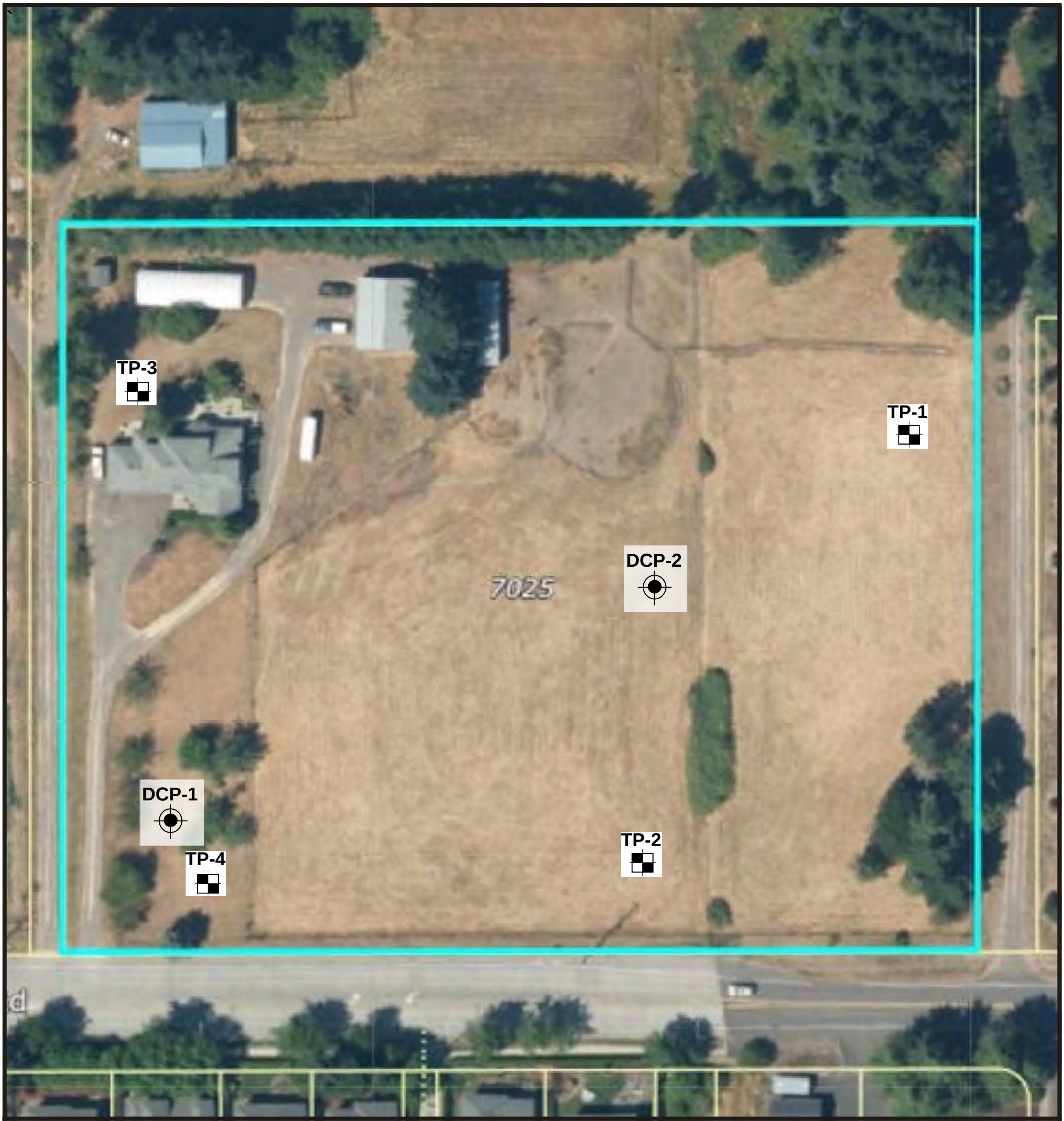
SITE AND EXPLORATION PLAN



Legend

TP-1 ▨ Test Pit Designation and Approximate Location

DCP-1 ⌖ DCP Test Designation and Approximate Location

Base map obtained from Portland Maps

Project: Pike Property Wilsonville, Oregon	Project No. 16-2151	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.0					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	3.5					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 7 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property Wilsonville, Oregon	Project No. 16-2151	Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.5					Medium stiff, Clay, gray, moist to slightly moist
2	1.5					
3	2.5					Stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
4	>4					
5						
6						
7						
						Test pit terminated at 7 feet due to hard soils No groundwater or seepage encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property Wilsonville, Oregon	Project No. 16-2151	Test Pit No. TP- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	**Material Description**
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.5					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						Test pit terminated at 8 feet due to hard soils Seepage encountered at 2 feet
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1	▽
Soil Sample Depth Interval and Designation	Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	2.5					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 9 feet due to hard soils Seepage encountered at 3 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

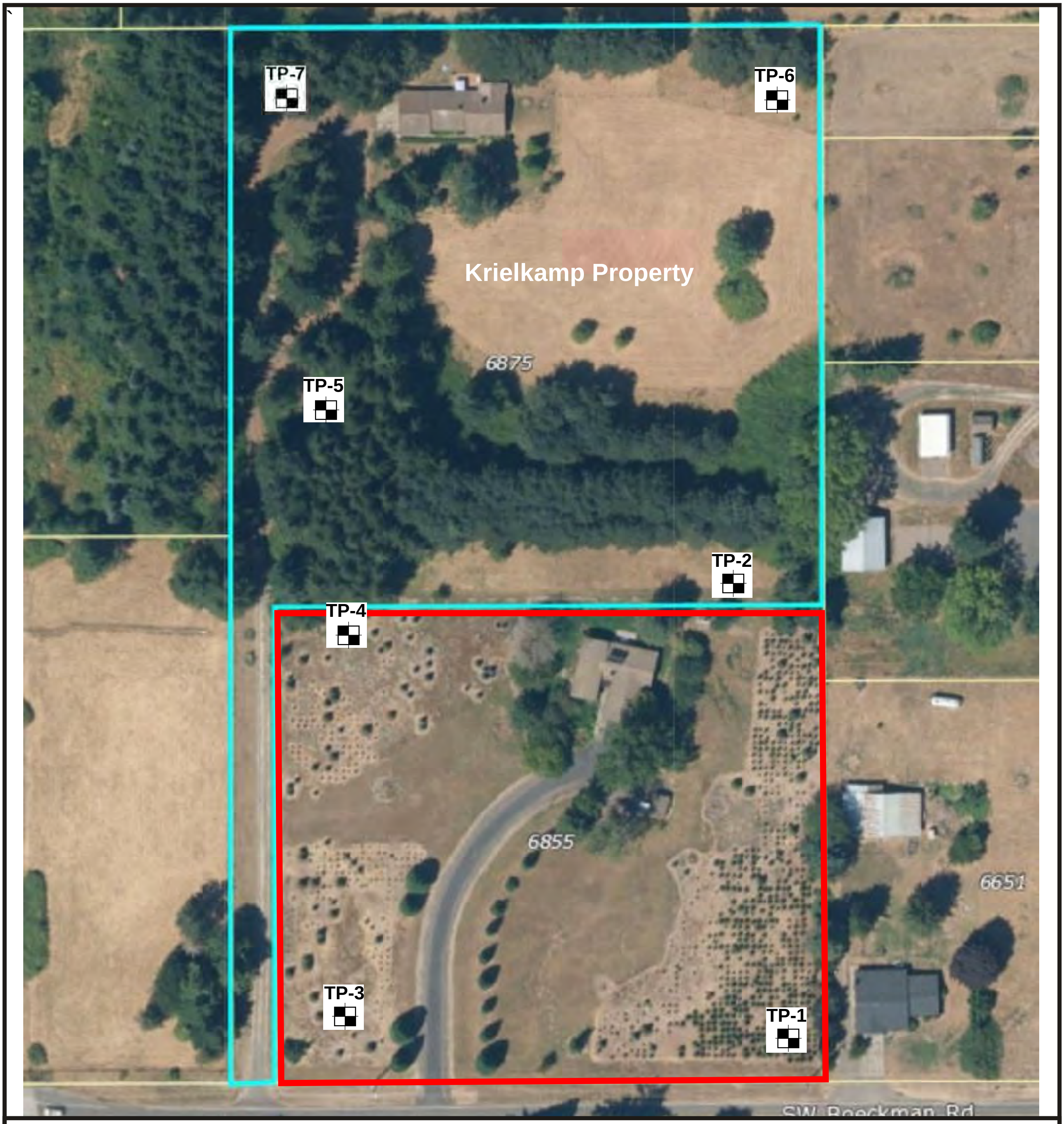
☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

SITE AND EXPLORATION PLAN



Legend

TP-7 ⊞ Test Pit Designation and Approximate Location

Base map obtained from www.portlandmaps.com

Project Krielkamp & Wehler Properties Wilsonville, Oregon	Project No. 16-2119	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet Slight seepage encountered at 3 feet
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	**Material Description**
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet No seepage or groundwater encountered
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1
Soil Sample Depth Interval and Designation

▽
Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP-3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet Slight seepage at 3.5 feet
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 5

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	1.0					
2	2.0					Stiff, Clay, gray, dry
3	3.5					
4	>4					Very stiff to hard, Clayey silt, brown with orange and gray mottling, dry
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP-6

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.0					
2	0.75					Medium stiff, Clay, gray, moist
3	1.5					
4	2.5					
5						Stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16
Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 7

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1	▽
Soil Sample Depth Interval and Designation	Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

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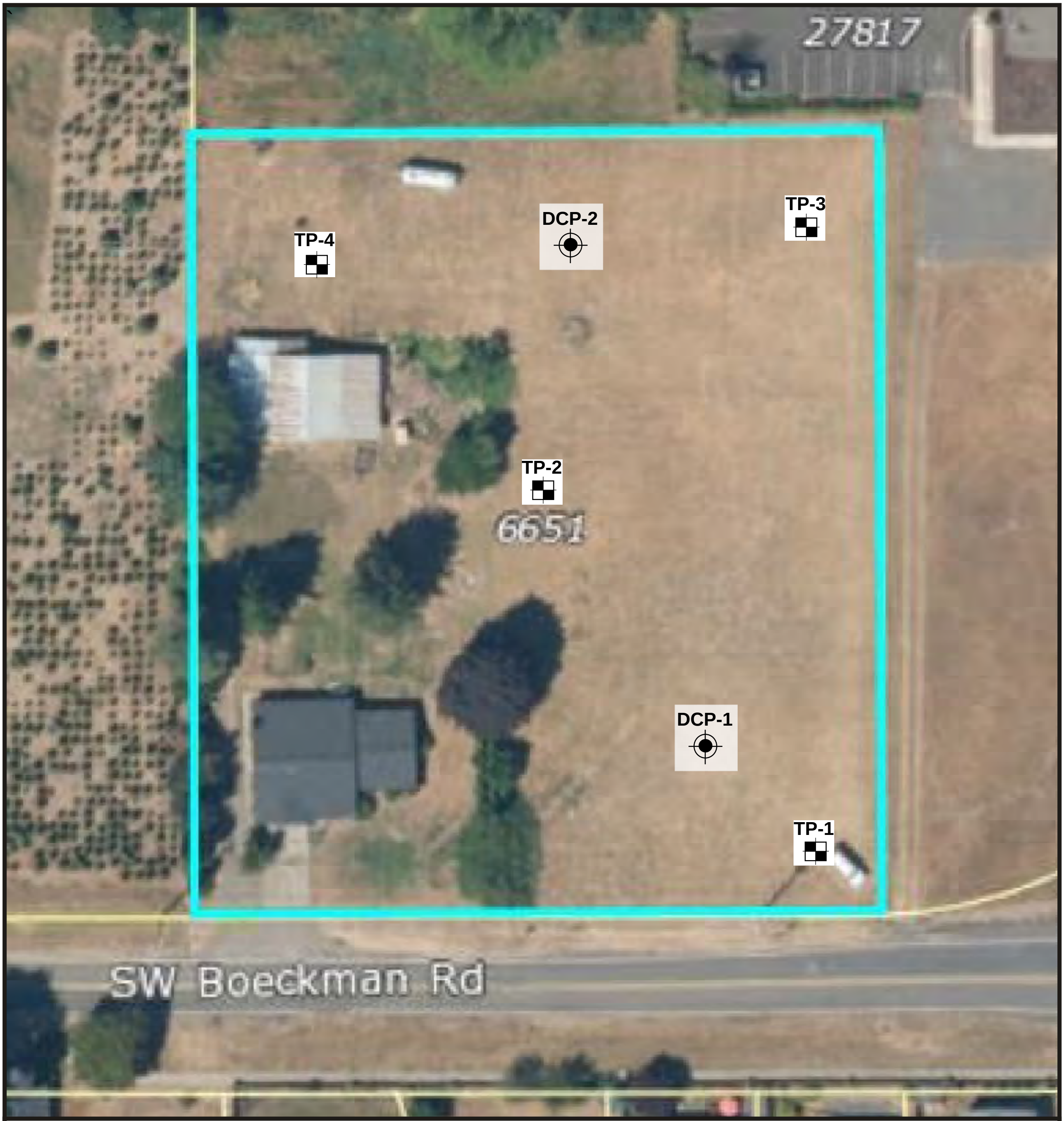
SITE AND EXPLORATION PLAN



Legend

TP-1 ⊞ Test Pit Designation and Approximate Location

DCP-1 ⊕ DCP Designation and Approximate Location

Base map provided by Portland Maps

Project: Killinger Property Wilsonville, Oregon	Project No. 16-2159	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	1.0					
2	4.0					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	>4					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 3 and 7 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.25					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						
10						
11						Test pit terminated at 10 feet Seepage encountered at 3 feet
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.25					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 3 and 6.5 feet
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	3.0					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	2.5					
4	4.0					
5						
6						
7						
8						
9						
10						
11						Test pit terminated at 10 feet Seepage encountered at 3 and 8 feet
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

Appendix C—BMP Sizing Tool Output

WES BMP Sizing Software Version 1.6.0.1, August 2015

WES BMP Sizing Report

Project Information

Project Name	Stafford Meadows East (1)
Project Type	Subdivision
Location	6800 Boeckman Rd
Stormwater Management Area	5275
Project Applicant	
Jurisdiction	CCSD1NCSA

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
E1 - impervious	9,417	Forested	ConventionalConcrete	D	E1
E1 - pervious	7,517	Forested	LandscapeDsoil	D	E1
E2 - impervious	14,989	Forested	ConventionalConcrete	D	E2
E2 - pervious	7,959	Forested	LandscapeDsoil	D	E2
E3 - impervious	8,150	Forested	ConventionalConcrete	D	E3
E3 - pervious	7,149	Forested	LandscapeDsoil	D	E3
E4 - impervious	9,068	Forested	ConventionalConcrete	D	E4
E4 - pervious	7,230	Forested	LandscapeDsoil	D	E4
E5 - impervious	8,085	Forested	ConventionalConcrete	D	E5
E5 - pervious	7,122	Forested	LandscapeDsoil	D	E5
E9b - impervious	2,982	Forested	ConventionalConcrete	D	E9b
E9b - pervious	557	Forested	LandscapeDsoil	D	E9b
E9a - pervious	558	Forested	LandscapeDsoil	D	E9a
E9a - impervious	1,867	Forested	ConventionalConcrete	D	E9a
E16a - impervious	5,812	Forested	ConventionalConcrete	D	E16a
E16a - pervious	13,922	Forested	LandscapeDsoil	D	E16a
E16b - impervious	11,293	Forested	ConventionalConcrete	D	E16b

E16b - pervious	2,893	Forested	LandscapeDsoil	D	E16b
E16c - impervious	8,355	Forested	LandscapeDsoil	D	E16a
E16c - pervious	2,396	Forested	LandscapeDsoil	D	E16a
E14 - impervious	9,107	Forested	ConventionalConcrete	D	E14
E14 - pervious	13,610	Forested	LandscapeDsoil	D	E14
E13 - impervious	10,318	Forested	ConventionalConcrete	D	E13
E13 - pervious	5,787	Forested	LandscapeDsoil	D	E13
E12 - impervious	5,752	Forested	ConventionalConcrete	D	E12
E12 - pervious	1,084	Forested	LandscapeDsoil	D	E12
E12a - impervious	5,500	Forested	ConventionalConcrete	D	E12a
E12a - pervious	12,384	Forested	LandscapeDsoil	D	E12a
E15 - impervious	3,413	Forested	ConventionalConcrete	D	E15
E15 - pervious	519	Forested	LandscapeDsoil	D	E15
E10 - impervious	11,492	Forested	ConventionalConcrete	D	E10
E10 - pervious	6,552	Forested	LandscapeDsoil	D	E10
E8 - impervious	8,450	Forested	ConventionalConcrete	D	E8
E8 - pervious	7,214	Forested	LandscapeDsoil	D	E8
E5a - impervious	4,827	Forested	ConventionalConcrete	D	E5a
E5a - pervious	5,603	Forested	LandscapeDsoil	D	E5a
E2b - impervious	6,051	Forested	ConventionalConcrete	D	E2b
E2b - pervious	2,919	Forested	LandscapeDsoil	D	E2b
E2a - impervious	3,148	Forested	ConventionalConcrete	D	E2a
E2a - pervious	402	Forested	LandscapeDsoil	D	E2a
E1a - impervious	3,652	Forested	ConventionalConcrete	D	E1a
E1a - pervious	264	Forested	LandscapeDsoil	D	E1a
E6 - impervious	8,143	Forested	ConventionalConcrete	D	E6
E6 - pervious	7,170	Forested	LandscapeDsoil	D	E6
E7 - impervious	8,116	Forested	ConventionalConcrete	D	E7
E7 - pervious	8,320	Forested	LandscapeDsoil	D	E7
E9 - impervious	9,859	Forested	ConventionalCo	D	E9

			ncrete		
E9 - pervious	6,133	Forested	LandscapeDsoil	D	E9
Future - impervious	203,167	Forested	ConventionalConcrete	D	Future
Future - pervious	178,378	Forested	LandscapeDsoil	D	Future

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
E1	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	440.4	513.0	1.4
E2	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	616.8	620.0	1.7
E3	WaterQuality	Stormwater Planter - Filtration	D1	197.3	222.0	0.6
E4	WaterQuality	Stormwater Planter - Filtration	D1	211.9	222.0	0.7
E5	WaterQuality	Stormwater Planter - Filtration	D1	196.1	222.0	0.6
E9b	WaterQuality	Stormwater Planter - Filtration	D1	50.6	53.5	0.3
E16b	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	399.5	405.0	1.3
E16a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	692.5	797.0	1.9
E14	WaterQuality	Stormwater Planter - Filtration	D1	279.5	465.0	0.8
E13	WaterQuality	Stormwater Planter - Filtration	D1	215.5	355.0	0.7
E12	WaterQuality	Stormwater Planter - Filtration	D1	97.7	240.0	0.4
E12a	WaterQuality	Stormwater Planter - Filtration	D1	212.5	256.0	0.7
E15	WaterQuality	Stormwater	D1	56.6	208.0	0.3

		Planter - Filtration				
E10	WaterQuality	Stormwater Planter - Filtration	D1	241.2	565.0	0.7
E8	WaterQuality	Stormwater Planter - Filtration	D1	202.5	222.0	0.6
E5a	WaterQuality	Stormwater Planter - Filtration	D1	131.2	154.0	0.5
E2b	WaterQuality	Stormwater Planter - Filtration	D1	121.4	121.5	0.5
E2a	WaterQuality	Stormwater Planter - Filtration	D1	51.4	56.0	0.3
E1a	WaterQuality	Stormwater Planter - Filtration	D1	57.6	58.0	0.3
E6	WaterQuality	Stormwater Planter - Filtration	D1	197.4	222.0	0.6
E7	WaterQuality	Stormwater Planter - Filtration	D1	209.1	222.0	0.7
E9	WaterQuality	Stormwater Planter - Filtration	D1	212.3	380.0	0.7
E9a	WaterQuality	Stormwater Planter - Filtration	D1	33.9	54.0	0.3
Future	WaterQuality	Stormwater Planter - Filtration	D1	4,920.5	4,930.0	3.2

Pond Sizing Details

Pond ID	Design Criteria(1)	Facility Soil Type	Max Depth (ft)(2)	Top Area (sq-ft)	Side Slope (1:H)	Facility Vol. (cu-ft)(3)	Water Storage Vol. (cu-ft)(4)	Adequate Size?
Pond	FCWQT	D1	4.00	4,200.0	4	9,869.1	6,169.3	Yes

1. FCWQT = Flow control and water quality treatment, WQT = Water quality treatment only

2. Depth is measured from the bottom of the facility and includes the three feet of media (drain rock, separation layer and growing media).

3. Maximum volume of the facility. Includes the volume occupied by the media at the bottom of the facility.

4. Maximum water storage volume of the facility. Includes water storage in the three feet of soil media assuming a

40 percent porosity.

Simple Pond Geometry Configuration

Pond ID: Pond

Design: FlowControlAndTreatment

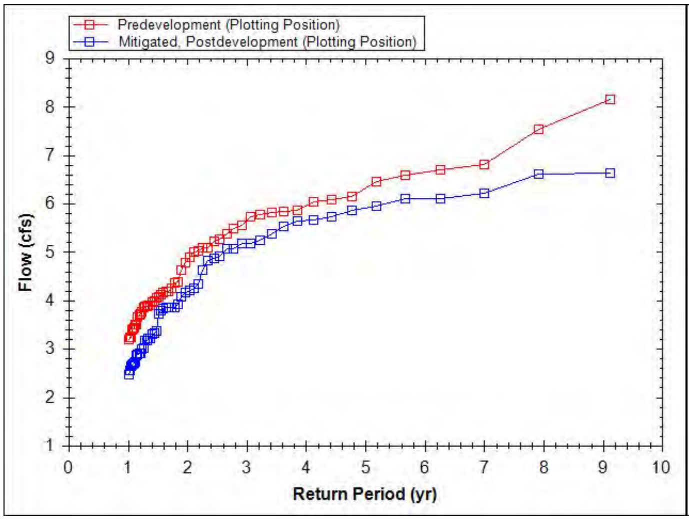
Shape Curve

Depth (ft)	Area (sq ft)
4.0	4,200.0

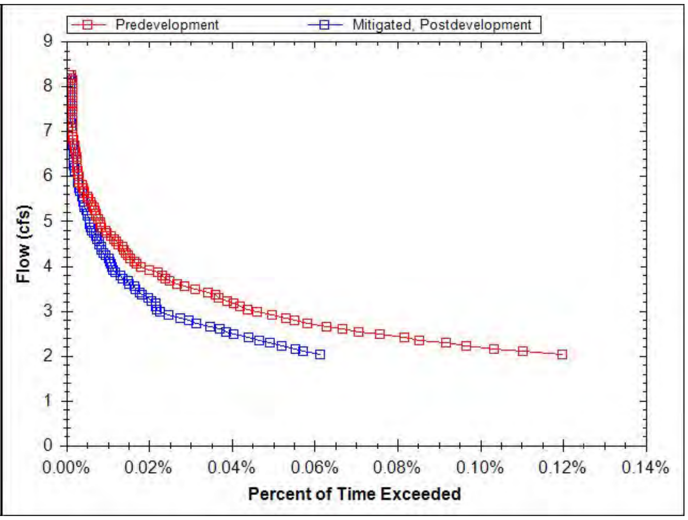
Outlet Structure Details

Lower Orifice Invert (ft)	0.0
Lower Orifice Dia (in)	6.2
Upper Orifice Invert(ft)	2.7
Upper Orifice Dia (in)	14.4
Overflow Weir Invert(ft)	3.0
Overflow Weir Length (ft)	6.3

Flow Frequency Chart



Flow Duration Chart



WES BMP Sizing Software Version 1.6.0.1, August 2015

WES BMP Sizing Report

Project Information

Project Name	Stafford Meadows East (2)
Project Type	Subdivision
Location	6800 Boeckman Rd
Stormwater Management Area	5275
Project Applicant	
Jurisdiction	CCSD1NCSA

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
E30a - impervious	4,630	Forested	ConventionalConcrete	D	E30a
E30a - pervious	1,364	Forested	LandscapeDsoil	D	E30a
E38 - impervious	7,735	Forested	ConventionalConcrete	D	E38
E38 - pervious	2,201	Forested	LandscapeDsoil	D	E38
E36a - impervious	5,500	Forested	ConventionalConcrete	D	E36a
E36a- pervious	14,141	Forested	LandscapeDsoil	D	E36a
E33 - impervious	4,084	Forested	ConventionalConcrete	D	E33
E33 - pervious	961	Forested	LandscapeDsoil	D	E33
E31 - impervious	2,752	Forested	ConventionalConcrete	D	E31
E31 - pervious	479	Forested	LandscapeDsoil	D	E31
E32 - impervious	2,283	Forested	ConventionalConcrete	D	E32
E32 - pervious	551	Forested	LandscapeDsoil	D	E32
E39 - impervious	3,606	Forested	ConventionalConcrete	D	E39
E39 - pervious	1,125	Forested	LandscapeDsoil	D	E39
E39a - impervious	2,750	Forested	ConventionalConcrete	D	E39a
E39a - pervious	5,478	Forested	LandscapeDsoil	D	E39a
E39b - impervious	2,750	Forested	ConventionalConcrete	D	E39b

E39b - pervious	7,011	Forested	LandscapeDsoil	D	E39b
E34 - pervious	1,020	Forested	LandscapeDsoil	D	E34
E34 - impervious	5,685	Forested	ConventionalConcrete	D	E34
E32a - pervious	16,996	Forested	LandscapeDsoil	D	E32a
E35 - impervious	5,219	Forested	ConventionalConcrete	D	E35
E35 - pervious	1,322	Forested	LandscapeDsoil	D	E35
E35a - impervious	550	Forested	ConventionalConcrete	D	E35a
E35a - pervious	12,000	Forested	LandscapeDsoil	D	E35a
E32a - impervious	5,500	Forested	Roofs	D	E32a
E31a - pervious	5,500	Forested	LandscapeDsoil	D	E31a
E31a- impervious	11,302	Forested	Roofs	D	E31a
E30c - impervious	1,329	Forested	Roofs	D	E30c
E30c - pervious	412	Forested	LandscapeDsoil	D	E30c
E35b - impervous	1,091	Forested	Roofs	D	E35b
E35b - pervious	2,246	Forested	LandscapeDsoil	D	E35b
E38a - impervious	5,500	Forested	Roofs	D	E38a
E38a- pervious	13,936	Forested	LandscapeDsoil	D	E38a
E30b - impervious	6,736	Forested	Roofs	D	E30b
E30b - pervious	3,288	Forested	LandscapeDsoil	D	E30b
E36b - impervious	660	Forested	Roofs	D	E36b
E36b - pervious	1,482	Forested	LandscapeDsoil	D	E36b
E33a - impervious	1,005	Forested	Roofs	D	E33a
E33a - pervious	1,608	Forested	LandscapeDsoil	D	E33a

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
E32a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	521.9	532.0	1.7
E30a	FlowControlAndTreatment	Stormwater Planter -	D1	167.5	188.0	0.9

		Filtration				
E30c	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	48.5	92.0	0.5
E38	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	278.3	320.0	1.1
E36a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	462.0	496.0	1.6
E33	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	142.7	152.0	0.8
E31	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	92.6	120.0	0.6
E32	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	80.1	170.0	0.6
E39	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	131.8	199.0	0.8
E39a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	197.5	216.0	1.0
E39b	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	229.7	232.0	1.1
E34	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	192.0	308.0	0.9
E35	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	184.3	193.0	0.9
E35a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	268.5	272.0	1.2
E35b	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	79.9	96.0	0.6
E31a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	454.6	458.0	1.4
E30b	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	271.1	305.0	1.1
E38a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	457.7	469.0	1.5

E36b	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	50.9	69.0	0.5
E33a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	63.9	71.0	0.6

Pond Sizing Details

1. FCWQT = Flow control and water quality treatment, WQT = Water quality treatment only

2. Depth is measured from the bottom of the facility and includes the three feet of media (drain rock, separation layer and growing media).

3. Maximum volume of the facility. Includes the volume occupied by the media at the bottom of the facility.

4. Maximum water storage volume of the facility. Includes water storage in the three feet of soil media assuming a 40 percent porosity.

WES BMP Sizing Software Version 1.6.0.1, August 2015

WES BMP Sizing Report

Project Information

Project Name	Stafford Meadows (West)
Project Type	Subdivision
Location	6800 SW Boeckman Rd
Stormwater Management Area	5275
Project Applicant	
Jurisdiction	CCSD1NCSA

Drainage Management Area

Name	Area (sq-ft)	Pre-Project Cover	Post-Project Cover	DMA Soil Type	BMP
W1 - impervious	2,677	Forested	ConventionalConcrete	D	W1
W1 - pervious	2,971	Forested	LandscapeDsoil	D	W1
W2 - impervious	2,964	Forested	ConventionalConcrete	D	W2
W2 - pervious	2,696	Forested	LandscapeDsoil	D	W2
W3 - impervious	2,215	Forested	ConventionalConcrete	D	W3
W3 - pervious	733	Forested	LandscapeDsoil	D	W3
W4 - impervious	2,815	Forested	ConventionalConcrete	D	W4
W4 - pervious	530	Forested	LandscapeDsoil	D	W4
W5 - pervious	2,510	Forested	LandscapeDsoil	D	W5
W2a - pervious	13,855	Forested	LandscapeDsoil	D	W2a
W2a - impervoius	7,353	Forested	Roofs	D	W2a
W1a - impervious	5,812	Forested	Roofs	D	W1a
W1a - pervious	10,717	Forested	LandscapeDsoil	D	W1a
W6 - impervious	1,459	Forested	ConventionalConcrete	D	W6
W6 - pervious	784	Forested	LandscapeDsoil	D	W6
W5 -impervious	2,491	Forested	ConventionalConcrete	D	W5
W6a - pervious	5,575	Forested	LandscapeDsoil	D	W6a
W6a -	2,750	Forested	Roofs	D	W6a

impervious					
W7 - impervious	2,078	Forested	ConventionalConcrete	D	W7
W7 - pervious	1,983	Forested	LandscapeDsoil	D	W7
W1b - impervous	4,588	Forested	Roofs	D	W1
W1b - pervious	1,529	Forested	LandscapeDsoil	D	W1
W4a - impervious	5,500	Forested	Roofs	D	W4a
W4a - pervious	10,379	Forested	LandscapeDsoil	D	W4a
W3a - pervious	8,788	Forested	LandscapeDsoil	D	W3a
W3a - impervious	5,812	Forested	Roofs	D	W3a
W5a - pervious	8,785	Forested	LandscapeDsoil	D	W5a
W5a - impervious	5,812	Forested	Roofs	D	W5a
W5b - pervious	1,808	Forested	LandscapeDsoil	D	W5
W5b - impervious	3,797	Forested	Roofs	D	W5

LID Facility Sizing Details

LID ID	Design Criteria	BMP Type	Facility Soil Type	Minimum Area (sq-ft)	Planned Areas (sq-ft)	Orifice Diameter (in)
W1	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	312.5	327.0	1.2
W2	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	145.5	173.0	0.8
W3	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	81.8	103.0	0.6
W4	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	95.6	103.0	0.6
W1a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	399.4	403.0	1.4
W2a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	511.5	519.0	1.6
W5	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	279.3	308.0	1.1
W6	FlowControlA	Stormwater	D1	60.2	127.0	0.5

	ndTreatment	Planter - Filtration				
W5a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	358.8	365.0	1.3
W7	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	104.0	193.0	0.7
W4a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	383.0	405.0	1.4
W3a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	358.9	365.0	1.3
W6a	FlowControlAndTreatment	Stormwater Planter - Filtration	D1	199.6	208.0	1.0

Pond Sizing Details

1. FCWQT = Flow control and water quality treatment, WQT = Water quality treatment only

2. Depth is measured from the bottom of the facility and includes the three feet of media (drain rock, separation layer and growing media).

3. Maximum volume of the facility. Includes the volume occupied by the media at the bottom of the facility.

4. Maximum water storage volume of the facility. Includes water storage in the three feet of soil media assuming a 40 percent porosity.

Appendix D—
Operations and Maintenance Plans

Stormwater Planters
Operations & Maintenance Plan

What to Look For	What to Do
Structural Components, including inlets and outlets/overflows, shall freely convey stormwater.	
Clogged inlets or outlets	-Remove sediment and debris from catch basins, trench drains and curb inlets and pipes to maintain at least 50% conveyance capacity at all times.
Cracked Drain Pipes	-Repair/seal cracks. Replace when repair is insufficient.
Check Dams	-Maintain 4 to 10 inch deep rock check dams at design intervals.
Vegetation	
Dead or strained vegetation	-Replant per original planting plan, or substitute from Appendix A. -Irrigate as needed. Mulch banks annually. DO NOT apply fertilizers, herbicides, or pesticides.
Tall Grass and Vegetation	-Cut back grass and prune overgrowth 1-2 times per year. Remove cuttings
Weeds	-Manually remove weeds. Remove all plant debris.
Growing/Filter Medium, including soil and gravels, shall sustain healthy plant cover and infiltrate within 72 hours.	
Gullies	-Fill, lightly compact, and plant vegetation to disperse flow.
Erosion	-Replace splash blocks or inlet gravel/rock.
Slope Slippage	-Stabilize 3:1 slopes/banks with plantings from Appendix A
Ponding	-Rake, till, or amend to restore infiltration rate.

Annual Maintenance Schedule:

Summer. Make any structural repairs. Improve filter medium as needed. Clear drain. Irrigate as needed.
Fall. Replant exposed soil and replace dead plants. Remove sediment and plant debris.
Winter. Monitor infiltration/flow-through rates. Clear inlets and outlets/overflows to maintain conveyance.
Spring. Remove sediment and plant debris. Replant exposed soil and replace dead plants. Mulch.
All seasons. Weed as necessary.

Maintenance Records: Record date, description, and contractor (if applicable) for all structural repairs, landscape maintenance, and facility cleanout activities. Keep work orders and invoices on file and make available upon request of the inspector.

Access: Maintain ingress/egress to design standards.

Infiltration/Flow Control: All facilities shall drain within 72 hours. Record time/date, weather, and site conditions when ponding occurs.

Pollution Prevention: All sites shall implement best management practices to prevent hazardous or solid wastes or excessive oil and sediment from contaminating stormwater. Contact ___________ for immediate assistance responding to spills. Record time/date, weather, and site conditions if site activities contaminate stormwater.

Vectors (Mosquitoes & Rodents): Stormwater facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Monitor standing water for small wiggling sticks perpendicular to the water's surface. Note holes/burrows in and around facilities. Call Clackamas County Vector Control for immediate assistance to eradicate vectors. Record time/date, weather, and site conditions when vector activity observed.

Stormwater Planter O & M Plan			CITY OF WILSONVILLE PUBLIC WORKS STANDARDS
DRAWING NUMBER: ST-6015	DRAWN BY: SR	SCALE: N.T.S.	
FILE NAME: ST-6015.DWG	APPROVED BY: NK	DATE: 10/8/14	

Rain Gardens
Operations & Maintenance Plan

What to Look For	What to Do
Structural Components, including inlets and outlets/overflows, shall freely convey stormwater.	
Clogged inlets or outlets	-Remove sediment and debris from catch basins, trench drains and curb inlets and pipes to maintain at least 50% conveyance capacity at all times.
Cracked Drain Pipes	-Repair/seal cracks. Replace when repair is insufficient.
Check Dams	-Maintain 4 to 10 inch deep rock check dams at design intervals.
Vegetation	
Dead or strained vegetation	-Replant per original planting plan, or substitute from Appendix A. -Irrigate as needed. Mulch banks annually. DO NOT apply fertilizers, herbicides, or pesticides.
Tall Grass and Vegetation	-Cut back grass and prune overgrowth 1-2 times per year. Remove cuttings
Weeds	-Manually remove weeds. Remove all plant debris.
Growing/Filter Medium, including soil and gravels, shall sustain healthy plant cover and infiltrate within 72 hours.	
Gullies	-Fill, lightly compact, and plant vegetation to disperse flow.
Erosion	-Replace splash blocks or inlet gravel/rock.
Slope Slippage	-Stabilize 3:1 slopes/banks with plantings from Appendix A
Ponding	-Rake, till, or amend to restore infiltration rate.

Annual Maintenance Schedule:

Summer. Make any structural repairs. Improve filter medium as needed. Clear drain. Irrigate as needed.
Fall. Replant exposed soil and replace dead plants. Remove sediment and plant debris.
Winter. Monitor infiltration/flow-through rates. Clear inlets and outlets/overflows to maintain conveyance.
Spring. Remove sediment and plant debris. Replant exposed soil and replace dead plants. Mulch.
All seasons. Weed as necessary.
Maintenance Records: Record date, description, and contractor (if applicable) for all structural repairs, landscape maintenance, and facility cleanout activities. Keep work orders and invoices on file and make available upon request of the inspector.
Access: Maintain ingress/egress to design standards.
Infiltration/Flow Control: All facilities shall drain within 72 hours. Record time/date, weather, and site conditions when ponding occurs.
Pollution Prevention: All sites shall implement best management practices to prevent hazardous or solid wastes or excessive oil and sediment from contaminating stormwater. Contact ___________ for immediate assistance responding to spills. Record time/date, weather, and site conditions if site activities contaminate stormwater.
Vectors (Mosquitoes & Rodents): Stormwater facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Monitor standing water for small wiggling sticks perpendicular to the water's surface. Note holes/burrows in and around facilities. Call Clackamas County Vector Control for immediate assistance to eradicate vectors. Record time/date, weather, and site conditions when vector activity observed.

Rain Garden O & M Plan			CITY OF WILSONVILLE PUBLIC WORKS STANDARDS
DRAWING NUMBER: ST-6030	DRAWN BY: SR	SCALE: N.T.S.	
FILE NAME: ST-6030.DWG	APPROVED BY: NK	DATE: 10/15/14	

This Detail Drawing may not be altered or changed in any manner except by the City Engineer. It is the responsibility of the user to acquire the most current version.

Detention Pond
Operations & Maintenance Plan

Detention Pond removes pollutants through several processes: sedimentation, filtration, and biological processes. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

What to Look For	What to Do
Structural Components, including inlets and outlets/overflows, shall freely convey stormwater.	
Clogged inlets or outlets	-Remove sediment and debris from catch basins, trench drains, curb inlets and pipes to maintain at least 50% conveyance capacity at all times.
Cracked Drain Pipes	-Repair/seal cracks. Replace when repair is insufficient.
Check Dams	-Maintain 4 - 10 inch deep rock check dams at design intervals.
Vegetation shall cover 90% of the facility.	
Dead or strained vegetation	-Replant per original planting plan, or substitute from Appendix A. -Irrigate as needed. Mulch banks annually. DO NOT apply fertilizers, herbicides, or pesticides.
Tall Grass and Vegetation	-Cut back grass and prune overgrowth 1-2 times per year. Remove cuttings.
Weeds	-Manually remove weeds. Remove all plant debris.
Growing/Filter Medium, including soil and gravels, shall sustain healthy plant cover and infiltrate within 72 hours.	
Gullies	-Fill, lightly compact, and plant vegetation to disperse flow.
Erosion	-Replace splash blocks or inlet gravel/rock.
Slope Sippage	-Stabilize 3:1 Slopes/banks with plantings from Appendix A
Ponding	-Rake, till, or amend to restore infiltration rate.

Annual Maintenance Schedule:

All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event.

Access: Maintain ingress/egress to design standards.

Infiltration/Flow Control: All facilities shall drain within 72 hours. Record time/date, weather, and site conditions when ponding occurs.

Pollution Prevention: All sites shall implement best management practices to prevent hazardous or solid wastes or excessive oil and sediment from contaminating stormwater. Contact ___________ for immediate assistance responding to spills. Record time/date, weather, and site conditions if site activities contaminate stormwater.

Vectors (Mosquitoes & Rodents): Stormwater facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Monitor standing water for small wiggling sticks perpendicular to the water's surface. Note holes/burrows in and around facilities. Call Clackamas County Vector Control for immediate assistance to eradicate vectors. Record time/date, weather, and site conditions when vector activity observed.

Detention Pond O & M Plan

DRAWING NUMBER: ST-6065
DRAWN BY: SR
SCALE: N.T.S.
FILE NAME: ST-6065.DWG
APPROVED BY: NK
DATE: 10/8/14

CITY OF
WILSONVILLE

PUBLIC WORKS STANDARDS

STORMWATER FACILITIES
OPERATIONS AND MAINTENANCE CHECKLIST

Problem	***Frequency***	***Trigger***	***Preferred Condition***
Sediment Accumulation in Treatment Area	*Monthly from November through April Annually Required*	*Sediment depth exceeds 3 inches*	*Sediment removed from vegetated treatment area: level side to side and drains freely toward outlet; no standing water within 24 hours of any major storm (1" in 24 hours)*
Erosion Scouring	*Monthly from November through April Annually Required*	*Monthly from November through April Annually Required*	*Repair ruts or bare areas by filling with topsoil during dry season; regreade and replant large bare areas.*
Standing Water	*Monthly from November through April and after any major storm (1 inch in 24 hours)*	*Standing water in the planter between storms that does not drain freely*	*Remove sediment or trash blockages; improve end to end grade so there is no standing water 24 hours after any major storm (1 inch in 24 hours)*
Flow not Distributed Evenly	*Monthly from November through April Annually Required*	*Flows unevenly distributed through planter width due to uneven or clogged flow spreader*	*Level the spreader and clean so that flows spread evenly over entire planter width*
Settlement/ Misalignment	*Annually Required*	*Failure of planters has created safety, function, or design problem*	*Planter replaced or repaired to design standards*
Constant Baseflow	*Monthly from November through April Annually Required*	*Small, continual flow of water through the planter even after weeks without rain; planter bottom has an eroded, muddy channel*	*Add a low-flow pea gravel drain the length of the planter or bypass the baseflow around the planter*
Vegetation	*Monthly from November through April Annually Required*	*Vegetation blocking more than 10% of the inlet pipe opening*	*No vegetation blocking the inlet pipe opening*
Poor Vegetation Coverage	*Monthly Annually Required*	*Grass or other vegetation is sparse, or bare in more than 10% of the planter area*	*Determine cause of poor growth and correct the condition; replant with plants (per Appendix A) as needed to meet facility standards*
Invasive Vegetation	*Monthly Annually Required*	*No invasive vegetation is planted or permitted to remain*	*no invasive vegetation present; remove excessive weeds. Control if complete eradication is not feasible*
Rodents	*Monthly Annually Required*	*Evidence of rodents or rodent damage*	*No rodents; functioning facility*
Insects	*Annually Required*	*Insects such as wasps and hornets that interfere with maintenance activities*	*Harmful Insects removed*
Trash and Debris	*Monthly and after any major storm (1 inch in 24 hours) Annually Required*	*Visual evidence of trash, debris or dumping*	*Trash and Debris removed from facility*
Contamination and Pollution	*Monthly from November through April Annually Required*	*Any evidence of oil, gasoline, contamination or other pollutants*	*No contaminants or pollutants present; coordinate removal/cleanup with local water quality response agency*
Obstructed Inlet/Outlet	*Monthly and after any major storm event (1 inch in 24 hours) Annually Required*	*Inlet/outlet areas clogged with sediment, vegetation or debris*	*Clear inlet and outlet; obstructions removed*
Excessive Shading	*Monthly from November through April Annually Required*	*Vegetation growth is poor because unlight does not reach planter*	*Trim over-hanging limbs and/or remove brushy vegetation as needed*
Vegetation	*Monthly from November through April Annually Required*	*Specified or approved grass grows so tall that if competes with shrubs and/or becomes a fire danger*	*String trim non-wetland grasses to 4 inch to 6 inch and remove clippings; protect woody vegetation*

Stormwater Facilities Operations & Maintenance Checklist

DRAWING NUMBER: ST-6115
DRAWN BY: SR
SCALE: N.T.S.
FILE NAME: ST-6115.DWG
APPROVED BY: NK
DATE: 10/3/14

CITY OF
WILSONVILLE
PUBLIC WORKS STANDARDS

Appendix E—
Downstream Analysis

Technical Memorandum

To: Mike Peebles, PE
Otak, Inc.

From: Mojy Rostaminia, PhD
Rose Horton, PE

Copies: File

Date: 1/16/2018

Subject: Downstream Impact Analysis
Stafford Meadows Development

Project No.: 17868

Introduction

Otak has conducted a downstream impact analysis on the downstream storm conveyance system for the proposed Stafford Meadows Development, per City of Wilsonville standards. This proposed development is located north of SW Boeckman Road, as shown on Figure 1.

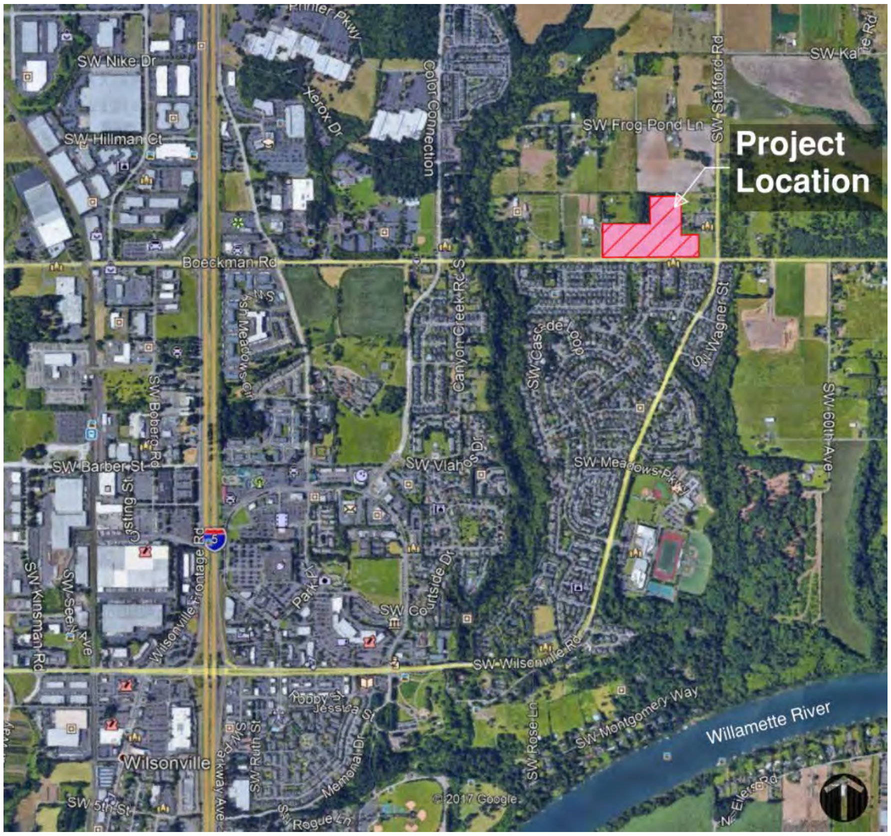


Figure 1 Vicinity map

The development will meet the City of Wilsonville Public Work Standards Section 301.4.04 which requires flow control from post-development conditions for peak flow rates generated by between 42% of the 2-year storm up to the 10-year storm.

In order to meet the requirements of City of Wilsonville Public Work Standards Section 301.5.01, a downstream analysis shall include:

- verifying that the downstream system has the capacity to convey the 25-year design storm
- extending the analysis downstream to a point in the drainage system where the proposed development site contributes 10% or less of the total tributary drainage flow or for one-quarter mile downstream of the approved point of discharge. The later was applied in this case.

Existing Conveyance System

The existing conveyance system used in this analysis is shown on Figure 2, which also includes drainage basin delineation, time of concentration (Tc) flow paths, and runoff node locations represented in the hydraulic model. Details of the downstream conveyance system used to create the hydraulic model were primarily obtained from City GIS as-built information, and field observation. The proposed Stafford Meadows development will discharge runoff into the existing Willow Creek channel running south through the site. The creek is conveyed south under SW Boeckman Road through a pair of 18" culverts and then runs in a grassed channel through a neighborhood. The channel is collected in a 36" diameter pipe that crosses under SW Willow Creek Drive where it is joined by runoff from the neighborhood. The combined flows then drain to a deep channel which outfalls to the Willamette River approximately one mile downstream of the end of this analysis.

The proposed development for this site is located above the 100-year floodplain delineated in the Flood Insurance Rate Map (FEMA, 2008) and in non-printed unmapped Flood Map Boundary Area. See Appendix B for the FIRMette corresponding to the proposed site.

Field Visit and Assessment

The project site is located in the headwaters of Willow Creek. The headwaters are currently in an agriculture condition. The proposed Stafford Meadows development is one of the first developments added per the Frog *Pond West Master Plan (*Wilsonville, 2017*)*. The basins downstream of SW Boeckman Road are developed single family residential areas and the channel is wide grassed and stable. Flow from the grassed channel is conveyed in a 36" storm pipe through the neighborhood and outfalls through a concrete box energy dissipater into a natural channel. Channel incision persists throughout this reach. Incision is occurring via upstream migration of multiple headcuts, measuring one to two-foot in height, through the fine grained soil. Riparian habitat was observed in sections above the active channel along the creek with high proportions of non-native, invasive plant species dominating the riparian community. In-stream wood is dispersed throughout the reach due to the scattering of riparian trees available for recruiting.

The stretch of channel downstream of the project site was visited on December 1st, 2017 after several days of wet weather. The field assessment started at the onsite drainage channel directly upstream of SW Boeckman Road and extended one quarter mile downstream through the section of channel adjacent to Willow Creek Park.

The purpose of the field visit was to observe and document existing channel conditions, road crossings, outfalls, and contributing waterways. Visual documentation of the drainage system along the channel is included in the Photo Log in Appendix A. The estimated downstream distances (in feet), referred to as Stations in this analysis, are referenced to Node 1 at station 0+00. The following section discusses the observations made through each of the reaches.

Table 1 identifies six nodes where drainage basins contribute to the creek. Existing and potential problems are highlighted. Field observations and references to photos are listed in the last column with the goal of emphasizing the more significant channel modifications caused by the existing flow rates.

Table 1: Downstream Impact Analysis - Drainage System Table

Station	**Drainage Component**	**Contributing Drainages** (See Figure 2 for referenced basins)	**Existing Problems**	**Potential Problems**	**Observations** (Referenced Photos are in Appendix B)
0+00 to 0+35	Node 1: Existing stream south of development and upstream of outfall.	**.Basin 1 and Site** Agricultural properties with homestead buildings north of Boeckman Road	None	None	Shallow natural channel and wetland located adjacent to Stafford Meadows property. The channel is in good condition without indicators of degradation. (**Photo 1)**
0+35 to 1+25	Existing pair of 18-inch dia, 80-ft long concrete culverts at SW Boeckman Road	—	None	None	Culvert inlets in **Photo 2**. Gravels accumulating at downstream end of culverts in **Photo 3**.
1+25 to 6+65	Grassed channel with brushy sides	**Basin 2** SW Boeckman Road runoff discharged to channel through culvert and rocked swale	None	None	Grassed channel with brushy banks. Channel typically 6-ft wide, 4H:1V side slopes. Banks vary 2-3' height. Blackberry dominates much of the riparian corridor in this reach. (**Photo 4)**
6+65 to 7+75	Grassed channel with maintained sides	—	None	None	Channel widens and vegetated side slopes steepen. 10.5-ft bottom width, banks 4-5-ft high. (**Photo 5)**
7+75 to 7+90	Upstream input from 18-inch, CCP	**Basin 3** Neighborhood west of channel managed with two upstream stormwater facilities	None	None	Accumulation of silt and leaves in culvert bottom reduces capacity. (**Photo 6)**
7+90 to 10+70	36-in dia, 295-ft long concrete culvert at SW Willow creek Drive with angle at manhole halfway	**Basin 4** Residential neighborhood located adjacent of channel	None	None	295-ft long, 36-in dia. CPP culvert under SW Willow Creek Dr (**Photo 7**). Accumulation of debris at upstream grate. Downstream end of culvert drops into grated concrete box (**Photo 8**) with 24-inch concrete outfall onto riprap (**Photo 9**). Approximately 3-ft of drop from culvert to channel.

Table 1: Downstream Impact Analysis - Drainage System Table

10+70 11+15	Natural channel	**Basin 5** Park area and channel	Incision	Incision	Slightly meandering, 8-ft wide fine grained channel (**Photo 10**). Incised vertical banks 2-ft high. Top of slope about 10-ft above channel bottom. Slopes heavily vegetated with blackberry, ferns and trees.
11+15 to 11+30	Natural channel	—	Incision	Incision	Channel narrows to 4-ft. A pair of 10-inch drops over 1-ft to 3-ft dia rocks. (**Photo 11**)
11+30 to 11+45	Natural channel	—	Incision	Incision	Channel narrows to 1-ft wide and 1-ft deep. Vertical right bank 5-ft high. Left bank vertical for 1-ft and then more gradual slope above. (**Photo 12**)
11+45 to 11+90	Natural channel	—	Incision	Incision	Channel widens to 6-ft width, left bank 18-inches high and right 4-ft high vertically. Large rocks in channel and large wood across. (**Photo 13**)
11+90 to 12+70	Natural channel	—	None	None	Channel narrows to 3-ft width, 1-ft drop. Left bank 4-ft high (steep) and right bank 3-ft high. Large rocks in channel with ferns established on banks at 3-ft each side. (**Photo 14**)
12+70 to 13+40	Natural channel	—	None	None	Channel about 2-ft bottom width. 2-ft drops spaced about every 20-ft and wood in channel. Side slopes 1:1. (**Photo 15**)
13+40 to 13+80	24-inch dia. CPP culvert outfall perched 3-ft above channel.	**Basin 6** Residential area west of the channel.			Perched culvert on right side (**Photo 16**).Channel width 4-ft. 2-ft drop in channel. Right bank near vertical for 10-ft and left 5-ft high with 6-ft wide bench with another 5-ft slope to top. (**Photo 17**)

Hydrology

Peak runoff rates from the drainage basins delineated in Figure 2, during existing and proposed conditions were calculated using XPSWMM V14. The Santa Barbara Urban Hydrograph (SBUH) method was used to apply the conveyance design event (25-year recurrence interval, 24-hour duration, NRCS Type 1A rainfall distribution), per Section 301.5.01. Time of Concentration values were calculated for each delineated drainage basin using TR-55 equations. Time of Concentration (Tc) flow paths are shown in Figure 2 and corresponding calculations for each drainage basin are included in Appendix B. A time of concentration of 5 minutes, the minimum allowable, was applied to developed impervious areas.

Most of the study area is comprised of silt loam categorized in the hydrologic soil group (HSG) D. HSG D soils generally exhibit very slow infiltration rates when thoroughly wet. A small upland area is categorized as HSG C with low to moderate infiltration, and a section of the channel is HSG B with moderate infiltration. A Curve Number (CN) of 98 was used for all impervious areas. The pervious areas were open space with good grass cover, thus a CN of 61 (HSG B), 74 (HSG C), or 80 (HSG D) was used as applicable.

The basins downstream of the proposed project site are developed residential areas. Impervious percentages were estimated based on existing impervious surfaces captured in 2007 aerial imagery. Basin 1 and the 15.3-acre proposed Stafford Meadows development are currently agricultural with few homes, outbuildings, and driveways. Per the *Frog Pond West Master Plan* (Wilsonville, 2017), Basin 1 is to be developed into primarily a mix of small, medium, and large lot single family homes. Based on a published Clackamas County Water and Environmental Services (WES) study of impervious surfaces (WES, 2005), impervious percentages for future land uses in Basin 1 were estimate and averaged for the basin (see Appendix B). The impervious percentage for the proposed site was calculated using the proposed site plan. The existing two-lane SW Boeckman Road, included in Basin 2, is anticipated to be widened to include bicycle lanes and sidewalks in the near future and this improvement is included the Basin1 Fully Developed scenario.

Table 2 summarizes the 25-year existing and developed peak flowrates in Willow Creek for proposed project conditions calculated in XP-SWMM. The stationing represents the 1,380 feet measured downstream from the starting point of the downstream impact analysis.

Table 2: Peak 25-Year Flowrates

Node	Station	Contributing Basin Area (ac)	Existing Flow Rate (cfs)	Proposed Flow Rate (cfs)	Basin 1 Fully Developed Flow Rate (cfs)
1	0+00	55.80	20.83	28.06	44.61
2	1+25	5.84	24.91	31.10	47.92
3	7+75	5.89	29.62	35.28	52.56
4	7+90	11.87	40.45	46.89	63.32
5	10+70	1.32	40.59	47.13	63.14
6	13+40	9.80	48.44	55.07	71.07

Downstream Conveyance Modeling Analysis

The stormwater conveyance network was analyzed in XP-SWMM. The conveyance system was modeled to determine whether the existing downstream system has sufficient capacity to support the Stafford Meadows development runoff undetained during the 25-year, 24-hour storm event. The pipe network reflects inverts from GIS As-built data. A Manning's n value of 0.013 was applied to the storm conveyance pipes in the network and a value of 0.035 was applied to the open channel reach of Willow Creek upstream of SW Willow Creek Drive. A value of 0.04 was applied to the channel and 0.08 was applied to the banks of the open channel reach of Willow

Creek downstream of SW Willow Creek Drive. A minimum of one-foot of freeboard between the hydraulic grade line (HGL) and the structure rim elevations was confirmed; therefore it is assumed that adequate capacity exists. Appendix C includes output information from the XP-SWMM model, summarizing the pipe network characteristics and results of the hydraulic routing during the design storm. The existing channel on the Stafford Meadows (XPSWMM Link 1) site is only about 1.5-ft in depth. The runoff generated by the Fully Developed Basin 1 will over top the existing channel banks and the downstream SW Boeckman Road.

Directly downstream of the project site a pair of 18-inch diameter culverts convey Willow Creek beneath SW Boeckman Road. These culverts are approximately 80 feet long and invert elevations were obtained through survey. The hydraulic capacity of these culverts, referred to as Culvert West and Culvert East, were modeled using HY-8 software. The peak flow rate entering the culverts is the 26.8 cfs from the upstream channel (XPSWMM Link 1) under proposed conditions. The results of the hydraulic calculations (see Appendix C) show that the existing culverts do not have adequate capacity to convey the 25-year flow rate without overtopping the existing roadway.

Conclusions

The downstream stormwater conveyance system analyzed as part of this downstream analysis extends from the proposed development approximately one quarter of a mile downstream to the open channel adjacent to Willow Creek Park. The system consists of both open channel and piped conveyance components. A site visit along the downstream reach provided a qualitative assessment of the storm conveyance system, and found no evidence of capacity restrictions under existing conditions. The storm sewer was modeled using XP-SWMM software, and shows adequate capacity for the proposed flows and that the onsite channel lacks capacity for Basin 1 Fully Buildout flow rates. The culverts beneath SW Boeckman Road were modeled using HY-8 software, and lack adequate capacity to convey the proposed undetained flows from the Stafford Meadows development.

The proposed development will need to detain high flows on site or increase the capacity at the crossing under SW Boeckman Road to meet City standards.

References

City of Wilsonville. *City of Wilsonville Public Works Standards. Section 3, Stormwater & Surface Water Design and Construction Standards*, City of Wilsonville, Revised December 2015.

FEMA, 2008. *Flood Insurance Rate Map (FIRM) for Clackamas County, Oregon, Incorporated Areas, Panel 243*, Federal Emergency Management Agency, June 17, 2008.

National Resource Conservation Services, United States Department of Agriculture. “Web Soil Survey.” <http://websoilsurvey.nrcs.usda.gov/> Accessed: December 14, 2017.

WES, 2005. *Results of evaluation and analysis of impervious surface and current and future land use types in CCSD#1 and the Damascus UGB expansion area*. Clackamas County Water Environment Services, July 2005

Wilsonville, 2017. *Frog Pond West Master Plan*, City of Wilsonville, July 17, 2017.

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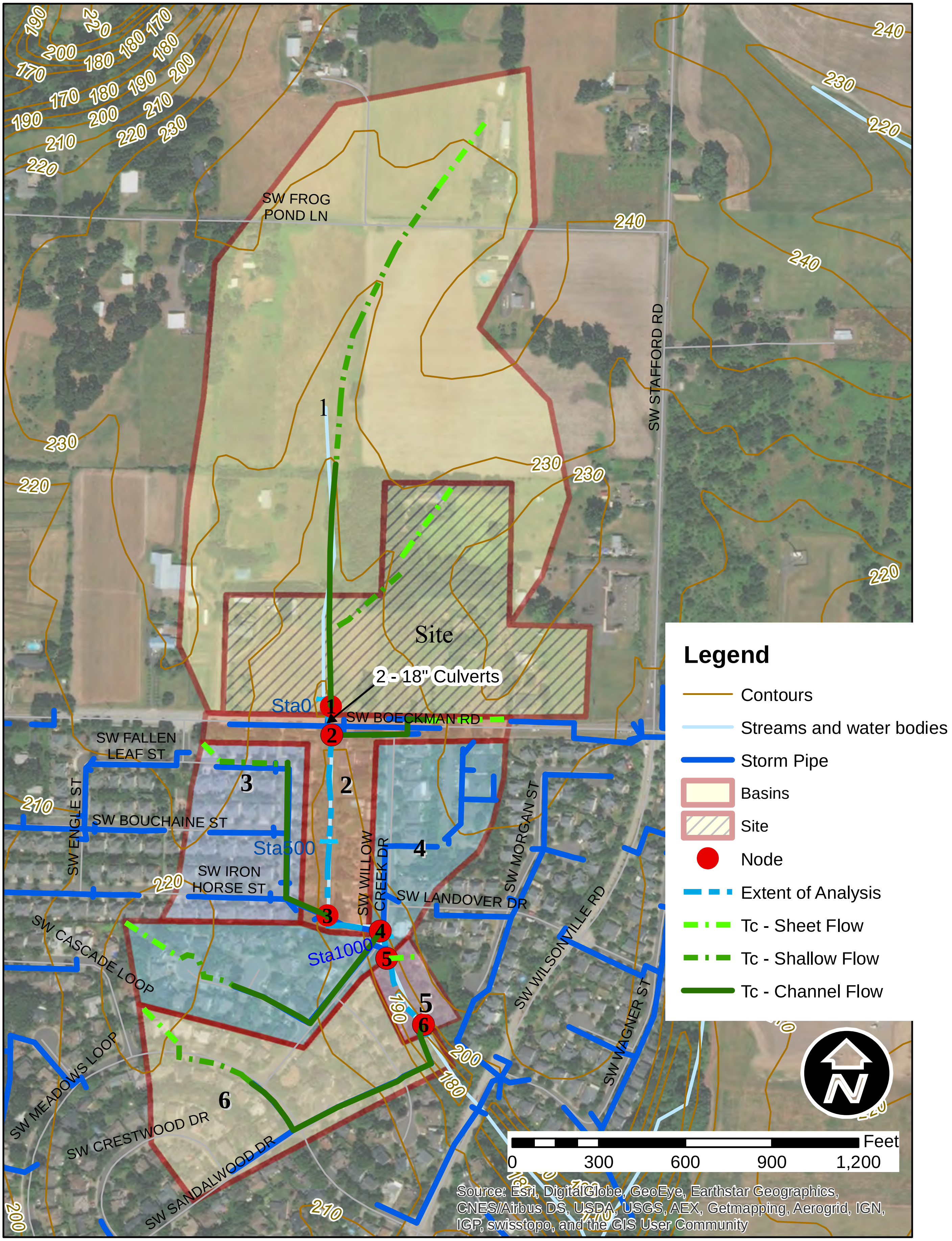
Figures



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FIGURE 2

Appendices

Appendix A — Photo Log

Downstream Analysis

Photo 1 Channel in ROW on Frog Property

Photo 2 Upstream Ends of Culverts

Photo 3 Downstream of culvert with gravel accumulation

Photo 4 Vegetated section of channel

Photo 5 Vegetated channel with taller banks and logs channeling flow

Photo 6 Partly submerged 18-inch CCP contributing culvert

Photo 7 36-inch culvert under SW Willow Creek Drive

Photo 8 36-inch Outfall into Concrete Box

Photo 9 24-inch Outfall from energy dissipation Concrete Box at outfall from 36-inch Pipe

Photo 10 Wide Incised Channel

Photo 11 Channel with Drops adjacent to rocks in the channel

Photo 12 Confined channel section

Photo 13 Widened channel with rock and large wood

Photo 14 Channel with steep and eroding banks, and rock in channel

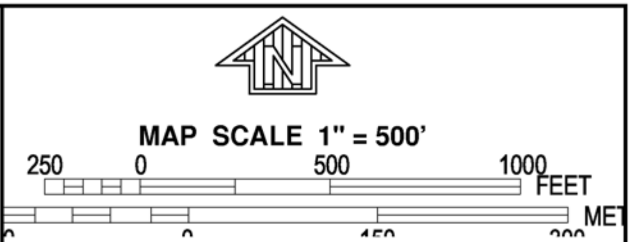
Photo 15 2-ft high drops in Channel

Photo 16 Perched Culvert on Right Bank

Photo 17 Channel at downstream extent of analysis

Appendix B — Hydrology

Site located in non-printed area



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0234D

FIRM
FLOOD INSURANCE RATE MAP
CLACKAMAS COUNTY, OREGON
AND INCORPORATED AREAS

PANEL 234 OF 1175

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CLACKAMAS COUNTY	415588	0234	D
WILSONVILLE, CITY OF	410025	0234	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
41005C0234D

EFFECTIVE DATE
JUNE 17, 2008

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Basin Areas
17868 Stafford Meadows Downstream Analysis

Existing Conditions

Basin	HSG	% HSG Type	Basin Area (ac)	Time of Concentration (Tc)	% Impervious	Total Impervious Area (ac)	Area HSG D (ac)	Area HSG C (ac)	Area HSG B (ac)	Total Pervious Area (ac)	Drains To Node
1	C/D	100	40.30	36.1	10	4.03	36.27	0.00	0.00	36.27	1
Site	C/D	100	15.30	33.4	8	1.17	14.13	0.00	0.00	14.13	1
2	C/D	100	5.84	5.0	45	2.63	3.21	0.00	0.00	3.21	2
3	C/D	100	5.89	12.2	60	3.53	2.36	0.00	0.00	2.36	3
4	C/D	100	11.87	5.0	60	7.12	4.75	0.00	0.00	4.75	4
5	C/D, B	41, 59	1.32	8.0	5	0.07	0.51	0.74	0.00	1.25	5
6	C/D, C, B	94, 3, 3	9.80	34.8	60	5.88	3.69	0.12	0.12	3.92	6

Proposed Conditions

Basin	HSG	% HSG Type	Basin Area (ac)	Time of Concentration (Tc)	% Impervious	Total Impervious Area (ac)	Area HSG D (ac)	Area HSG C (ac)	Area HSG B (ac)	Total Pervious Area (ac)	Drains To Node
1	C/D	100	40.30	36.1	10	4.03	36.27	0.00	0.00	36.27	1
Site_developed	C/D	100	15.30	5.0	44	6.70	8.60	0.00	0.00	8.60	1
2	C/D	100	5.84	5.0	45	2.63	3.21	0.00	0.00	3.21	2
3	C/D	100	5.89	12.2	60	3.53	2.36	0.00	0.00	2.36	3
4	C/D	100	11.87	5.0	60	7.12	4.75	0.00	0.00	4.75	4
5	C/D, B	41, 59	1.32	8.0	5	0.07	0.51	0.74	0.00	1.25	5
6	C/D, C, B	94, 3, 3	9.80	34.8	60	5.88	3.69	0.12	0.12	3.92	6

Basins 1 Fully Developed

Basin	HSG	% HSG Type	Basin Area (ac)	Time of Concentration (Tc)	% Impervious	Total Impervious Area (ac)	Area HSG D (ac)	Area HSG C (ac)	Area HSG B (ac)	Total Pervious Area (ac)	Drains To Node
1_developed	C/D	100	40.30	28.9	55	22.17	18.14	0.00	0.00	18.14	1
Site_developed	C/D	100	15.30	5.0	44	6.70	8.60	0.00	0.00	8.60	1
2_developed*	C/D	100	5.84	5.0	60	3.50	2.34	0.00	0.00	2.34	2
3	C/D	100	5.89	12.2	60	3.53	2.36	0.00	0.00	2.36	3
4	C/D	100	11.87	5.0	60	7.12	4.75	0.00	0.00	4.75	4
5	C/D, B	41, 59	1.32	8.0	5	0.07	0.51	0.74	0.00	1.25	5
6	C/D, C, B	94, 3, 3	9.80	34.8	60	5.88	3.69	0.12	0.12	3.92	6

*Includes widening of Boeckman Road

WES 2005 Memo Data

Description	Density (units/acre)	Impervious Area (%)
Ras-A Small Lot Single Family	10.45	53
Ras-B	9.57	58
school (ID-6)	NA	35
school (ID-29)	NA	16

Summary of Basin 1 Full Buildout Impervous % by Land Use

Description	Density (units/acre)	Impervious Area (%)	% of Basin
R-10 Large Lot Single Family	4.3	50*	4.9
R-7 Medium Lot Single Family	6.2	60*	57.9
R-5 Small Lot Single Family	8.7	60*	20.2
Public Facilities	NA	35	13.6
Civic	NA	35	0.6
SROZ	NA	0	2.8

*Values reflect an increase of 5% to account for future collector roads.

Time of Concentration Calculations

17868 Stafford Meadows Downstream Analysis

BASINS		**1**	**1 developed**	**Site**	**2**
SHEET FLOW					
INPUT					
Surface Description (from Table 3-1)		Short grass	Short grass	Short grass	Paved
Manning's Roughness Coefficient		0.15	0.15	0.15	0.011
Flow Length , L (<300 ft)	ft	295	295	300	268
2-Year, 24-Hour Rainfall, P_2	in	2.5	2.5	2.5	2.5
Land Slope, s	ft/ft	0.020	0.020	0.017	0.025
OUTPUT					
Travel Time	hr	0.44	0.44	0.48	0.05
SHALLOW CONCENTRATED FLOW					
INPUT					
Surface Description (paved or unpaved)		Unpaved		Unpaved	
Flow Length, L	ft	1039		491	
Watercourse Slope, s	ft/ft	0.017		0.018	
OUTPUT					
Average Velocity, V	ft/s	2.12		2.16	
Travel Time	hr	0.14		0.06	
CHANNEL FLOW					
INPUT					
Cross Sectional Flow Area, a	ft^2	3.14	3.14	25	4.71
Wetted Perimeter, p_w	ft	0.79	0.79	16.8	1.77
Channel Slope, s	ft/ft	0.006	0.012	0.011	0.017
Manning's Roughness Coefficient		0.035	0.035	0.035	0.035
Flow Length, L	ft	872	1911	325	373
OUTPUT					
Average Velocity, V	ft/s	8.09	11.72	5.84	10.79
Hydraulic Radius, $r = a/p_w$	ft	3.97	3.97	1.49	2.66
Travel Time	hr	0.030	0.045	0.015	0.010
Basin Time of Concentration, T_c	**hrs**	**0.60**	**0.48**	**0.56**	**0.06**
	min	**36.1**	**28.9**	**33.4**	**3.3** *

* Minimum Tc of 5 minutes applied to analysis.

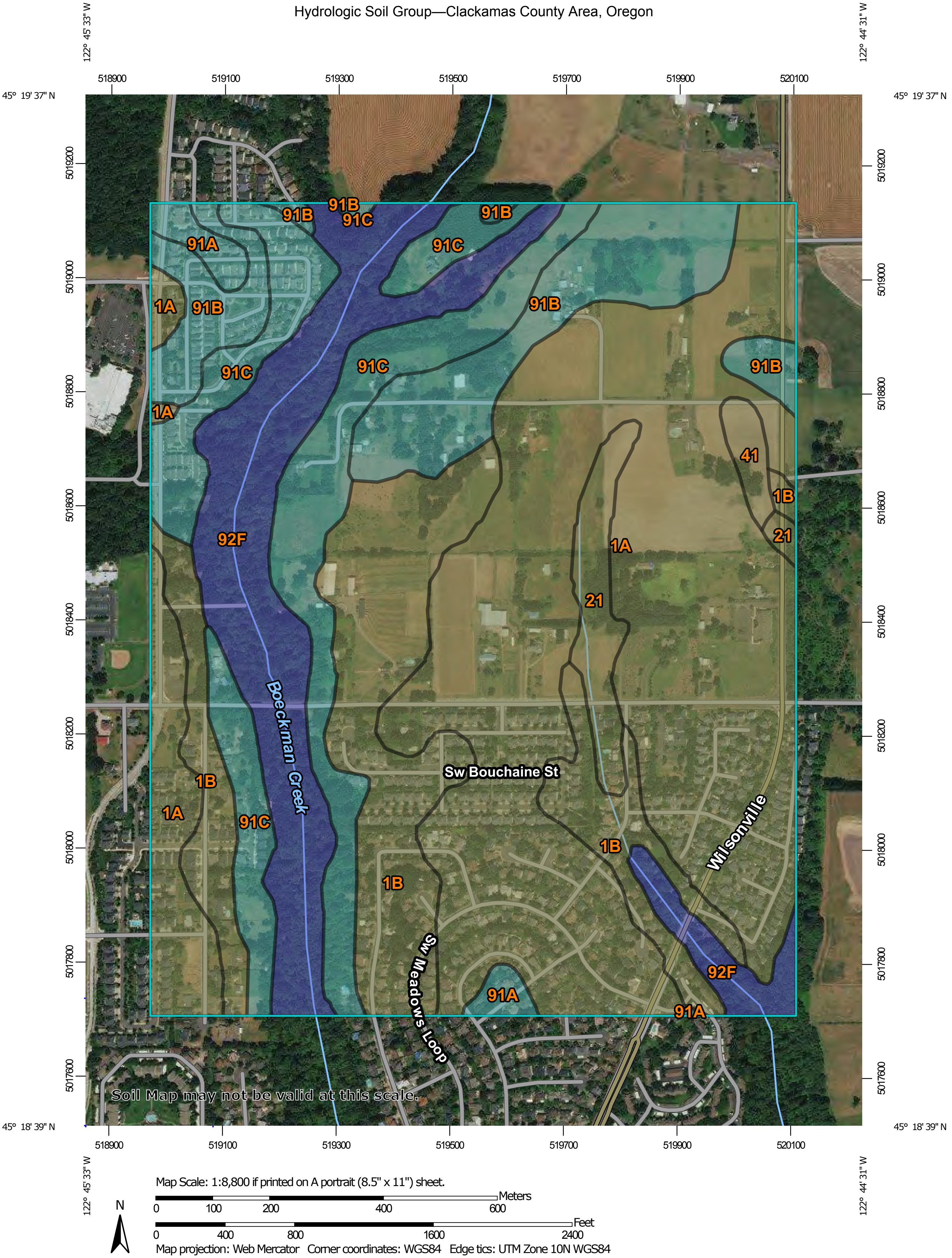
Time of Concentration Calculations

17868 Stafford Meadows Downstream Analysis

BASINS		**3**	**4**	**5**	**6**
SHEET FLOW					
INPUT					
Surface Description (from Table 3-1)		short grass	Short grass	Short grass	Short grass
Manning's Roughness Coefficient		0.15	0.15	0.15	0.15
Flow Length , L (<300 ft)	ft	82	228	125	175
2-Year, 24-Hour Rainfall, P_2	in	2.5	2.5	2.5	2.5
Land Slope, s	ft/ft	0.018	0.010	0.070	0.005
OUTPUT					
Travel Time	hr	0.16	0.48	0.13	0.52
SHALLOW CONCENTRATED FLOW					
INPUT					
Surface Description (paved or unpaved)		paved	paved		paved
Flow Length, L	ft	231	243		312
Watercourse Slope, s	ft/ft	0.011	0.029		0.013
OUTPUT					
Average Velocity, V	ft/s	2.16	3.45		2.33
Travel Time	hr	0.03	0.02		0.04
CHANNEL FLOW					
INPUT					
Cross Sectional Flow Area, a	ft^2	3.14	3.14		6.28
Wetted Perimeter, p_w	ft	0.79	0.79		3.14
Channel Slope, s	ft/ft	0.013	0.012		0.031
Manning's Roughness Coefficient		0.035	0.035		0.035
Flow Length, L	ft	471	700		885
OUTPUT					
Average Velocity, V	ft/s	12.26	11.77		11.85
Hydraulic Radius, r = a/p_w	ft	3.97	3.97		2.00
Travel Time	hr	0.011	0.017		0.021
Basin Time of Concentration, T_c	**hrs**	**0.20**	**0.04**	**0.13**	**0.58**
	min	**12.2**	**2.2** *	**8.0**	**34.8**

* Minimum Tc of 5 minutes applied to analysis.

Hydrologic Soil Group—Clackamas County Area, Oregon



Map Scale: 1:8,800 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- ▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

- 🟪 A
- 🟩 A/D
- 🟦 B
- 🟫 B/D
- 🟦 C
- 🟨 C/D
- 🟥 D
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- □ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- 🟩 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clackamas County Area, Oregon
Survey Area Data: Version 12, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2015—Sep 13, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1A	Aloha silt loam, 0 to 3 percent slopes	C/D	169.0	42.0%
1B	Aloha silt loam, 3 to 6 percent slopes	C/D	64.8	16.1%
21	Concord silt loam	C/D	10.5	2.6%
41	Huberly silt loam	C/D	3.0	0.7%
91A	Woodburn silt loam, 0 to 3 percent slopes	C	5.0	1.3%
91B	Woodburn silt loam, 3 to 8 percent slopes	C	38.6	9.6%
91C	Woodburn silt loam, 8 to 15 percent slopes	C	55.0	13.7%
92F	Xerochrepts and Haploxerolls, very steep	B	55.9	13.9%
Totals for Area of Interest			**401.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61 ←	74 ←	80 ←
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98 ←	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

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[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

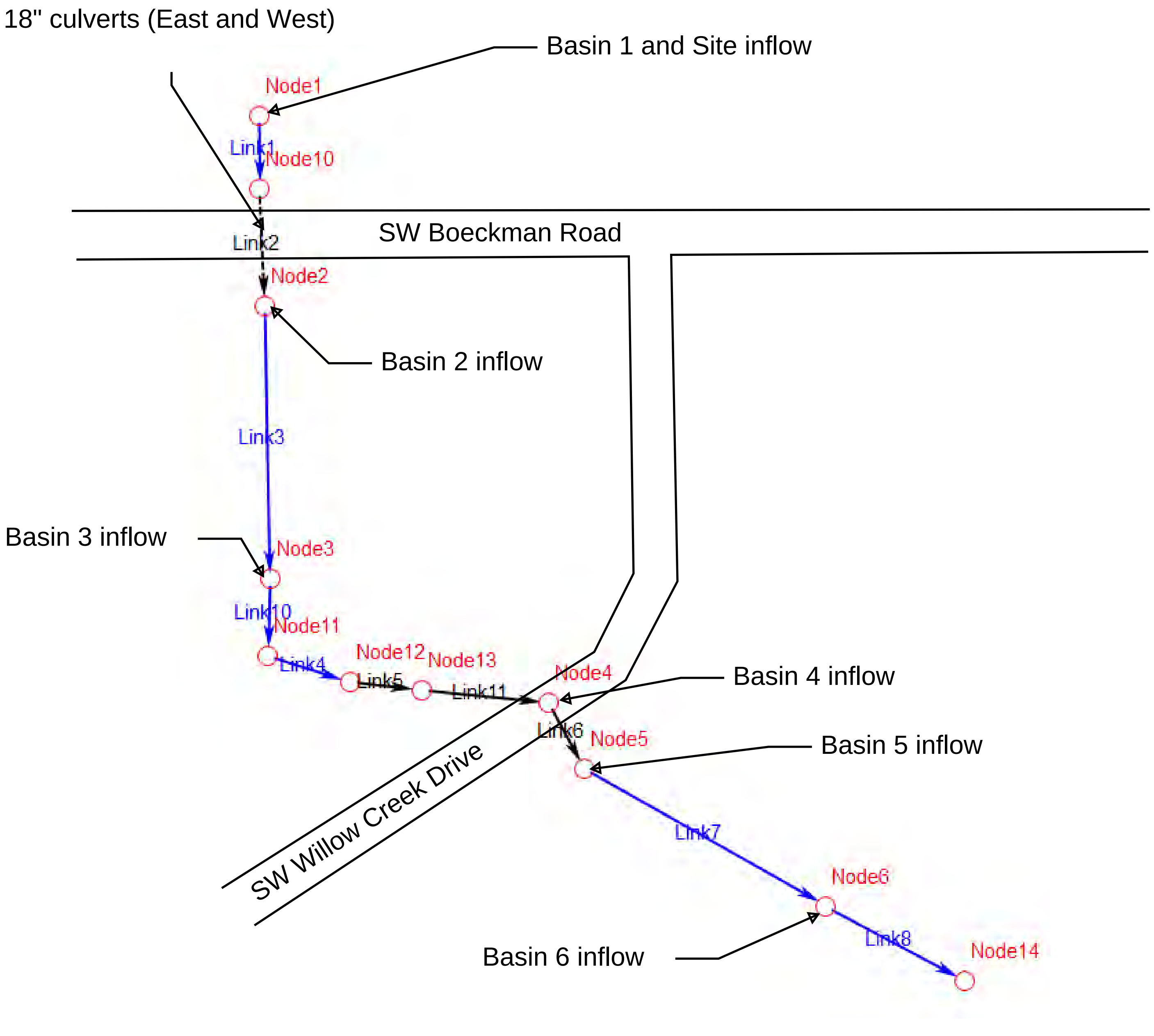
[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Appendix C — Hydraulics

XP-SWMM Layout

Stafford Meadows Downstream Analysis



XP-SWMM RUNOFF DATA

Stafford Meadows Development

SCS Type 1A 25-Year Storm Event

Existing Conditions

XP-SWMM Input Data					XP-SWMM Output Data		
Node Name	Total Area (ac)	Impervious %	Curve Number	Tc (min)	Unit Hydrograph Method	Infiltration Depth (in)	Surface Runoff Flow (cfs)
Node1	4.030	100	98	5.0	Santa Barbara	2.02	4.727
Node1	36.270	0	80	36.1	Santa Barbara	0.00	10.501
Node1	1.170	100	98	5.0	Santa Barbara	0.00	1.372
Node1	14.130	0	80	33.4	Santa Barbara	0.00	4.234
Node2	2.630	100	98	5.0	Santa Barbara	2.02	3.085
Node2	3.210	0	80	5.0	Santa Barbara	0.00	1.855
Node3	3.530	100	98	5.0	Santa Barbara	2.02	4.141
Node3	2.360	0	80	12.2	Santa Barbara	0.00	1.074
Node4	7.120	100	98	5.0	Santa Barbara	2.02	8.352
Node4	4.750	0	80	5.0	Santa Barbara	0.00	2.745
Node5	0.070	100	98	5.0	Santa Barbara	2.44	0.082
Node5	0.510	0	80	8.0	Santa Barbara	0.00	0.265
Node5	0.740	0	74	8.0	Santa Barbara	0.00	0.259
Node6	5.880	100	98	5.0	Santa Barbara	3.18	6.898
Node6	3.690	0	79	34.8	Santa Barbara	0.00	1.086
Node6	0.120	0	79	34.8	Santa Barbara	0.00	0.023
Node6	0.120	0	79	43.8	Santa Barbara	0.00	0.006

XP-SWMM RUNOFF DATA

Stafford Meadows Development

SCS Type 1A 25-Year Storm Event							
Proposed Conditions							
XP-SWMM Input Data					XP-SWMM Output Data		
Node Name	Total Area (ac)	Impervious %	Curve Number	Tc (min)	Unit Hydrograph Method	Infiltration Depth (in)	Surface Runoff Flow (cfs)
Node1	4.030	100	98	5.0	Santa Barbara	2.02	4.727
Node1	36.270	0	79	36.1	Santa Barbara	0.00	10.501
Node1	6.700	100	80	5.0	Santa Barbara	0.00	7.860
Node1	8.600	0	79	5.0	Santa Barbara	0.00	4.971
Node2	2.630	100	80	5.0	Santa Barbara	2.02	3.085
Node2	3.210	0	79	5.0	Santa Barbara	0.00	1.855
Node3	3.530	100	80	5.0	Santa Barbara	2.02	4.141
Node3	2.360	0	79	12.2	Santa Barbara	0.00	1.074
Node4	7.120	100	80	5.0	Santa Barbara	2.02	8.352
Node4	4.750	0	79	5.0	Santa Barbara	0.00	2.745
Node5	0.070	100	80	5.0	Santa Barbara	2.44	0.082
Node5	0.510	0	79	8.0	Santa Barbara	0.00	0.265
Node5	0.740	0	80	8.0	Santa Barbara	0.00	0.259
Node6	5.880	100	74	5.0	Santa Barbara	3.18	6.898
Node6	3.690	0	79	34.8	Santa Barbara	0.00	1.086
Node6	0.120	0	79	34.8	Santa Barbara	0.00	0.023
Node6	0.120	0	79	43.8	Santa Barbara	0.00	0.006

XP-SWMM RUNOFF DATA

Stafford Meadows Development

SCS Type 1A 25-Year Storm Event							
Basin 1 Fully Developed Conditions							
XP-SWMM Input Data					XP-SWMM Output Data		
Node Name	Total Area (ac)	Impervious %	Curve Number	Tc (min)	Unit Hydrograph Method	Infiltration Depth (in)	Surface Runoff Flow (cfs)
Node1	22.170	100	98	5.0	Santa Barbara	2.02	26.007
Node1	18.140	0	79	28.9	Santa Barbara	0.00	5.769
Node1	6.700	100	98	5.0	Santa Barbara	0.00	7.860
Node1	8.600	0	80	5.0	Santa Barbara	0.00	4.971
Node2	3.500	100	98	5.0	Santa Barbara	2.02	4.106
Node2	2.340	0	80	5.0	Santa Barbara	0.00	1.352
Node3	3.530	100	98	5.0	Santa Barbara	2.02	4.141
Node3	2.360	0	80	12.2	Santa Barbara	0.00	1.074
Node4	7.120	100	98	5.0	Santa Barbara	2.02	8.352
Node4	4.750	0	80	5.0	Santa Barbara	0.00	2.745
Node5	0.070	100	98	5.0	Santa Barbara	2.44	0.082
Node5	0.510	0	80	8.0	Santa Barbara	0.00	0.265
Node5	0.740	0	79	8.0	Santa Barbara	0.00	0.259
Node6	5.880	100	80	5.0	Santa Barbara	3.18	6.898
Node6	3.690	0	74	34.8	Santa Barbara	0.00	1.086
Node6	0.120	0	79	34.8	Santa Barbara	0.00	0.023
Node6	0.120	0	79	43.8	Santa Barbara	0.00	0.006

XP-SWMM HYDRAULICS DATA

17868 Stafford Meadows Downstream Analysis

SCS Type 1A 25-Year Storm Event

Existing Conditions

Location			Conduit Properties				Conduit Profile								Conduit Results				
Link Name	Node Limits		Diameter		Length	Slope	Ground Elevation (ft)		Invert Elevation (ft)		Freeboard (ft)		Max. HGL Elevation (ft)		Design Flow	Max. Flow	Max. Velocity	Max. Depth	y/d0
	From	To	in	ft	ft	%	US	DS	US	DS	US	DS	US	DS	(cfs)	(cfs)	(ft/s)	(ft)	
Link1 +	Node1	Node10	18	1.5	35	0.2	214.70	216.00	212.70	212.63	0.6	2.2	214.1	213.8	17.40	19.99	2.24	1.36	0.90
Link2 *	Node10	Node2	18	1.5	80	2.0	216.00	214.50	212.63	211.00	2.2	2.6	213.8	211.9	14.99	10.06	6.81	1.21	0.81
Link2 **	Node10	Node2	18	1.5	80	2.0	216.00	214.50	212.64	211.06	2.2	2.6	213.8	211.9	14.76	9.91	6.73	1.20	0.80
Link2 ***	Node10	Node2	0	0.0	0	0.0	216.00	214.50	0.00	0.00	2.2	2.6	213.8	211.9	0.00	0.00	0.00	0.00	0.00
Link3 +	Node2	Node3	24	2.0	540	1.2	214.50	209.00	211.00	204.40	2.6	3.9	211.9	205.1	152.09	24.41	3.07	0.87	0.43
Link4 +	Node11	Node12	48	4.0	15	3.3	208.00	207.60	203.10	202.60	4.3	4.0	203.7	203.6	1736.29	29.35	3.66	1.01	0.25
Link5	Node12	Node13	36	3.0	32	3.9	207.60	206.00	202.52	201.27	4.0	3.9	203.6	202.1	131.82	29.36	12.93	1.09	0.36
Link6	Node4	Node5	36	3.0	104	6.4	206.00	200.00	195.11	188.58	9.5	13.5	196.5	186.6	167.13	39.88	12.90	1.39	0.46
Link7 +	Node5	Node6	120	10.0	270	4.3	200.00	184.00	185.50	174.00	13.5	7.8	186.6	176.2	5327.19	40.43	5.29	2.16	0.22
Link8 +	Node6	Node14	120	10.0	40	1.0	184.00	184.00	174.00	173.60	7.8	9.4	176.2	174.6	674.27	48.05	5.65	2.16	0.22
Link10+	Node3	Node11	48	4.0	110	1.2	209.00	208.00	204.40	203.10	3.9	4.3	205.1	203.7	1033.85	29.36	3.43	0.66	0.17
Link11	Node13	Node4	36	3.0	144	3.9	206.00	206.00	200.97	195.31	3.9	9.5	202.1	196.5	132.23	29.35	12.33	1.19	0.40

Proposed Conditions

Location			Conduit Properties				Conduit Profile								Conduit Results				
Link Name	Node Limits		Diameter		Length	Slope	Ground Elevation (ft)		Invert Elevation (ft)		Freeboard (ft)		Max. HGL Elevation (ft)		Design Flow	Max. Flow	Max. Velocity	Max. Depth	y/d0
	From	To	in	ft	ft	%	US	DS	US	DS	US	DS	US	DS	(cfs)	(cfs)	(ft/s)	(ft)	
Link1 +	Node1	Node10	18	1.5	35	0.2	214.70	216.00	212.70	212.63	0.1	1.4	214.6	214.6	17.40	26.74	2.25	1.98	1.00
Link2 *	Node10	Node2	18	1.5	80	2.0	216.00	214.50	212.63	211.00	1.4	2.5	214.6	212.0	14.99	13.06	7.61	1.98	1.32
Link2 **	Node10	Node2	18	1.5	80	2.0	216.00	214.50	212.64	211.06	1.4	2.5	214.6	212.0	14.76	13.15	7.59	1.97	1.31
Link2 ***	Node10	Node2	0	0.0	0	0.0	216.00	214.50	0.00	0.00	1.4	2.5	214.6	212.0	0.00	0.00	0.00	0.00	0.00
Link3 +	Node2	Node3	24	2.0	540	1.2	214.50	209.00	211.00	204.40	2.5	3.9	212.0	205.1	152.09	30.64	3.26	0.98	0.49
Link4 +	Node11	Node12	48	4.0	15	3.3	208.00	207.60	203.10	202.60	4.2	3.9	203.8	203.7	1736.29	35.62	3.76	1.14	0.28
Link5	Node12	Node13	36	3.0	32	3.9	207.60	206.00	202.52	201.27	3.9	3.8	203.7	202.2	131.82	35.63	13.49	1.22	0.41
Link6	Node4	Node5	36	3.0	104	6.4	206.00	200.00	195.11	188.58	9.3	13.4	196.7	186.6	167.13	46.41	13.14	1.55	0.52
Link7 +	Node5	Node6	120	10.0	270	4.3	200.00	184.00	185.50	174.00	13.4	7.7	186.6	176.3	5327.19	46.95	5.51	2.34	0.23
Link8 +	Node6	Node14	120	10.0	40	1.0	184.00	184.00	174.00	173.60	7.7	9.2	176.3	174.8	674.27	54.64	5.92	2.34	0.23
Link10 +	Node3	Node11	48	4.0	110	1.2	209.00	208.00	204.40	203.10	3.9	4.2	205.1	203.8	1033.85	35.62	3.68	0.73	0.18
Link11	Node13	Node4	36	3.0	144	3.9	206.00	206.00	200.97	195.31	3.8	9.3	202.2	196.7	132.23	35.63	12.75	1.35	0.45

+ open channel
* 18" culvert west
** 18" culvert east
*** road surface

XP-SWMM HYDRAULICS DATA

17868 Stafford Meadows Downstream Analysis

SCS Type 1A 25-Year Storm Event

Basin 1 Fully Developed

Location			Conduit Properties				Conduit Profile								Conduit Results				
Link Name	Node Limits		Diameter		Length	Slope	Ground Elevation (ft)		Invert Elevation (ft)		Freeboard (ft)		Max. HGL Elevation (ft)		Design Flow	Max. Flow	Max. Velocity	Max. Depth	y/d0
	From	To	in	ft	ft	%	US	DS	US	DS	US	DS	US	DS	(cfs)	(cfs)	(ft/s)	(ft)	
Link1 +	Node1	Node10	47	3.9	35.0	0.2	216.70	216.83	212.70	212.63	0.3	0.4	216.4	216.4	222.42	43.34	2.25	3.77	0.97
Link2 *	Node10	Node2	18	1.5	80.0	2.0	216.83	214.50	212.63	211.00	0.4	2.3	216.4	212.2	14.99	17.65	10.02	3.77	2.52
Link2 **	Node10	Node2	18	1.5	80.0	2.0	216.83	214.50	212.64	211.06	0.4	2.3	216.4	212.2	14.76	17.26	9.69	3.76	2.51
Link2 ***	Node10	Node2	0	0.0	0.0	0.0	216.83	214.50	0.00	0.00	0.4	2.3	216.4	212.2	0.00	7.55	0.00	0.00	0.00
Link3 +	Node2	Node3	24	2.0	540.0	1.2	214.50	209.00	211.00	204.40	2.3	3.7	212.2	205.3	152.09	47.35	3.65	1.23	0.62
Link4 +	Node11	Node12	48	4.0	15.0	3.3	208.00	207.60	203.10	202.60	4.0	3.6	204.0	204.1	1736.29	52.22	3.82	1.45	0.36
Link5	Node12	Node13	36	3.0	32.0	3.9	207.60	206.00	202.52	201.27	3.6	3.4	204.1	202.6	131.82	52.22	14.66	1.53	0.51
Link6	Node4	Node5	36	3.0	104.0	6.4	206.00	200.00	195.11	188.58	9.0	13.2	197.0	186.8	167.13	62.52	13.57	1.93	0.64
Link7 +	Node5	Node6	120	10.0	270.0	4.3	200.00	184.00	185.50	174.00	13.2	7.2	186.8	176.8	5327.19	63.06	5.93	2.76	0.28
Link8 +	Node6	Node14	120	10.0	40.0	1.0	184.00	184.00	174.00	173.60	7.2	8.9	176.8	175.1	674.27	70.55	6.48	2.76	0.28
Link10+	Node3	Node11	48	4.0	110.0	1.2	209.00	208.00	204.40	203.10	3.7	4.0	205.3	204.0	1033.85	52.24	4.21	0.90	0.23
Link11	Node13	Node4	36	3.0	144.0	3.9	206.00	206.00	200.97	195.31	3.4	9.0	202.6	197.0	132.23	52.22	13.48	1.73	0.58

+ open channel
* 18" culvert west
** 18" culvert east
*** road surface functioning as weir

HY-8 Culvert Analysis Report

Roadway Data for Crossing: SW Boeckman Road

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Roadway Surface: Paved

Roadway Top Width: 68.00 ft

Tailwater Channel Data - SW Boeckman Road

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 6.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0120

Channel Manning's n: 0.0350

Channel Invert Elevation: 211.00 ft

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 26.8 cfs

Maximum Flow: 43.3 cfs

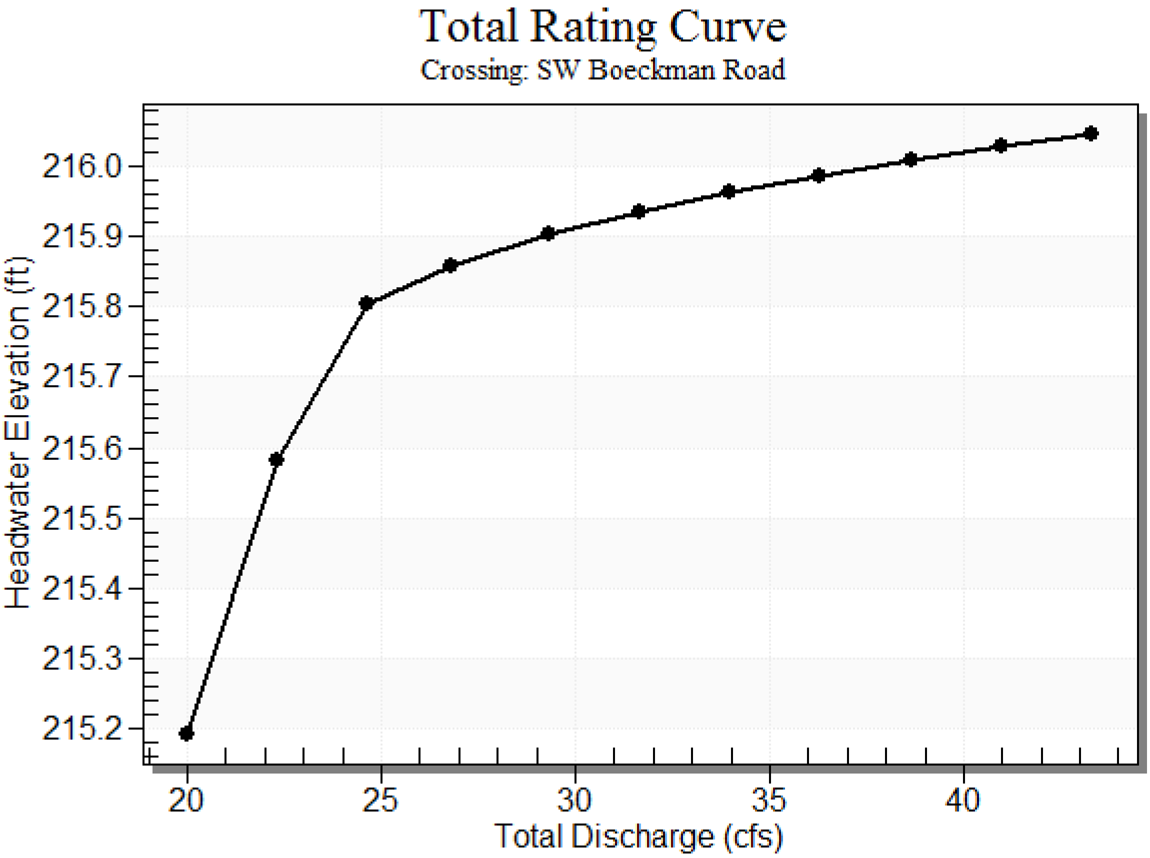
Table 1 - Downstream Channel Rating Curve (Crossing: SW Boeckman Road)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	211.73	0.73	3.09	0.54	0.73
22.33	211.77	0.77	3.19	0.58	0.74
24.66	211.81	0.81	3.28	0.61	0.75
26.80	211.85	0.85	3.36	0.64	0.75
29.32	211.89	0.89	3.45	0.67	0.75
31.65	211.93	0.93	3.52	0.69	0.76
33.98	211.96	0.96	3.59	0.72	0.76
36.31	211.99	0.99	3.66	0.74	0.77
38.64	212.03	1.03	3.73	0.77	0.77
40.97	212.06	1.06	3.79	0.79	0.77
43.30	212.09	1.09	3.85	0.81	0.77

Table 2 - Summary of Culvert Flows at Crossing: SW Boeckman Road

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert West Discharge (cfs)	Culvert East Discharge (cfs)	Roadway Discharge (cfs)	Iterations
215.19	20.00	10.02	9.99	0.00	6
215.58	22.33	11.14	11.11	0.00	40
215.80	24.66	11.74	11.71	1.12	19
215.86	26.80	11.88	11.86	2.93	8
215.90	29.32	12.00	11.98	5.26	7
215.94	31.65	12.08	12.06	7.37	5
215.96	33.98	12.16	12.13	9.61	5
215.99	36.31	12.22	12.19	11.76	4
216.01	38.64	12.27	12.25	14.01	4
216.03	40.97	12.32	12.30	16.27	4
216.05	43.30	12.37	12.35	18.53	4
215.69	22.84	11.43	11.41	0.00	Overtopping

Rating Curve Plot for Crossing: SW Boeckman Road



Site Data - Culvert West

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 212.63 ft

Outlet Station: 79.01 ft

Outlet Elevation: 211.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert West

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: NONE

Table 3 - Culvert Summary Table: Culvert West

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	10.02	215.19	2.563	1.292	5-S2n	0.892	1.218	0.907	0.728	8.973	3.085
22.33	11.14	215.58	2.952	1.691	5-S2n	0.958	1.276	0.974	0.771	9.165	3.186
24.66	11.74	215.80	3.172	1.917	5-S2n	0.995	1.303	1.010	0.813	9.284	3.280
26.80	11.88	215.86	3.228	1.974	5-S2n	1.004	1.309	1.019	0.849	9.310	3.359
29.32	12.00	215.90	3.273	2.021	5-S2n	1.011	1.314	1.026	0.890	9.333	3.447
31.65	12.08	215.94	3.305	2.053	5-S2n	1.016	1.317	1.030	0.926	9.350	3.522
33.98	12.16	215.96	3.333	2.082	5-S2n	1.021	1.320	1.034	0.961	9.366	3.594
36.31	12.22	215.99	3.356	2.106	5-S2n	1.024	1.323	1.039	0.994	9.371	3.662
38.64	12.27	216.01	3.378	2.128	5-S2n	1.028	1.324	1.043	1.026	9.373	3.726
40.97	12.32	216.03	3.398	2.149	5-S2n	1.031	1.326	1.046	1.057	9.379	3.788
43.30	12.37	216.05	3.416	2.168	5-S2n	1.034	1.328	1.049	1.088	9.384	3.847

****

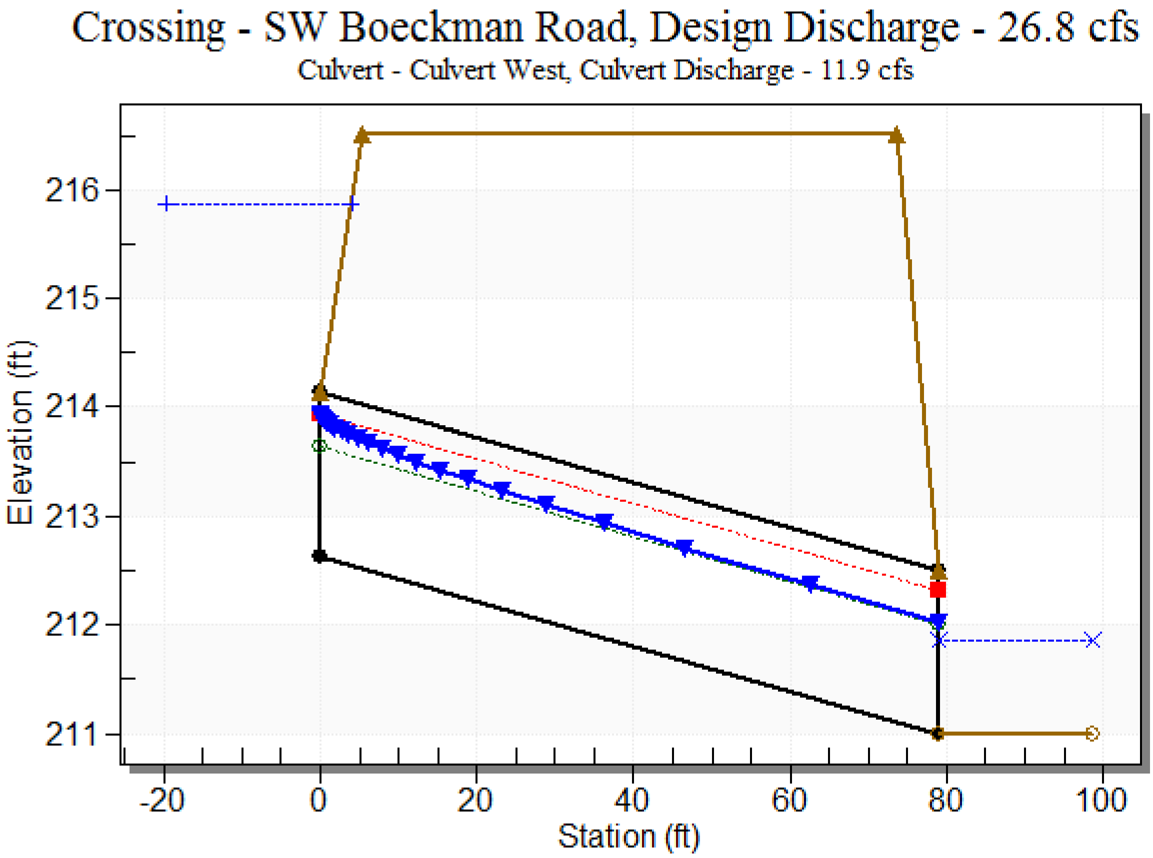
Straight Culvert

Inlet Elevation (invert): 212.63 ft,   Outlet Elevation (invert): 211.00 ft

Culvert Length: 79.03 ft,   Culvert Slope: 0.0206

****

Water Surface Profile Plot for Culvert: Culvert West



Site Data - Culvert East

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 212.64 ft

Outlet Station: 78.87 ft

Outlet Elevation: 211.06 ft

Number of Barrels: 1

Culvert Data Summary - Culvert East

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: NONE

Table 4 - Culvert Summary Table: Culvert East

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	9.99	215.19	2.553	1.331	5-S2n	0.899	1.217	0.913	0.728	8.872	3.085
22.33	11.11	215.58	2.942	1.730	5-S2n	0.966	1.275	0.982	0.771	9.062	3.186
24.66	11.71	215.80	3.162	1.955	5-S2n	1.004	1.302	1.017	0.813	9.194	3.280
26.80	11.86	215.86	3.218	2.012	5-S2n	1.013	1.308	1.027	0.849	9.208	3.359
29.32	11.98	215.90	3.263	2.059	5-S2n	1.021	1.313	1.035	0.890	9.223	3.447
31.65	12.06	215.94	3.295	2.092	5-S2n	1.026	1.316	1.040	0.926	9.234	3.522
33.98	12.13	215.96	3.323	2.120	5-S2n	1.030	1.319	1.045	0.961	9.244	3.594
36.31	12.19	215.99	3.346	2.144	5-S2n	1.034	1.322	1.049	0.994	9.253	3.662
38.64	12.25	216.01	3.368	2.166	5-S2n	1.038	1.323	1.052	1.026	9.261	3.726
40.97	12.30	216.03	3.388	2.187	5-S2n	1.041	1.325	1.055	1.057	9.268	3.788
43.30	12.35	216.05	3.406	2.206	5-S2n	1.044	1.327	1.058	1.088	9.275	3.847

****

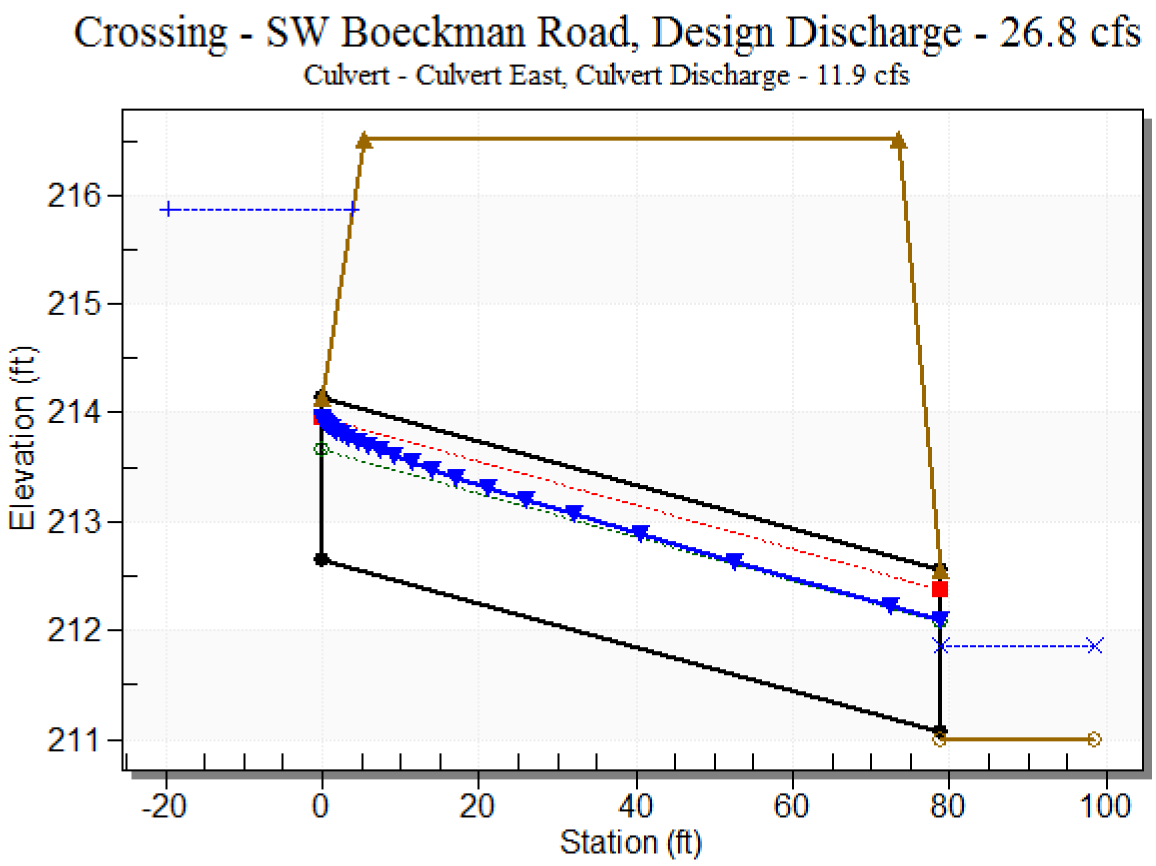
Straight Culvert

Inlet Elevation (invert): 212.64 ft, Outlet Elevation (invert): 211.06 ft

Culvert Length: 78.89 ft, Culvert Slope: 0.0200

****

Water Surface Profile Plot for Culvert: Culvert East



Appendix C

Wilsonville Frog Pond West Hills

Transportation Impact Study

Developed for

WILSONVILLE
OREGON

Developed by

DKS

January 2018

DKS
117 Commercial St NE
Suite 310
Salem, OR 97301
503.391.8773
dksassociates.com

January 30, 2018

Steve Adams
City of Wilsonville
29799 Town Center Loop East
Wilsonville, OR 97070

Subject: Wilsonville Frog Pond West Hills Transportation Impact Study P17021-004

Dear Steve,

DKS Associates is pleased to submit this transportation impact study for the proposed Frog Pond West Hills subdivision on tax lots 31W12D 02001, 02100, 02201, and 02202 located northwest of the intersection of Boeckman Road-Advance Road/Stafford Road-Wilsonville Road.

Please feel free to call if you have any questions or comments regarding this study.

Sincerely,
DKS Associates

Scott Mansur, P.E., PTOE
Transportation Engineer

REGISTERED PROFESSIONAL ENGINEER
56267
OREGON
July 9, 2002
SCOTT M. MANSUR
EXPIRES: 12-31-2018

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CHAPTER 1: INTRODUCTION

This study evaluates the transportation impacts associated with the residential development of the tax lots 31W12D 02001, 02100, 02201, and 02202 located northwest of the intersection of Boeckman Road-Advance Road/Stafford Road-Wilsonville Road in Wilsonville, Oregon. The project consists of a maximum of 50 single-family homes. For the purposes of a worst-case transportation evaluation, the maximum development size will be assumed for this analysis. The existing tax lots include four existing single family homes that will be removed. An aerial photo of the project location is shown in Figure 1.

This development is part of the Frog Pond West Master Plan adopted on July 17, 2017 as a supporting document to the Wilsonville Comprehensive Plan. The proposed land use and internal roadway network is consistent with the Frog Pond West Master Plan.

The purpose of this transportation impact analysis is to identify potential mitigation measures needed to offset transportation impacts that the proposed development may have on the nearby transportation network. The impact analysis is focused on the study intersections, which were selected for evaluation in coordination with City staff[1]. The intersections are shown in Figure 2 and listed below:

- Boeckman Road/SW Parkway Avenue
- Boeckman Road/Canyon Creek Road
- Boeckman Road-Advance Road/SW Stafford Road-Wilsonville Road (herein referred to as Boeckman Road/SW Stafford Road)
- Boeckman Road/Willow Creek Drive

This chapter provides an introduction to the proposed development and the steps taken to analyze the associated impacts on the transportation network. It highlights important elements of the remaining chapters, including a description of the project and the findings of the transportation analysis.

Table 1 lists important characteristics of the study area and proposed project.

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[1] Email correspondence with Steve Adams, City of Wilsonville, September 11, 2017.

Figure 1: Study Area Aerial Photo

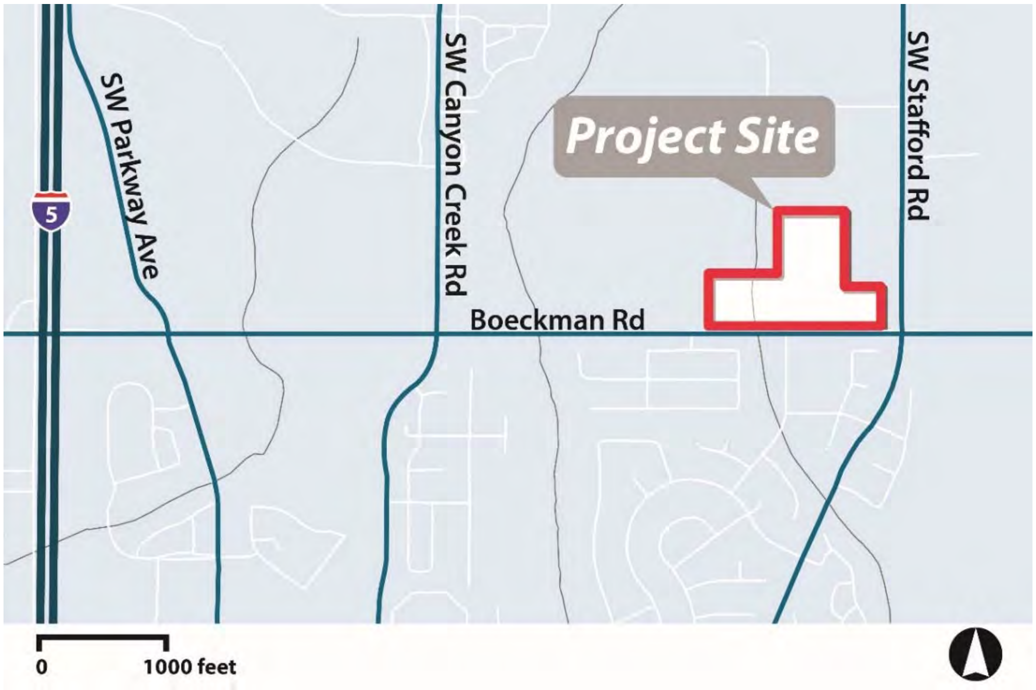

Figure 2: Study Area Map

Table 1: Key Study Area and Proposed Development Characteristics

Characteristics	Information
Study Area	
Number of Study Intersections	4
Analysis Period	Weekday PM Peak Hour (Peak hour between 4-6 PM)
Project Site	
Existing Land Use	4 existing single-family homes
Proposed Development	50 single-family homes
Project Access	One access along Boeckman Road, forming the fourth leg of the intersection of Boeckman Road/Willow Creek Drive

CHAPTER 2: EXISTING CONDITIONS

This chapter provides documentation of existing study area conditions, including the study area roadway network, pedestrian and bicycle facilities, and existing traffic volumes and operations. Supporting details are provided in the appendix.

Project Site

The project sponsor plans to demolish four existing homes and develop a 50-lot subdivision (46 net new homes) in the Frog Pond West Master Plan area of Wilsonville.

Study Area Roadway Network

Key roadways in the study area are summarized in Table 2 along with their existing (or proposed) roadway characteristics. The functional classifications for City of Wilsonville streets are provided in the *City of Wilsonville Transportation System Plan* (TSP).[2]

Table 2: Study Area Roadway Characteristics (within the Study Area)

Roadway	Classification	No. of Lanes	Posted Speed	Sidewalks	Bike Lanes	On-Street Parking
Boeckman Road	Minor Arterial	2	40 mph	Yes/No[a]	Yes/No	No
SW Parkway Avenue	Minor Arterial	3	45 mph north of Boeckman, 40 mph south of Boeckman	Yes/No[b]	Yes/No[b]	No
Canyon Creek Road	Minor Arterial	3	35 mph north of Boeckman, 30 mph south of Boeckman	Yes	Yes	No
SW Stafford Road	Major Arterial	2	45 - 35 mph	No	No	No

[a] No sidewalk between Canyon Creek Road and Stafford Road on north side
[b] Sidewalk and bike lane missing along segments of SW Parkway Ave

Pedestrian and Bicycle Facilities

Near the project site Boeckman Road is classified by the City as a minor arterial. A Section of Boeckman Road does have curbs, gutters, sidewalk (south side) and bike lanes, however much of it does not. A temporary sidewalk does exist on the south side between Willow Creek Drive and Wilsonville Road; however curbs, gutters and bike lanes do not exist along much of this section.

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[2] *Wilsonville Transportation System Plan*, Adopted by Council, June 2013.

Public Transit Service

South Metro Area Regional Transit (SMART) operates several fixed routes that serve Wilsonville and the surrounding area.[3] Route 6 travels on Boeckman Road and Canyon Creek Road and provides service between the SMART Central station in Wilsonville to the commercial area at SW Elligsen Road, Canyon Creek Road, SW Parkway Center Drive, and SW Burns Way. There are two stops along Route 6 that are located on Boeckman Road.

Route 4 provides service from the SMART Central station in Wilsonville to the CREST Environment Education Center and Meridian Creek Middle School. This route travels on SW Wilsonville Road and Advance Road. There is one stop located south of the Boeckman Road/SW Stafford Road intersection.

Future Planned Projects

Higher Priority Projects

The following is a list of higher priority projects included in the Wilsonville TSP[4]. A map of these improvements can be seen in the appendix.

- **BW-04 Boeckman Road Bike Lanes and Sidewalk Infill:** Construct bike lanes (both sides of street) and sidewalks (south side of street) from Parkway Avenue to Canyon Creek Road. Restriping was completed in 2013 to add bike lanes. A sidewalk on the south side will be constructed when the property develops.
- **RE-12A Frog Pond West Neighborhood Collector Roads:** Construct the collector roadways within the west neighborhood as identified in the Frog Pond Area Plan.
- **RT-01A Boeckman Creek Trail (North):** Construct north-south trail through east Wilsonville following Boeckman Creek, with connections to neighborhoods, parks, and intersection roads (may need a boardwalk for various sections and would require a comprehensive public process).
- **RW-01 Boeckman Road Bridge and Corridor Improvements:** Widen Boeckman Road from Boberg Road to 500 feet east of Parkway Avenue to include additional travel lanes in both directions along with bike lanes and sidewalks; project includes reconstruction of the bridge over I-5 and improvement at Boeckman Road/Boberg Road and Boeckman road/Parkway Avenue intersections.

---

[3] South Metro Area Regional Transit (SMART) operates several fixed routes that serve Wilsonville and make connections to TriMet in Portland, Cherriots in Salem, and Canby Area Transit. The City's transit center, "SMART Central at Wilsonville Station," provides connections to all SMART routes and to TriMet's Westside Express Service (WES) commuter rail station.

[4] *Wilsonville Transportation System Plan*, Adopted by Council, June 2013.

- **UU-01 Boeckman Road Dip Improvements:** Upgrade at vertical curve east of Canyon Creek Road to meet applicable cross-section standards (i.e., 3 lanes with bike lanes, sidewalks, and transit stop improvements); options should also be considered to make connections to the regional trail system and to remove the culvert and install a 2-lane bridge with pedestrian and bicycle facilities.
- **UU-02 Boeckman Road Urban Upgrade:** Upgrade along the Frog Pond West frontage to meet Frog Pond Master Plan cross-section standards (i.e., 3 lanes with bike lanes, sidewalks, and transit stop improvements); project includes a traffic signal or roundabout at the Boeckman Road-Advance Road/Stafford Road-Wilsonville Road intersection. A traffic signal has already been constructed as part of this project at Boeckman Road-Advance Road/Stafford Road-Wilsonville Road.
- **UU-06 Stafford Road Urban Upgrade:** Upgrade to meet applicable cross-section standards (i.e., 3 lanes with bike lanes, sidewalks, and transit stop improvements).
- **UU-10 Advance Road Urban Upgrade:** Upgrade Advance Road to collector standards starting at Stafford Road to the proposed 63rd Avenue (entrance to the Meridian Creek Middle School). The south side has been completed with a bike lane, curbs, gutter, and sidewalk.

Additional Planned Projects

The following is a planned but unfunded project included in the Wilsonville TSP near the project site. A map of this improvement location can be seen in the appendix.

- **LT-P4 Canyon Creek Trail:** Shared Use Path from Canyon Creek Park to Boeckman Creek Trail providing connectivity to neighborhoods to the south.

Existing Traffic Volumes and Operations

Existing PM peak hour traffic operations were analyzed at the following study intersections based on coordination with city staff[5]:

- Boeckman Road/SW Parkway Avenue
- Boeckman Road/Canyon Creek Road
- Boeckman Road-Advance Road/SW Stafford Road-Wilsonville Road
- Boeckman Road/Willow Creek Drive

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[5] Email correspondence with Steve Adams, City of Wilsonville, September 11, 2017.

Intersection turn movement volumes were collected[6] at these intersections during two consecutive PM peak periods when schools were in session. The volume of the highest day was used in the intersection operations analysis and is shown in Figure 3. The following sections describe intersection performance measures, required operating standards, and existing operating conditions.

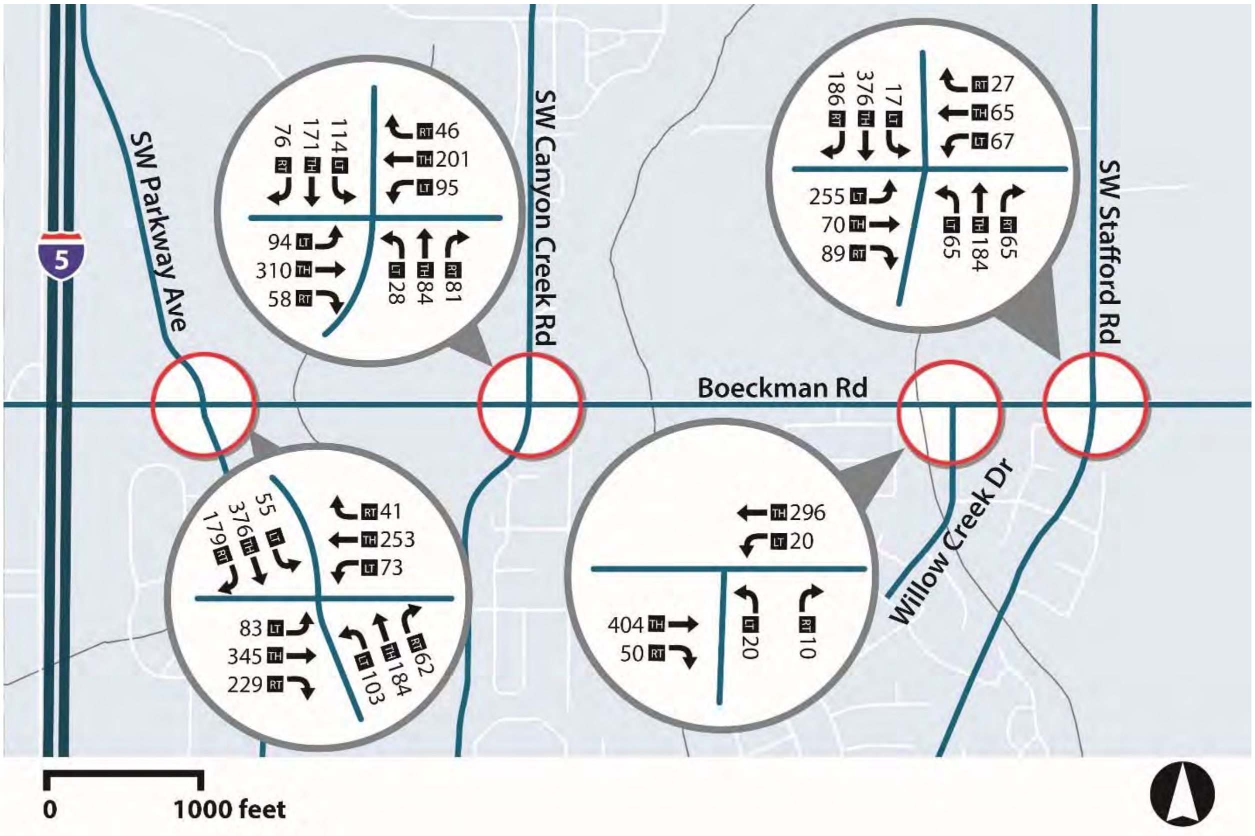

Figure 3: Existing PM Peak Hour Traffic Volumes

Intersection Performance Measures

Level of service (LOS) ratings and volume-to-capacity (v/c) ratios are two commonly used performance measures that provide a good picture of intersection operations.

- **Level of service (LOS):** A "report card" rating (A through F) based on the average delay experienced by vehicles at the intersection.[7] LOS A, B, and C indicate conditions where

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[6] Traffic data for Boeckman Road/Canyon Creek Road and Boeckman Road-Advance Road/SW Stafford Road-Wilsonville Road was collected on November 29th and November 30th, 2017 by Key Data Network. Traffic data for Boeckman Road/SW Parkway Avenue was collected on January 24th, 2017 by All Traffic Data. Traffic counts at Boeckman Road/SW Parkway Avenue were increased to account for growth in 2017. Turning movement volumes for Boeckman Road/Willow Creek Drive were taken from the Frog Pond Master Plan and balanced with Boeckman Road/SW Stafford Road using through volumes.

[7] A description of Level of Service (LOS) is provided in the appendix and includes a list of the delay values (in seconds) that correspond to each LOS designation.

traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle delay has become excessive and demand has exceeded capacity.

- **Volume-to-capacity (v/c) ratio:** A decimal representation (typically between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays.

Required Operating Standards

The City of Wilsonville requires study intersections on public streets to meet its minimum acceptable level of service (LOS) standard, which is LOS D for peak periods.[8]

Existing Operating Conditions

Existing traffic operations at the study intersection were determined for the PM peak hour based on the 2000 Highway Capacity Manual (HCM) methodology for signalized intersections, while unsignalized intersections were analyzed with 2010 HCM methodology.[9] The results were then compared with the City of Wilsonville's minimum acceptable level of service (LOS) operating standard of LOS D or better. Table 3 lists the estimated delay, LOS, and v/c ratio of each study intersection. The existing study intersections currently meet mobility targets and operating standards.

Table 3: Existing PM Peak Study Intersection Operations

Intersection	Mobility Target/Operating Standard	Existing PM Peak		
		Delay	*LOS*	*v/c*
Boeckman Road/SW Parkway Avenue	LOS D	46.9	D	0.91
Boeckman Road/Canyon Creek Road	LOS D	24.2	C	0.85[a]
Boeckman Road-Advance Road/SW Stafford Road-Wilsonville Road	LOS D	21.2	C	0.76
Boeckman Road/Willow Creek Drive	LOS D	0.8	A	0.09[a]

Delay = Average Intersection Delay (sec.) LOS = Level of Service v/c = Volume-to-Capacity Ratio

[a] v/c shown for unsignalized intersections is the worst lane's v/c

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[8] *City of Wilsonville Code*, City of Wilsonville Section 4.140(.09)J.2., p.166.

[9] *2000 & 2010 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000/2010.

CHAPTER 3: PROJECT IMPACTS

This chapter reviews the impacts that the proposed Frog Pond West Hills development may have on the study area transportation system. This analysis includes site plan evaluation, trip generation, trip distribution, and future year traffic volumes and operating conditions for the four study intersections

Proposed Development

The proposed development involves demolishing four existing homes and constructing a 50 lot subdivision (46 net new homes). This development will have access via one roadway along Boeckman Road, which will form the fourth leg of the intersection of Boeckman Road/Willow Creek Drive.

This new roadway is consistent with the Frog Pond Area Plan for an internal roadway network, as shown in the appendix.

Trip Generation

Trip generation is the method used to estimate the number of vehicles added to site roadways and the adjacent roadway network by a development during a specified period (i.e., such as the PM peak hour). For this study, typical ITE 10th Edition trip generation data was used which is based on national land use data.

Table 4 provides the trip generation for the proposed residential development, taking into account the removal of the 4 existing homes. The development is expected to generate approximately 46 total (30 in, 16 out) PM peak hour trips.

Table 4: PM Peak Hour Primary Trip Generation

Land Use (ITE Code)	Units	Trip Rate per Unit	In	Out	Total
Proposed Land Use					
Single-Family Detached Housing (210)	50	0.99	32	18	**50**
Existing Land Use to be Removed					
Single-Family Detached Housing (210)	4	0.99	2	2	**4**
Total Primary Trips (Proposed - Existing):			30	16	**46**

Trip Distribution

Trip distribution provides an estimate of where project-related trips would be coming from and going to. It is given as percentages at key gateways to the study area and is used to route project trips through the study intersections. Figure 4 shows the expected trip distribution and project trip routing for the additional traffic generated by the Frog Pond West Hills project. The trip distribution was estimated using the City of Wilsonville travel demand model and is consistent with what was assumed for the Frog Pond Area Plan.[10]

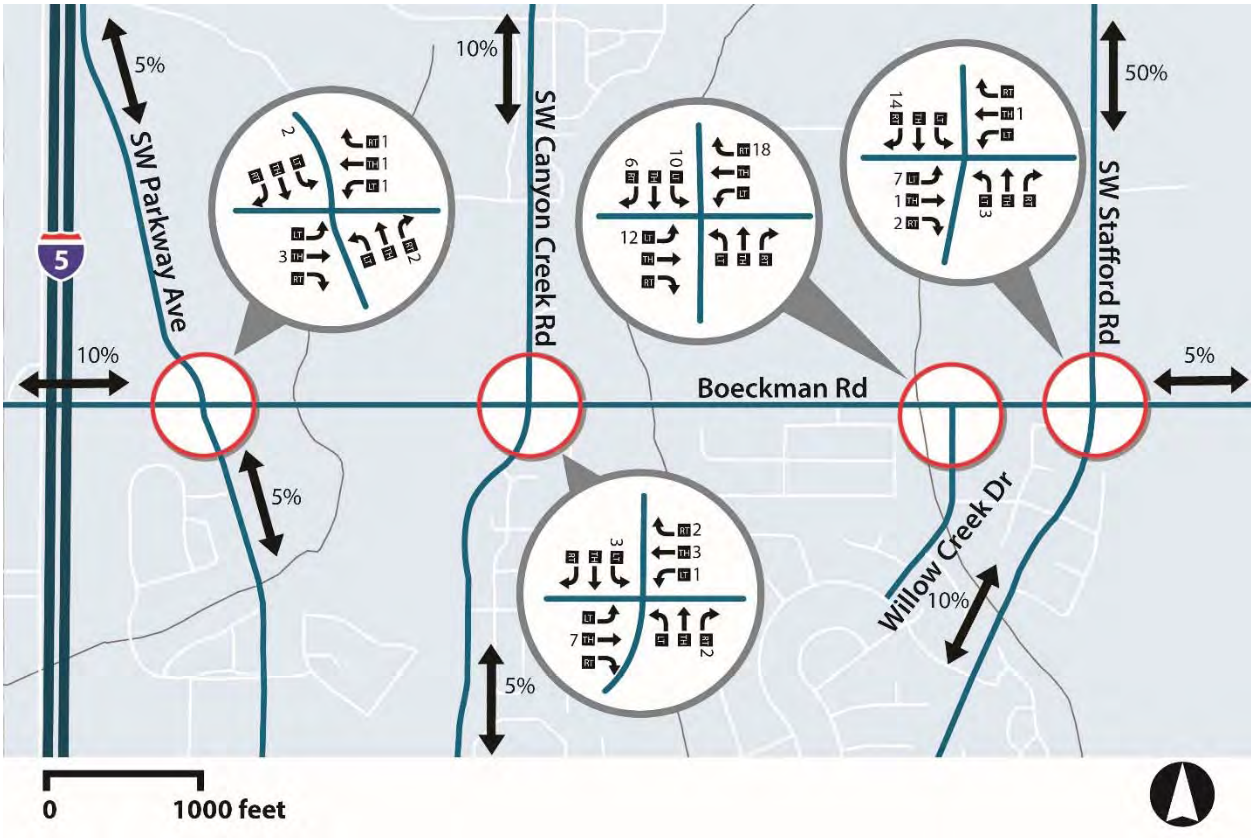

Figure 4: Trip Distribution and Project Trips

Project Trips Through City of Wilsonville Interchange Areas

The project trips through the two City of Wilsonville I-5 interchange areas were estimated based on the trip generation and distribution assumptions from the Frog Pond Area Plan:

“The primary reason why the Area Plan scenario results only in minor changes to the I-5 interchange ramp operating conditions is because the Area Plan is not dependent upon I-5 for interstate access, and as congestion on I-5 increases, alternatives routes are expected to be

---

[10] *Wilsonville Travel Forecast Model, Select zone model run for Frog Pond Zone.*

utilized by more drivers. Due to the proximity of the project area to Stafford Road and I-205, less than 10 percent of Area Plan trips are expected to use I-5 during the p.m. peak hour. While approximately 40% of Area Plan trips are expected use Stafford Road to access I-205, only 3% are expected to access I-5 at the Elligsen Road interchange and 5% are expected to use the Wilsonville Road interchange." [11]

The proposed Frog Pond West Hills development is expected to generate 2 PM peak hour trips through the I-5/SW Elligsen Road interchange area and 3 PM peak hour trips through the I-5/Wilsonville Road interchange area.

Future Traffic Volumes and Operating Conditions

The proposed Frog Pond West Hills development includes a total of 50 single-family homes. Future operating conditions were analyzed at the study intersections for the following future traffic scenarios. The comparison of the following scenarios enables the assessment of project impacts:

- Existing + Stage II (includes traffic from other developments with Stage II approval or are under construction)
- Existing + Project
- Existing + Project + Stage II

Future traffic volumes were estimated at the study intersection for each scenario. The future operating scenarios include various combinations of three types of traffic: existing, project, and Stage II. Stage II development trips are estimated based on the list of currently approved Stage II developments provided by City staff.[12] The Stage II list and the corresponding PM peak hour trip generation estimates for these developments are included in the appendix.

Figure 5 shows the PM peak hour traffic volumes used to analyze the "Existing plus Stage II" scenario. Figure 6 shows the PM peak hour traffic volumes used to analyze the "Existing plus Project plus Stage II" scenario.

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[11] Frog Pond Area Plan Technical Appendix D: Transportation Analyses, Frog Pond Area Plan Existing and Baseline Transportation Analysis

[12] Email from Daniel Pauly, City of Wilsonville, December 6, 2017.

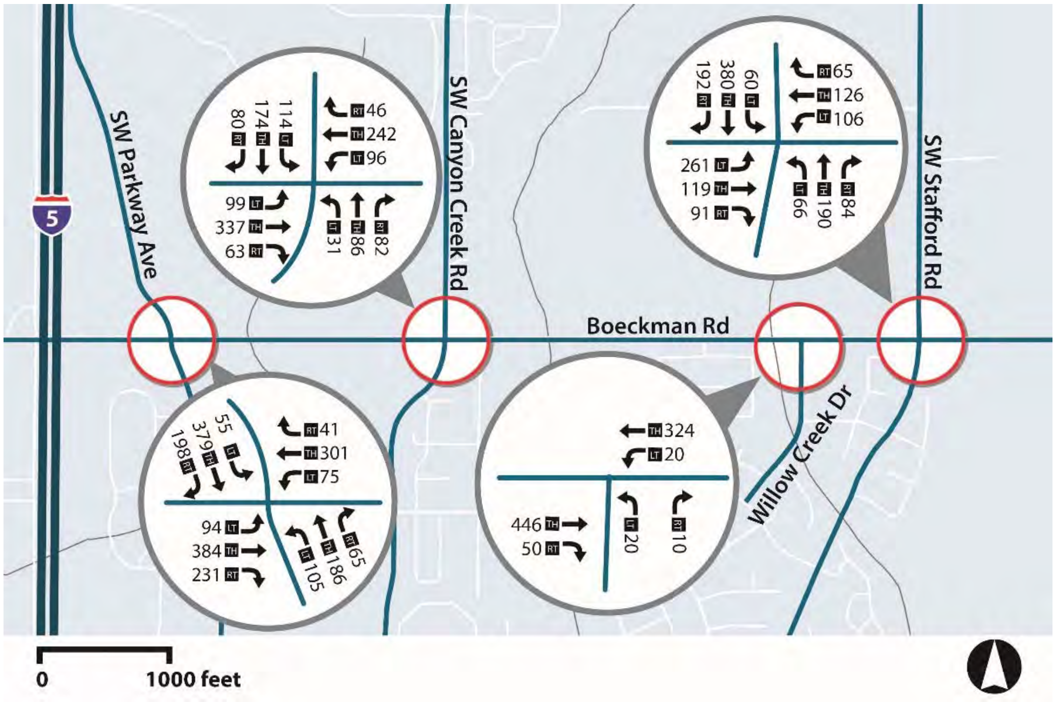

Figure 5: Existing plus Stage II PM Peak Hour Traffic Volumes

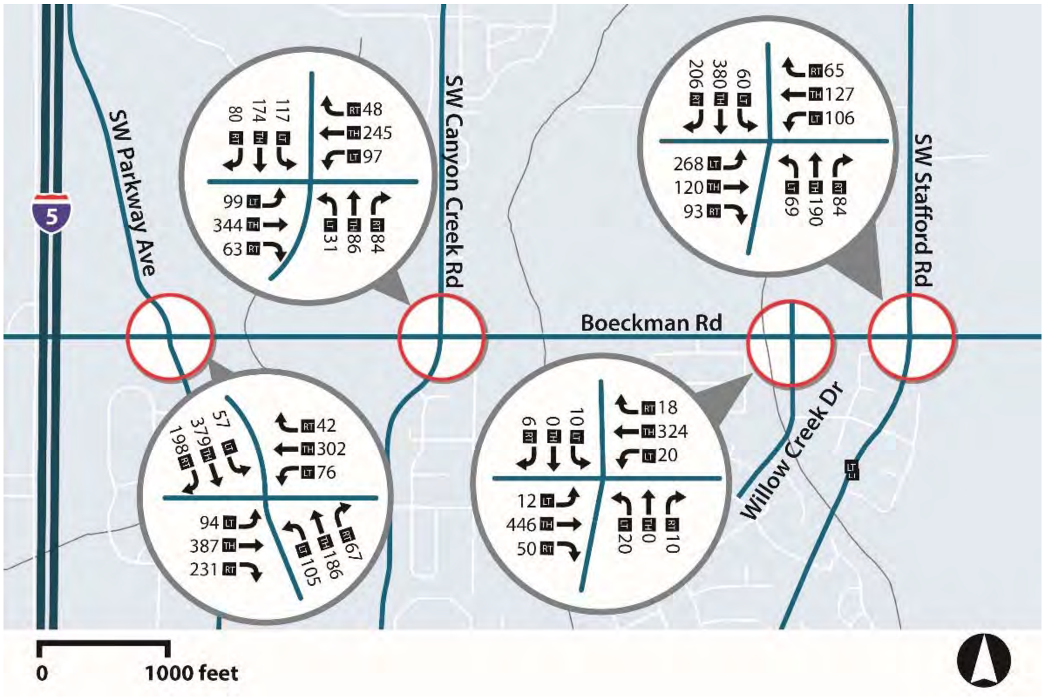

Figure 6: Existing plus Stage II plus Project PM Peak Hour Traffic Volumes

Intersection Operations

The study intersection operating conditions for the project trips after development and future Stage II developments are listed in Table 5. All the study intersections meet operating standards for "Existing plus Project" and "Existing plus Stage II" scenarios.

Table 5: Future Project and Stage II Intersection Operations Comparison

Intersection	Mobility Target/ Operating Standard	Existing + Project			Existing + Stage II			Existing + Project + Stage II		
		Delay	*LOS*	*v/c*	*Delay*	*LOS*	*v/c*	*Delay*	*LOS*	*v/c*
Boeckman Road/SW Parkway Avenue	LOS D	47.4	D	0.91	50.1	D	0.93	50.3	D	0.93
Boeckman Road/Canyon Creek Road	LOS D	25.8	D	0.88[a]	33.8	D	0.97[a]	35.4	E	1.00[a]
Boeckman Road-Advance Road/SW Stafford Road-Wilsonville Road	LOS D	21.8	C	0.77	27.5	C	0.82	27.9	C	0.85
Boeckman Road/Willow Creek Drive	LOS D	1.3	A	0.11[a]	0.8	A	0.10	1.3	A	0.12

Delay = Average Intersection Delay (sec.) v/c = Volume-to-Capacity Ratio LOS = Level of Service

[a] v/c shown for unsignalized intersections is the worst lane v/c reported

As shown, the intersection of Boeckman Road/Canyon Creek Road does not meet the LOS D mobility standards in the "Existing plus Project plus Stage II" scenario. This intersection will be studied further in the next section.

Additionally, the intersection of Boeckman Road/SW Parkway Avenue is close to falling below the LOS D standard. As the Frog Pond area develops, operations at this intersection will continue to degrade and may trigger the need for improvements at this intersection as identified as part of the City of Wilsonville TSP project RW-01: Boeckman Road Bridge and Corridor Project.

Mitigation

The intersection of Boeckman Road/Canyon Creek Road operates at an overall LOS E in the scenario with Stage II volumes and project trips added to the existing network. Therefore, mitigation measures must be explored in order to bring the operations back up to LOS D or better, in order to meet the City of Wilsonville standards.

The Wilsonville Transportation System Plan shows a traffic signal as a high priority project at the intersection of Boeckman Road/Canyon Creek Road as part of project UU-01. To mitigate future impacts of the transportation system, it is recommended that the planned project to signalize the Boeckman Road/Canyon Creek Road intersection described in the Wilsonville TSP be completed. This mitigation was assumed in the following analysis. The same lane geometry and channelization as the existing scenario were assumed.

The construction of a new traffic signal at Boeckman Road/Canyon Creek Road should be coordinated with the other tasks in the project UU-01 Boeckman Road Dip Improvements. This project includes a bridge, sidewalks, and bike lanes across Boeckman Creek. Coordination will be necessary to avoid replacing the new traffic signal when the bridge is constructed.

The "Existing plus Project plus Stage II" scenario is shown again with the signal mitigation at Boeckman Road/Canyon Creek Road in Table 6.

Table 6: Future Project and Stage II Intersection Operations with Mitigation

Intersection	Mobility Target/ Operating Standard	Existing + Project + Stage II (Mitigated)		
		Delay	*LOS*	*v/c*
Boeckman Road/Canyon Creek Road	LOS D	7.6	A	0.51

Delay = Average Intersection Delay (sec.) v/c = Volume-to-Capacity Ratio LOS = Level of Service

With the addition of a traffic signal at the Boeckman Road/Canyon Creek Road intersection, all study intersections meet mobility standards.

Site Plan Evaluation

A site plan showing the proposed development can be found in the appendix. The site plan shows sufficient space for two way motor vehicle circulation throughout the neighborhood.

The site access to the proposed Frog Pond West Hills site includes one street along Boeckman Road, which will form the fourth leg of the intersection of Boeckman Road/Willow Creek Drive. This new roadway is consistent with the Frog Pond Area Plan for an internal roadway network, as shown in the appendix. As future development in Frog Pond West occurs, additional internal streets will provide access to Stafford Road.

With the Adoption of the Frog Pond West Infrastructure Funding Plan the City has agreed to undertake the design and re-construction of Boeckman Road adjacent to the Frog Pond West development. The developer will pay their cost share through the per lot Frog Pond West Infrastructure Supplemental Fee to be paid at the time building permits are issued. The project will include adding left-turn pockets on Boeckman Road at Willow Creek Drive for both eastbound and westbound traffic. The City anticipates the project design to occur in 2018 followed by construction when supplemental fees have accrued.

Bicycle and Pedestrian Facilities

The site plan shows sidewalks on all internal streets as well as pedestrian connections over the SROZ via a road crossing and several connecting pathways between internal streets and Boeckman Road. It is recommended that the developer construct temporary asphalt pedestrian paths from the site to the intersection of Boeckman Road-Advance Road/SW Stafford Road-

Wilsonville Road, which will serve as a connection until the City builds a permanent sidewalk. This connection from the proposed sidewalks within the development along Boeckman Road to the signal will provide students a safe route to Boeckman Primary School, Meridian Creek Middle School, and Wilsonville High School.

Access Spacing and Sight Distance

The proposed access road along Boeckman Road forms the fourth leg of the intersection of Boeckman Rd and Willow Creek Road. Willow Creek Road is currently spaced approximately 900 feet from SW Stafford Road and approximately 720 feet from SW Laurel Glen Street which conforms with the City's minimum access spacing standards (600 feet) in the TSP[13] for a minor arterial. The proposed access location is consistent with the Frog Pond Area Plan and the Frog Pond West Master Plan.

Prior to occupancy, sight distance at any proposed access points will need to be verified, documented, and stamped by a registered professional Civil or Traffic Engineer licensed in the State of Oregon to assure that buildings, signs or landscaping does not restrict sight distance.

Project Impact Summary

The Frog Pond West Hills development is anticipated to result in the following impacts:

Trip Generation

- The development consists of 50 single-family homes, to be built in a single phase. The development will remove 4 existing homes, for a net increase of 46 homes.
- The development is expected to generate an additional 46 (30 in, 16 out) PM peak hour trips.
- Of the 46 total project trips, 2 new PM peak hour trips are estimated to pass through the I-5/SW Elligsen Road interchange area and 3 PM peak hour trips through the I-5/Wilsonville Road interchange area.

Intersection Operations

- All of the study intersections meet operating standards for “Existing plus Project” and “Existing plus Stage II” scenarios.
- The intersection of Boeckman Road/Canyon Creek Road fails under the “Existing plus Project plus Stage II” scenario.
- Installing a new traffic signal at the intersection of Boeckman Road/Canyon Creek Road as recommended in project UU-01 in the Wilsonville TSP results in this intersection meeting mobility standards. This project should also be coordinated with the future

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[13] City of Wilsonville Transportation System Plan, Table 3-2, Amended June 2016.

planned bridge that will replace the existing Boeckman Road Dip as identified in project UU-01.

Site Plan Evaluation

- The proposed internal roadway network will be consistent with the Frog Pond Area Plan.
- It is recommended that the developer construct a temporary asphalt pedestrian connection along the north side of Boeckman from the proposed sidewalks in the subdivision to the signal at Advance Road to provide students a safe route to Boeckman Primary School, Meridian Creek Middle School, and Wilsonville High School.

Access Spacing and Sight Distance

- The proposed access road along Boeckman Road will conform with the current minimum access spacing standards (600 feet) in the TSP for a minor arterial. The proposed access location is consistent with the Frog Pond West Master Plan.
- Prior to occupancy, sight distance at any existing access points will need to be verified, documented, and stamped by a registered professional Civil or Traffic Engineer licensed in the State of Oregon to assure that buildings, signs or landscaping does not restrict sight distance.

Appendix D

January 2018
West Hills Land Development: Stafford Meadows Residential Development

Wetland Delineation Report

Prepared for West Hills Land Development

January 2018
West Hills Land Development: Stafford Meadows Residential Development

Wetland Delineation Report

Prepared for
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Prepared by
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Project Number: 161015-02.01/161015-01.01
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ABBREVIATIONS

2010 Regional Supplement	*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*
Cowardin classification system	*Classification of Wetlands and Deepwater Habitats of the United States*
bgs	below ground surface
DP	Data Plot
DSL	Oregon Department of State Lands
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
HGM	hydrogeomorphic
LWI	Local Wetlands Inventory
NGVD	National Geodetic Vertical Datum
NOL	not on list
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OAR	Oregon Administrative Rule
OBL	obligate
Oregon HGM classification system	*Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles*
PEM	palustrine emergent
PEM1Fx	palustrine emergent persistent, semipermanently flooded, excavated
PFO	palustrine forested
PHS	Pacific Habitat Services, Inc.
PSS	palustrine scrub-shrub
R5UBH	perennial riverine unconsolidated bottom, permanently flooded
TP	Test Plot
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WETS	Natural Resources Conservation Service Climate Analysis for Wetlands

1 Introduction

Anchor QEA, LLC, was retained by West Hills Land Development to perform a routine-level wetland delineation for a proposed residential development site known as Stafford Meadows Residential Development within the urban growth boundary of the City of Wilsonville, Clackamas County, Oregon (Figure 1). The study area consists of a 16.15-acre site that includes four parcels known as the Pike, Kreilkamp, Wehler, and Killinger properties (Figures 2 and 3). These parcels are located in what is referred to as Area L in the July 2013 City of Wilsonville Community Plan Area (City of Wilsonville 2013), which is now part of the 181-acre Frog Pond West Neighborhood planning area described in the July 2017 *Frog Pond West Master Plan* (City of Wilsonville 2017). Site-specific location information for the study area is as follows:

City/County/State:	Wilsonville, Clackamas County, Oregon
General Location:	Northwest of the intersection of SW Boeckman Road and SW Wilsonville/SW Stafford Road
Tax Lots:	31W12D 02001 (Killinger) 31W12D 02100 (Wehler) 31W12D 02201 (Kreilkamp) 31W12D 02202 (Pike)
Latitude/Longitude[1]:	45.318473° N/-122.747021° W
PLSS:	SE 1/4 of Section 12, Township 3 South, Range 1 West, Willamette Meridian
Street Addresses:	6651 SW Boeckman Road (Killinger) 6875 SW Boeckman Road (Kreilkamp) 7025 SW Boeckman Road (Pike) 6855 SW Boeckman Road (Wehler)
Approximate Areas:	2.00 acres (Killinger) 5.12 acres (Kreilkamp) 5.33 acres (Pike) 3.70 acres (Wehler) Total Area: 16.15 acres
Zoning:	R-7 and R-10 (proposed)
Waterways:	Willow Creek, a tributary to the Willamette River

Note:

1. Latitude and longitude shown are for the approximate centroid of the study area.

This wetland delineation report presents the results of wetland delineation field work performed for the study area on December 6 and 14, 2017. Additional site visits for wetland determination field work were performed on the Pike property on May 3, 2016, and January 17, 2017; on the Wehler and

Kreilkamp properties on October 21, 2016; and on the Killinger property on January 17, 2017. This report describes existing site conditions observed at the time of the site visits, presents the methods used to complete the delineation, and describes each of the wetlands and other waters identified within the study area. Supporting information is provided in the following appendices:

- Appendix A: Historical Aerial Photographs
- Appendix B: Precipitation Data
- Appendix C: Site Photographs
- Appendix D: Wetland Determination Data Forms
- Appendix E: Pike Property Drain Tile Map

2 Project Description

The study area is proposed for a residential development of 46 single-family units that would also include a future development tract for an additional six single-family lots. The proposed development would include single-family residential building lots, residential streets, utilities, landscaping, open space, and a water quality facility. The project has been designed to be consistent with the recently adopted *Frog Pond West Master Plan* (City of Wilsonville 2017). Access to the proposed development site would be provided from SW Boeckman Road to the south and from future residential roadways to the east and west.

3 Landscape Setting and Land Use

The study area is situated in the Prairie Terraces subregion of the Willamette Valley ecoregion (Thorson et al. 2003). This subregion is characterized by level to undulating topography drained by low gradient, meandering streams and rivers; poorly drained soils derived from fluvial geologic deposits from the Missoula floods; and a mild climate with cool, wet winters, warm, dry summers, and a mean annual precipitation of 40 to 50 inches (Watershed Professionals Network 1999). Hydrologically, the study area is located in the Coffee Lake Creek watershed (hydrologic unit code 170900070402) of the Willamette River basin (USGS 2017a).

3.1 Study Area Description

3.1.1 Study Area Location

The 16.15-acre study area is located on tax lots 31W12D 02001, 31W12D 02100, 31W12D 02201, and 31W12D 02202 in Wilsonville, Oregon (Figures 2 and 3). The study area is located in the Frog Pond West Neighborhood of the Frog Pond West Master planning area, a 181-acre area added to the urban growth boundary in 2002, located west of SW Stafford Road and north of SW Boeckman Road in East Wilsonville.

3.1.2 Study Area Conditions and Land Use

The current conditions and land use of the study area are depicted in the 2017 aerial photograph provided in Figure 3. As indicated in the photograph, the Killinger property includes a rural residence, a shop, and associated landscaping with an active agricultural field (e.g., pasture and grassland) in the eastern portion. The Wehler property includes a rural residence, sheds, and associated landscaping surrounded by an actively managed Christmas tree farm in the eastern and western portions. On the Kreilkamp property, land use includes a rural residence, a shed and associated landscaping, fallow pasture in the central and northwestern portions, forested areas in the southern and western portions, and a narrow row of trees along the northern property boundary. The Pike property includes a rural residence, a parking canopy, a garage, and a horse barn in the northwestern portion surrounded by predominantly horse pasture that is rotationally farmed (likely as cut-and-bale hay or alfalfa), including a small domestic fruit orchard in the southwest portion. Small forested areas are present in the southeast and northeast portions of the Pike property, with a narrow band of trees located along the northwestern property boundary and a primarily herbaceous drainage corridor running from north to south through the property. Access to the study area is currently provided by four private driveways off SW Boeckman Road.

3.1.2.1 Topography and On-Site Drainage

Topography on the site is generally flat, except for a gentle slope that runs from northeast to southwest on the Kreilkamp and Wehler properties toward Willow Creek and another gentle slope that runs from west to east toward Willow Creek on the Pike property. Elevations range from approximately 235 feet National Geodetic Vertical Datum (NGVD) to 215 feet NGVD across the study area (Figure 4; USGS 2017b). Surrounding topography is also generally flat with elevations gradually sloping from north to south. The majority of the study area drains to Willow Creek, which flows from north to south through the Pike property and drains to the Willamette River approximately 1.2 miles to the south of the study area.

3.1.2.2 Vegetation

The study area contains a mix of forested, scrub-shrub, and herbaceous vegetation. Table 1 summarizes typical vegetation observed within the study area at the time of the site visit including their individual wetland indicator status according to *National Wetland Plant List: 2016 Wetland Ratings* (Lichvar et al. 2016). Typical vegetation observed on each of the four properties is discussed further in the following sections.

Table 1
Typical Vegetation Observed within the Study Area

Common Name	Scientific Name	Wetland Indicator Status[1]
Alaska brome	*Bromus sitchensis*	NOL
Alfalfa	*Medicago sativa*	UPL
American water plantain	*Alisma plantago-aquatica*	OBL
Beaked hazelnut	*Corylus cornuta*	FACU
Bentgrass species	*Agrostis* spp.	UPL to FACW
Bing cherry	*Prunus avens*	NOL
Bitter cherry	*Prunus emarginatus*	FACU
Bluegrass species	*Poa* spp.	FACU to OBL
Canada thistle	*Cirsium arvense*	FAC
Cascara false buckthorn	*Frangula purshiana*	FAC
Colonial bentgrass	*Agrostis capillaris*	FAC
Common dandelion	*Taraxacum officinale*	FACU
Common duckweed	*Lemna minor*	OBL
Common hawthorn	*Crataegus monogyna*	FAC
Common plantain	*Plantago major*	FAC
Common selfheal	*Prunella vulgaris*	FAC
Common velvetgrass	*Holcus lanatus*	FAC
Creeping buttercup	*Ranunculus repens*	FAC
Creeping yellowcress	*Rorippa sylvestris*	OBL
Cultivated apple tree	*Malus* spp.	--
Dense sedge	*Carex densa*	OBL
Douglas fir	*Pseudotsuga menziesii*	FACU
Dwarf Oregon-grape	*Mahonia nervosa*	FACU
English holly	*Ilex aquifolium*	FACU
English plantain	*Plantago lanceolata*	FACU
European centaury	*Centuriums erythraea*	FAC
Fescue species	*Festuca* spp.	UPL to FAC
Field bindweed	*Convolvulus arvensis*	NOL
Fringed willowherb	*Epilobium ciliates*	FACW
Giant sequoia	*Sequoiadendron giganteum*	NOL
Hairy cat's ear	*Hypochaeris radicata*	FACU
Himalayan blackberry	*Rubus armeniacus*	FAC
Indian plum	*Oemleria cerasiformis*	FACU
Lupine species	*Lupinus* spp.	FACU to FAC

Common Name	**Scientific Name**	**Wetland Indicator Status**[1]
Mannagrass	*Glyceria striata*	OBL
Meadow foxtail	*Alopecurus pratensis*	FAC
Mustard species	Various genera.	--
Norway spruce	*Picea abies*	NOL
Ox-eye daisy	*Leucanthemum vulgare*	FACU
Paper birch	*Betula papyrifera*	FAC
Ponderosa pine	*Pinus ponderosa*	FACU
Queen Anne's lace	*Daucus carota*	FACU
Red fescue	*Festuca rubra*	FAC
Red pine	*Pinus resinosa*	NI
Reed canarygrass	*Phalaris arundinacea*	FACW
Scouler's willow	*Salix scouleriana*	FAC
Shiny geranium	*Geranium lucidum*	NOL
Soft rush	*Juncus effusus*	FACW
Tansy ragwort	*Jacobaea vulgaris*	FACU
Tall fescue	*Schedonorus arundinaceus*	FAC
Trailing blackberry	*Rubus ursinus*	FACU
Various fir species	*Abies* spp.	--
Various pine species	*Pinus* spp.	--
Water parsley	*Oenanthe sarmentosa*	OBL
Western dock	*Rumex occidentalis*	FACW
Western red cedar	*Thuja plicata*	FAC
Western swordfern	*Polystichum munitum*	FACU
White clover	*Trifolium repens*	FAC
Wild rose	*Rosa* spp.	UPL to FAC
Willow hybrid	*Salix* spp. (hybrid ornamental)	FAC to OBL

Notes:

1. Wetland indicator status based on the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016).

--: not applicable
FAC: facultative
FACU: facultative upland
FACW: facultative wetland
NI: no indicator status
NOL: not on list (species is not listed on the 2016 National Wetland Plant List)
OBL: obligate
UPL: upland

3.1.2.2.1 Typical Vegetation on the Killinger Property

Typical vegetation surrounding the residential home on the Killinger property includes red pine, Douglas fir, and American elm (*Ulmus americana*) trees, along with several patches of Himalayan blackberry. The agricultural field in the eastern portion is dominated by various grass hay species (fescues, bentgrasses, and bluegrasses) along with lesser amounts of shiny geranium, western buttercup (*Ranunculus occidentalis*), common plantain, hairy cat's ear, and tansy ragwort.

3.1.2.2.2 Typical Vegetation on the Wehler Property

In the actively managed Christmas tree farm portions of the Wehler property, various true fir, spruce, and pine tree species are currently planted, along with Douglas fir trees. The rural residential home is surrounded by a mix of native and non-native deciduous and coniferous trees and shrubs, and a maintained lawn; giant sequoia are present along the driveway.

3.1.2.2.3 Typical Vegetation on the Kreilkamp Property

In the western portion of the Kreilkamp property, typical tree species along the driveway and near the house include Norway spruce, ponderosa pine, Douglas fir, and willow, with an understory of Cascara false buckthorn and common hawthorn saplings, Himalayan blackberry, and Western swordfern. Two western red cedar trees are also adjacent to the house, along with various native and non-native trees and shrubs. Red pine trees are present along the northern property boundary with a thin understory of Cascara false buckthorn saplings and Himalayan blackberry. A few common hawthorn trees and saplings are present along the eastern fence line and in the fallow pasture, which also contains a ponderosa pine tree surrounded by a few Cascara false buckthorn saplings and Himalayan blackberry patches. The forested patch in the southern portion or the Kreilkamp property is predominantly red pine trees with some Douglas fir trees and a sparse understory of Cascara false buckthorn saplings and Indian plum. The fallow pasture is dominated by red fescue with lesser amounts of field bindweed, common velvetgrass, and colonial bentgrass, along with a very small percentage of alfalfa, Canada thistle, and western dock.

3.1.2.2.4 Typical Vegetation on the Pike Property

Douglas fir trees are present along the northwestern boundary of the Pike property. Vegetation observed in the northeastern and southeastern portions includes Douglas fir, ponderosa pine, and paper birch trees, as well as bitter cherry saplings, wild rose, and Himalayan blackberry. A small orchard of domestic fruit trees is present in the southwestern portion. The pasture contains predominantly grass hay species (fescues, bentgrasses, and bluegrasses), along with Queen Anne's lace, white clover, hairy cat's ear, shiny geranium, English plantain, common selfheal, lupine, ox-eye daisy, common dandelion, and trailing blackberry. Typical vegetation present within and around the stream channel that flows from north to south through the property includes American water plantain, water foxtail (*Alopecurus geniculatus*), water parsley, mannagrass, common duckweed, dense sedge, fringed willowherb, western dock, creeping buttercup, Alaska brome, and meadow foxtail, along with a few wild rose shrubs growing in portions of the channel.

3.2 Existing Data Review

Potential wetlands and other non-wetland waters were identified in the study area prior to field work using the following sources:

- U.S. Geological Survey (USGS) Canby and Sherwood Quadrangles, Oregon, 7.5-Minute Series (USGS 2017b)
- U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) Wetlands Mapper (USFWS 2017; Figure 5)
- City of Wilsonville Local Wetlands and Riparian Corridor Inventory (FES 1999) (Figure 6)[1]
- Pacific Habitat Services, Inc. (PHS) *Wetland Inventory Results - Natural Resources Inventory for the Frog Pond and Advance Road Urban Growth Areas in Wilsonville*. (PHS 2014)
- Natural Resources Conservation Service (NRCS) online Web Soil Survey (NRCS 2017a; Figure 7)
- Historical aerial photographs from the U.S. Army Corps of Engineers (USACE) and Google Earth Pro's Satellite Imagery's Timeline Function (Appendix A)

3.2.1 U.S. Geological Survey Canby and Sherwood Quadrangles

The USGS 7.5-minute geological quadrangle maps for Canby and Sherwood, Oregon (Figure 4), show a stream on the study area and topography generally sloping from northeast to southwest across the study area.

3.2.2 National Wetlands Inventory

The NWI Wetlands Mapper indicates that there is one mapped NWI wetland in the study area: an unknown perennial riverine unconsolidated bottom, permanently flooded water regime (R5UBH) wetland. The location of the R5UBH wetland coincides with the location of the Willow Creek channel.

3.2.3 Local Wetlands Inventory

The project site was not included in the survey area for the 1999 Local Wetland Inventory (LWI) that was prepared for the City of Wilsonville by Fishman Environmental Services (FES 1999); however, the off-site portion of Willow Creek to the south of the project site is shown on the LWI but is identified as a tributary to Meridian Creek (Figure 6). The stream segment that receives water from the project site is identified as "R2.15" and is described in the LWI as a relatively narrow, shallow intermittent stream that is bordered by upland vegetation.

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[1] The study area is not included in any currently approved or pending local wetlands inventories.

3.2.4 Pacific Habitat Services Wetland Inventory

PHS conducted an inventory of wetlands, tree groves, and riparian areas within the Frog Pond and Advance Road Urban Growth Areas planning areas and documented that study in an April 8, 2014 report prepared for the City of Wilsonville. Through routine off-site and on-site determination methodologies, PHS inventoried approximately 30.14 acres of potentially jurisdictional wetlands within the two planning areas. Of those, only 1 wetland (Wetland 10) was determined to be locally significant. The City of Wilsonville adopted PHS's inventory and assessment of locally significant wetlands into the Frog Pond West Master Plan, such that only Wetland 10 and waterways and riparian areas became part of the City's mapped Significant Resource Overlay Zone (SROZ). The PHS inventory map shows tree grove areas and a portion of a waterway and wetland (Wetland 5) on the study area. The mapped tree groves correspond to the location of the forested area present in the southern portion of the Kreilkamp property and in the northeast corner of the Pike property. The location of the mapped waterway corresponds with the location of Willow Creek on the Pike property, and the creek's associated riparian wetland and the wetland in the northeast portion of the Kreilkamp property correspond with a small portion of Wetland 5.

3.2.5 Soil Survey Information

The NRCS online Web Soil Survey (NRCS 2017a) maps three soil types within the study area (Figure 7): Aloha silt loam, 0 to 3% slopes; Aloha silt loam, 3 to 6% slopes; and Concord silt loam. Table 2 summarizes the soil mapping information for the study area. Of these soil types, Concord silt loam is classified as a hydric soil. The remaining soil types on the study area are considered non-hydric but are known to contain potential inclusions of hydric soils in low areas and swales.

Table 2
Soils Mapped within the Study Area by the Clatsop County Soil Survey

Map Unit	Soil Type Name	Drainage Class	Hydrologic Soil Group[1]	Hydric Rating	Hydric Inclusions[2]	Acres
1A	Aloha silt loam, 0 to 3% slopes	Somewhat poorly drained	C/D	5	Yes	13.30
1B	Aloha silt loam, 3 to 6% slopes	Somewhat poorly drained	C/D	5	Yes	0.52
21	Concord silt loam	Poorly drained	C/D	93	Yes	2.35

Notes:

1. Hydrologic soil groups are based on runoff potential according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.
   i. Group C soils have slow infiltration rates when thoroughly wet, caused by either an underlying layer that impedes the downward movement of water or soils of moderately fine or fine texture.
   ii. Group D soils have a very slow infiltration rate (high runoff potential) when thoroughly wet and include soils consisting of clays with high shrink-swell potential, soils that have a high water table, soils that have a clay or claypan layer at or near the surface, and soils that are shallow over nearly impervious material.
2. Non-hydric soils may have inclusions of hydric soil (Huberly and Dayton) in the lower positions on the landform.

3.2.6 Historical Aerial Photographs

A series of historical aerial images (Appendix A) obtained from USACE Portland District (1936, 1953, 1976, 1983, and 1996) and Google Earth Pro (2003, 2004, 2008, 2012, and 2016) were examined to determine previous land use and site alterations in the study area. These images were also examined for evidence of wetlands and other waters in the study area and on adjacent properties.

Historical aerial photographs indicate that by 1936, the majority of the study area and much of the surrounding lands had been cleared and were being used for agricultural purposes (e.g., row crops, pasture, or orchards) and rural residences (Appendix A, Photo A1). Prior to 1936 and through 1953, the Pike, Kreilkamp, Wehler, and Killinger properties were occupied by a large, contiguous agricultural field bisected by a narrow, linear drainage (Willow Creek) running from north to south through the Pike property and continuing south of SW Boeckman Road (Appendix A, Photos A1 and A2). The 1936 photograph also shows a narrow, channelized feature that runs from the northeast corner of the Kreilkamp property southwest towards Willow Creek on the Pike property, as well as a potential farm vehicle tract running from northwest to southeast through the Pike property towards Willow Creek and towards what appears to be an excavated depression in the south-central portion of the Pike property. While these two latter features are no longer visible in the 1953 photograph, the drainage running from northeast to southwest through the Kreilkamp and Pike properties now appears to be a wider, less channelized feature that becomes less evident in the 1976 photograph (Appendix A, Photo A3). The 1976 photograph also shows rural residences and associated infrastructure (e.g., driveways, outbuildings) present on the Wehler and Killinger properties and additional rural development surrounding the study area. In the 1983 photograph, a rural residence and driveway is visible in the northwestern and western portions of the Kreilkamp property, including a patchy forested area along the driveway and a narrow band of planted trees along the driveway of the Wehler property (Appendix A, Photo A4). By the time of the 1996 photograph, a rural residence was constructed on the Pike property, and a narrow trees grove is visible along the southern portion of the Kreilkamp property (Appendix A, Photo A5). By this time, agricultural practices have transitioned from predominantly row crops to grass hay species and pastureland on the majority of the study area except land use on the Wehler property has transitioned to silviculture. Also visible in the 1996 photograph is a dark, linear signature running from northeast to southwest through the pasture on the Kreilkamp property that may be the potential location of drain tile. No other major changes in land use on any of these properties are apparent in these photographs.

Between 1996 and 2017, only minor changes in conditions or land use occur on the study area (Appendix A, Photos A6 through A10). Sometime between 2002 and 2003, a horse barn and corral were constructed on the Pike property. In the summer of 2004, the agricultural field to the north of the Kreilkamp property expanded crop production further to the east, potentially indicative of drier field conditions where older photos showed signatures of wetter conditions on the parcels northeast of the Kreilkamp property. The 2008 photograph shows that the large building in the southwest portion of the Kreilkamp is no longer present, and the 2012 photograph shows evidence of cattle presence in the Kreilkamp pasture. The 2016 photograph shows very little change in conditions or land use on the study area, other than harvesting or thinning of the Christmas trees on the Wehler property.

4 Site Alterations

According to the 1851 Historic Oregon Land Use and Land Cover data provided on the Oregon Explorer – Map Viewer (OSU 2017a), the study area was historically occupied by oak woodlands dominated by Oregon white oak (*Quercus garryana*) that may have also included ponderosa pine, California black oak (*Quercus kelloggii*), Douglas fir, and canyon live oak (*Quercus chrysolepis*), with a relatively open understory of shrubs, grasses, and wildflowers.

The Oregon Statewide Composite Historical Vegetation map (OSU 2017b) shows the study area historically located within an oak-conifer savanna. The majority of this cover type was cleared in the late 1800s to early 1900s and replaced by agricultural uses, including row crops, pastures, orchards, and other types of farms.

The study area appears to have been used for growing grass crops (e.g., wheat, hay) from prior to 1936 until sometime before 1976, when portions of the study area were developed with rural homes (Wehler and Killinger properties). Land use does not appear to change substantially between 1976 and 1983, except for the rural development of the Kreilkamp property, which included planting of a grove of trees in the western portion of the property. By 1996, land use on the Wehler property was converted from agriculture to silviculture (Christmas tree farm), and the remaining properties were converted to primarily pasture and cultivation of grass hay species. A small orchard was established in the southwestern portion of the Pike property sometime before 2000, and an additional grove of trees was planted in the southern portion of the Kreilkamp property. Otherwise, only minor changes in land use occurred in the study area between 1996 and 2017.

In 1989, drain tile was installed on the Pike property just west of Willow Creek, as indicated on a drain tile installation provided by Needy Tile Company (Appendix E). In addition, drain tile was installed on the Kreilkamp property by Hostetler Farm Tiling in the mid to late 1980s. While Hostetler Farm Tiling was unable to locate a drain tile map, the land owner (Kreilkamp) who ordered the installation confirmed that an east-west drain tile was placed in the northern portion of the property and a second line was placed running from the northeast corner of the property to the southwest towards the Willow Creek drainage. Although not readily apparent in historical aerial photographs, it is assumed that at some point, drain tile has also been installed on portions of the Wehler and Killinger properties.

No other major site alterations occurred in the study area during the years depicted in the available historical imagery.

5 Precipitation Data and Analysis

To provide additional information on the hydrologic conditions of the study area, precipitation data were acquired from the National Weather Service's Portland, Oregon, weather station (NWS 2017; Appendix B) for the day of the site visit, 1 day prior to the site visit, and 2 weeks prior to the site visit (Table 3). Table 4 shows the percent of normal rainfall received for the water year (October 1 to September 30) at the Portland, Oregon, weather station at the time of the site visit. Table 5 provides a determination of whether the precipitation recorded for the 5 months preceding the site visit is within the 30th to 70th percentile normal range listed in the NRCS Climate Analysis for Wetlands (WETS) Table for WETS Station N WILLAMETTE EXP STN, weather probability analysis (NRCS 2017b; Appendix B).

Table 3
Precipitation Data for the Study Area Site Visit

Date of Site Visit	Actual Precipitation on Day of Visit (inches)[1]	Actual Precipitation 1 Day Prior to Visit (inches)[1]	Actual Precipitation 2 Weeks Prior to Visit (inches)[1]
5/3/2016	0.09	0.00	0.82
10/21/2016	0.48	0.26	5.46
1/17/2017	0.70	0.00	1.55
12/6/2017	0.00	0.00	1.95
12/14/2017	0.00	0.00	0.44

Note:

1. Precipitation data obtained from the National Weather Service's Portland, Oregon, weather station (NWS 2017; Appendix B).

Table 4
Percent of Normal Rainfall for the Water Year for the Study Area Site Visit

Date of Site Visit	Actual Precipitation Since October 1 of Previous Year (inches)[1]	Normal Value for Water Year (inches)[1]	Departure from Normal (inches)	Percent of Normal
5/3/2016	41.44	29.30	12.14	141
10/21/2016	6.83	1.71	5.12	399
1/17/2017	22.05	16.95	5.10	130
12/6/2017	11.38	9.82	1.56	116
12/14/2017	11.38	11.25	0.13	101

Note:

1. Precipitation data for the water year obtained from the National Weather Service's Portland, Oregon, weather station (NWS 2017; Appendix B).

Table 5
Monthly Percent of Normal Precipitation for the 5 Months Prior to Study Area Site Visit

Month	Actual Monthly Precipitation (inches)[1]	30th to 70th Percentile Normal Range (inches)[2]	Within 30th to 70th Percentile Normal Range
December 2015	15.24	4.69 to 8.43	No, above normal
January 2016	7.23	3.99 to 7.51	Yes
February 2016	4.10	2.96 to 5.47	Yes
March 2016	4.73	3.05 to 4.92	Yes
April 2016	1.96	1.97 to 3.59	No, slightly below normal
May 2016	1.72	1.51 to 2.80	Yes
June 2016	1.42	0.97 to 2.03	Yes
July 2016	0.66	0.21 to 0.71	Yes
August 2016	0.09	0.22 to 0.87	No, below normal
September 2016	1.69	0.85 to 2.00	Yes
October 2016	8.31	1.98 to 4.14	No, above normal
November 2016	6.83	4.34 to 7.42	Yes
December 2016	4.61	4.42 to 7.64	Yes
January 2017	4.13	3.99 to 7.51	Yes
July 2017	Trace	0.27 to 0.84	No, below normal
August 2017	0.06	0.22 to 0.98	No, below normal
September 2017	2.38	0.85 to 2.00	No, above normal
October 2017	4.57	1.98 to 4.14	No, above normal
November 2017	6.44	4.08 to 7.25	Yes
December 2017	3.09	4.69 to 8.43	No, below normal

Notes:

1. Precipitation data obtained from the National Weather Service's Portland, Oregon, weather station (NWS 2017; Appendix B).
2. Precipitation data obtained from the WETS Table for the Clackamas County, Oregon, WETS Station N WILLAMETTE EXP STN (NRCS 2017b).

At the time of the May 3 and October 21, 2016 and January 17, 2017 site visits, precipitation was substantially above normal for the water year, and while not as marked, precipitation preceding the December 2017 site visits was also above normal for the water year (Table 4). Monthly rainfall recorded during the 5 months preceding the May 3, 2016 site visit was either within or above the 30th to 70th percentile normal range for the area, except for April 2016, when precipitation was slightly below normal (Table 5). Monthly rainfall recorded during the 5 months preceding the October 21, 2016 site visit was either within or below the normal range. For the January 17, 2017 site visit, rainfall recorded during the months of September, November, and December was within the normal range, while August was below normal and October above the normal range. The 5 months preceding the December 2017 visits also had a mix of precipitation amounts within, above, or below the normal range; September, October, and November 2017 precipitation amounts were either within or above the normal range, while the months of July and August 2017 were below normal.

Anchor QEA visited the study area during a broad range of precipitation conditions (i.e., within, above, and below the 30th to 70th percentile normal range for the area), allowing for a greater understanding of local hydrology and thus the ability to find sufficient evidence during the field visits to determine the presence of wetland hydrology.

6 Delineation Methods

Anchor QEA wetland scientists performed wetland delineation field work on December 6 and 14, 2017 and wetland determination field work on May 3, 2016; October 21, 2016; and January 17, 2017. Field work was conducted according to methods presented in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010 Regional Supplement; USACE 2010), and Oregon Administrative Rules (OARs) 141-090-0005 to 141-090-0055. Plant indicator status was determined using the 2016 National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016).

7 Wetlands and Non-Wetland Other Waters

Anchor QEA wetland scientists delineated two wetlands (Wetlands A and B) and one non-wetland other waters (Willow Creek) within the study area (Figure 8 and Figures 9a through 9b). These areas are summarized in Table 6 and described in more detail in the following subsections. Site photographs showing these features are included in Appendix C. Wetland determination data forms are provided in Appendix D.

Table 6
Potential Wetlands and Non-Wetland Other Waters Delineated within the Study Area

Wetlands/ Other Waters	Description	Classification		On-Site Area	
		Cowardin[1]	Oregon Hydrogeomorphic	Square Feet	Acres
Wetland A	Herbaceous riparian wetland	PEM	Slope	3,265	0.075
Wetland B	Forested/scrub-shrub/herbaceous wetland	PFO/PSS/PEM	Slope	11,149	0.256
			Total Area of Wetlands	**14,414**	**0.331**
Willow Creek	Intermittent stream	R4SBC	N/A	3,535	0.081
			Total Area of Wetlands and Non-Wetland Other Waters	**17,949**	**0.412**

Notes:

1. Cowardin classification system (Cowardin et al. 1979) wetland codes:
   PEM: palustrine emergent
   PFO: palustrine forested
   PSS: palustrine scrub-shrub
   R4SBC: riverine, intermittent, stream bed, seasonally flooded

N/A: not applicable

7.1 Wetlands

7.1.1 Wetland A

Wetland A is a 3,265-square-foot (0.075-acre) wetland located within the riparian boundary of Willow Creek on the Pike property and includes a 65-foot linear section that extends along the southeastern property boundary (Figures 8 and 9b). Wetland A was classified as a palustrine emergent (PEM) wetland under the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin classification system; Cowardin et al. 1979) and as a slope wetland under the *Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles* (Oregon HGM classification system; Adamus 2001).

The vegetation, soils, and hydrology of Wetland A are described in the following subsections. Wetland determination data forms are included in Appendix D.

7.1.1.1 Vegetation

Herbaceous vegetation dominates Wetland A and includes primarily facultative (FAC) grass hay species (fescues, bentgrasses, and bluegrasses) and meadow foxtail (FAC), along with white clover (FAC), creeping buttercup (FAC), English plantain (facultative upland [FACU]), common dandelion (FACU), Queen Anne's lace (FACU), and several unidentified mustard species (various genera). A small amount of wild rose and trailing blackberry are also present, but there are no trees in Wetland A. Overall, the vegetation in Wetland A meets the Dominance Test hydrophytic vegetation indicator and satisfies the hydrophytic vegetation criteria of the 2010 Regional Supplement.

7.1.1.2 Soils

Soils in Wetland A are mapped as Concord silt loam, a soil type that is classified as hydric. Upon inspection, the predominant texture was confirmed to be silt loam.

7.1.1.2.1 Data Plot 01

Data Plot 01 (DP-01) is located along the northeastern boundary of Wetland A (Figures 8 and 9b). Four distinct layers were observed in the soil profile, with the uppermost layer extending to 3 inches below ground surface (bgs), a second layer extending from 3 to 8 inches bgs, a third layer extending from 8 to 12 inches bgs, and the lowermost layer extending from 12 to 16 inches bgs. The matrix color observed in the upper layer was 10YR 3/2 (very dark grayish brown) with no evidence of redoximorphic concentrations. The second layer exhibited the same matrix color but with 5% to 15% 7.5YR 5/8 (strong brown) redoximorphic concentrations in the matrix and along pore linings (i.e., oxidized rhizospheres along living roots). The third layer exhibited similar redoximorphic concentrations (2% to 20%) in the matrix and along pore linings but with a matrix color of 10YR 4/2 (dark grayish brown). The lowermost soil layer had a matrix color of 10YR 4/1 (dark gray) with 10YR 6/8 (brownish yellow) redoximorphic concentrations occurring in the matrix at abundancy of 10%. The soil sample met the Depleted Matrix (F3) and Redox Dark Surface (F6) hydric soil indicators, satisfying the hydric soil criteria of the 2010 Regional Supplement.

7.1.1.2.2 Data Plot 03

DP-03 is located along the southwestern boundary of Wetland A (Figures 8 and 9b). Three distinct layers were noted in the soil profile, with the uppermost layer extending to 3 inches bgs, a middle layer extending from 3 to 10 inches bgs, and the lowermost layer extending from 10 to 16 inches bgs. The matrix color observed in the upper layer was 10YR 3/2 (very dark grayish brown) with 2% 7.5YR 5/8 (strong brown) redoximorphic concentrations in the matrix. The matrix color of the middle layer was 10YR 4/2 (dark grayish brown) with concentrations of 7.5YR 5/8 (strong brown) and 2.5YR 4/6 (red) in the matrix (5% to 10%) and along pore linings (10%). The lowermost soil layer had a matrix color of 10YR 4/2 (dark grayish brown) with 7.5YR 6/8 (reddish yellow) redoximorphic concentrations occurring in the matrix at abundancy of 5%. The soil sample met the Depleted Matrix (F3) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

7.1.1.2.3 Data Plot 15

DP-15 is located along the southeastern boundary of Wetland A (Figures 8 and 9b). Three distinct layers were noted in the soil profile, with the uppermost layer extending to 4 inches bgs, a middle layer extending from 4 to 8 inches bgs, and the lowermost layer extending from 8 to 16 inches bgs. The matrix color observed in the upper layer was 10YR 3/2 (very dark grayish brown) with no evidence of redoximorphic concentrations in the matrix or along pore linings. The matrix color of the middle layer was also 10YR 3/2 with concentrations of 10YR 6/8 (brownish yellow), 7.5YR 6/8 (reddish yellow), and 2.5YR 3/4 (dark reddish brown) at combined abundancy of 15% in the matrix. Concentrations of 2.5YR 3/4 along pore linings (2%) were also observed in this layer. The lowermost soil layer had a matrix color of 10YR 5/1 (gray) with 7.5YR 6/8 (reddish yellow) and 5YR 6/8 (reddish yellow) redoximorphic concentrations occurring at combined abundancy of 10% in the matrix. The soil sample met the Depleted Matrix (F3) and the Redox Dark Surface (F6) hydric soil indicators, satisfying the hydric soil criteria of the 2010 Regional Supplement.

7.1.1.3 Hydrology

As discussed in the site alterations section, the hydrology of the western portion of the Pike property has been manipulated by installation of plastic drain tile in 1989, which continues to function successfully to drain water towards the southern end of the pasture and then east into Willow Creek. Within Wetland A, wetland hydrology was confirmed by the presence of oxidized rhizospheres along living roots (Primary Wetland Hydrology Indicator C3). The water regime of Wetland A was determined to be seasonally flooded/saturated with overland flow, seasonal high water table, direct precipitation, and overbank flows from Willow Creek during storm events being the primary hydrologic sources.

7.1.1.4 Boundary Determination

The wetland/upland boundary of Wetland A was determined by a slight change in topography and the presence/absence of the wetland hydrology indicator oxidized rhizospheres along living roots.

7.1.2 Wetland B

The on-site portion of Wetland B is an 11,149-square-foot (0.256-acre) isolated wetland located in the northeastern portion of the study area on the Kreilkamp property (Figures 8 and 9a). This wetland was classified as a palustrine forested (PFO)/palustrine scrub-shrub (PSS)/PEM wetland under the Cowardin classification system (Cowardin et al. 1979) and as a slope wetland under the Oregon HGM classification system (Adamus 2001).

The vegetation, soils, and hydrology of Wetland B are described in the following subsections. Wetland determination data forms are included in Appendix D.

7.1.2.1 Vegetation

Dominant vegetation in the forested portion of Wetland B includes red pine (not on list [NOL]) with a sparse understory of common hawthorn (FAC) saplings and Himalayan blackberry (FAC) in the shrub layer. The herbaceous layer is dominated by red fescue (FAC) with some reed canarygrass (facultative wetland [FACW]) also present. Overall, the vegetation in Wetland B meets the Dominance Test hydrophytic vegetation indicator and satisfies the hydrophytic vegetation criteria of the 2010 Regional Supplement.

7.1.2.2 Soils

Soils in Wetland B are mapped as Aloha silt loam, 0 to 3% slopes, a soil type that is classified as non-hydric but known to contain hydric inclusions. Upon inspection, the predominant texture was confirmed to be a layer of silt loam over compacted roots and fill.

7.1.2.2.1 Data Plots 05, 07, and 09

DP-05, DP-07, and DP-09 are located in the PEM portions of Wetland B (Figures 8 and 9a). Three distinct layers were noted in the soil profile, with the uppermost layer extending to 5 inches bgs, a middle layer extending from 5 to 10 inches bgs, and the lowermost layer extending from 10 to 16 inches bgs. The matrix color observed in the upper layer was 10YR 4/2 (dark grayish brown) with no redoximorphic concentrations present. The middle layer exhibited the same matrix color but with 15% to 20% concentrations of 2.5YR 3/4 (dark reddish brown) and 2.5YR 3/6 (dark red) in the matrix and along pore linings. The lowermost soil layer had a matrix color of 10YR 4/1 (dark gray) with 10% to 20% of the same color redoximorphic concentrations occurring in the matrix. The soil sample met the Depleted Matrix (F3) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

7.1.2.2.2 Data Plot 11

DP-11 is located in the predominantly PFO/PSS portions of Wetland B (Figures 8 and 9a). Three distinct layers were observed in the soil profile, with the uppermost layer extending to 5 inches bgs, a middle layer extending from 5 to 12 inches bgs, and the lowermost layer extending from 12 to 16 inches bgs. The matrix color observed in the upper layer was 10YR 4/2 (dark grayish brown) with 2% redoximorphic concentrations present in the matrix. The middle layer exhibited the same matrix color but with 15% concentrations of 2.5YR 3/4 (dark reddish brown) and 2% concentrations of 7.5YR 5/8 (strong brown) in the matrix. The lowermost soil layer had a matrix color of 10YR 4/1 (dark gray) with 5% 7.5YR 5/8 (strong brown) redoximorphic concentrations occurring in the matrix. The soil sample met the Depleted Matrix (F3) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

7.1.2.2.3 Data Plot 13

DP-13 is located in the predominantly PSS portion of Wetland B (Figures 8 and 9a). Three distinct layers were observed in the soil profile, with the uppermost layer extending to 3 inches bgs, a middle layer extending from 3 to 10 inches bgs, and the lowermost layer extending from 10 to 16 inches bgs. The matrix color observed in the upper layer was 10YR 3/2 (very dark grayish brown) with 2% redoximorphic concentrations of 7.5YR 5/8 (strong brown) in the matrix. The middle layer exhibited a matrix color of 10YR 4/2 (dark grayish brown) with 5% to 10% concentrations of 2.5YR 4/6 (red) and 7.5YR 5/8 (strong brown) in the matrix and along pore linings. The lowermost soil layer had the same matrix color with 5% 7.5YR 6/8 (reddish yellow) redoximorphic concentrations occurring in the matrix. The soil sample met the Depleted Matrix (F3) hydric soil indicator, satisfying the hydric soil criteria of the 2010 Regional Supplement.

7.1.2.3 Hydrology

As discussed in the site alterations section, the hydrology of the Kreilkamp property has been manipulated by installation of plastic drain tile in the mid-1980s. As observed during site visits, the drain tile appears to be moderately successful in managing on-site hydrology, as demonstrated by the relatively rapid drop in water table within the wetland following rain events.

Wetland hydrology was confirmed in Wetland B by the presence of a high water table (Primary Wetland Hydrology Indicator A2), saturation (Primary Wetland Hydrology Indicator A3), and oxidized rhizospheres along living roots (Primary Wetland Hydrology Indicator C3). The wetland hydrology indicator Stunted or Stressed Plants (D1) was also observed for DP-11, evidenced by the multi-stem growth habit of red pine in the wetland, which is a sign of growth stress for this tree species. The water regime of Wetland B was determined to be seasonally saturated with overland flow, seasonal high water table, and direct precipitation being the primary hydrologic sources.

7.1.2.4 Boundary Determination

The western and southern wetland/upland boundaries of Wetland B were determined by the presence/absence of wetland hydrology indicators. As shown in Figures 8 and 9a, Wetland B continues off site to the northeast. Due to access restrictions, the off-site portion of Wetland B was not delineated; however, based on aerial imagery, it likely does not extend much farther onto the surrounding properties.

7.2 Non-Wetland Other Waters

7.2.1 Willow Creek

Willow Creek consists of a linear, intermittent stream channel that flows from north to south through the study area on the Pike property (Figures 8 and 9b). The channel originates off site to the north and receives surface water from the surrounding pastures and agricultural fields, and potentially from piped drainage from various drainage tile outlets. The on-site section of Willow Creek stream channel averages 2 to 4 feet wide and approximately 2 to 24 inches deep and is contained within the boundaries of Wetland A. The stream exits the study area through twin 18-inch concrete culverts under SW Boeckman Road and continues southward through a narrow forested/scrub-shrub riparian corridor surrounded by residential development. Willow Creek is a tributary to the Willamette River, approximately 1.2 miles to the south of the study area. The stream channel substrate consists predominantly of fine silts with some medium to coarse sand.

The stream channel on the study area is surrounded by pasture that is regularly grazed by horses. It is dominated by herbaceous vegetation with patches of wild rose growing in portions of the channel. Typical vegetation observed within the channel includes American water plantain, water parsley, common duckweed, mannagrass, creeping yellowcress, and dense sedge. Meadow foxtail dominates immediately adjacent to the channel, along with red fescue, fringed willowherb, and western dock.

Figure 8 shows the ordinary high water mark for Willow Creek, which was flagged in the field during site visits then later professionally surveyed by Otak, Inc. The maximum ordinary high water mark width of the stream on the study area is approximately 12 feet and occurs in the vicinity of the large wild rose shrub in the south-central portion of the channel.

8 Deviation from Local Wetlands Inventory, National Wetlands Inventory, or PHS Wetlands Inventory

There are no LWI data for the study area (Figure 6). The location of the other waters (Willow Creek) and associated riparian wetland (Wetland A) delineated within the study area corresponds to the general location of the R5UBH wetland shown on the NWI map. There is one deviation from the NWI map for the study area: Wetland B on the Kreilkamp property (Figure 5) is not mapped in NWI database. Based on wetland delineation field work, evidence of wetland conditions was observed in this area. Portions of the PHS waterway correspond to the location of Willow Creek, and portions of the PHS Wetland 5 correspond to the location of Wetland A and Wetland B.

9 Mapping Method

Wetland boundary and data plot locations were professionally land surveyed by Otak to an approximate accuracy of 0.1 foot. Survey data were plotted on a base map using AutoCAD, which was then pulled into ArcGIS to create the wetland delineation map shown in Figure 8.

10 Additional Information

Anchor QEA wetland scientists checked both the Oregon Explorer website (OSU 2017c) and the StreamNet Online Mapper (StreamNet 2017) for information on fish habitat and presence both within and near the study area. Neither of these sources indicates that any essential salmonid habitat or fish presence occurs within Willow Creek either in or outside the study area. For the Willamette River, the receiving water for this stream, StreamNet indicates the presence of a number of evolutionarily significant units including fall- and spring-run Chinook salmon (*Oncorhynchus tshawytscha*), summer- and winter-run steelhead (*Oncorhynchus mykiss*), coho salmon (*Oncorhynchus kisutch*), sockeye salmon (*Oncorhynchus nerka*), and white sturgeon (*Acipenser transmontanus*).

11 Results and Conclusions

Anchor QEA wetland scientists delineated two wetlands and one non-wetland other waters within the study area during site visits on May 3 and October 21, 2016, and on January 17 and December 6 and 14, 2017 (Figures 8 and 9a through 9d). The total area of wetlands was estimated to be 14,414 square feet (0.331 acre), and the total area of non-wetland other waters was estimated to be 3,535 square feet (0.081 acre). All of these areas will likely be considered jurisdictional by the Oregon Department of State Lands (DSL) under the Oregon Removal-Fill Law. USACE is also likely to take jurisdiction over these areas under Section 404 of the Clean Water Act. Note that only DSL and USACE can make an official jurisdictional determination for these areas.

12 Disclaimer

This report documents the investigation, best professional judgment, and conclusions of Anchor QEA. It is correct and complete to the best of Anchor QEA's knowledge. It should be considered a Preliminary Determination of wetlands and other waters and used at one's own risk, unless it has been reviewed and approved in writing by DSL in accordance with OARs 141-090-0005 through 141-090-0055. If impacts to wetlands and other waters within the study area are proposed, this report will need to be reviewed and approved in writing by both DSL and USACE, Portland District, in conjunction with the submittal of a Joint Section 404/Removal-Fill Permit Application.

13 References

Adamus, P.R., 2001. *Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles*. Oregon Division of State Lands. February 2001.

City of Wilsonville, 2013. *City of Wilsonville Comprehensive Plan*. Updated July 2013.

City of Wilsonville, 2017. *Frog Pond West Master Plan*. Adopted by Wilsonville City Council, July 17, 2017.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Washington, D.C.: Government Printing Office. December 1979.

Environmental Laboratory, 1987. *Corps of Engineers Wetland Delineation Manual*. Technical Report Y-87-1. U.S. Army Waterways Experiment Station. January 1987.

FES (Fishman Environmental Services), 1999. City of Wilsonville Local Wetlands and Riparian Corridor Inventory. Prepared for the City of Wilsonville. January. Available from: http://docs.dsl.state.or.us/PublicReview/0/doc/863262/Electronic.aspx. Accessed: January 9, 2018.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin, 2016. The National Wetland Plant List: 2016 Wetland Ratings. *Phytoneuron*. 2016(30):1-17.

NRCS (Natural Resources Conservation Service), 2017a. Web Soil Survey. Soil Survey Staff, Natural Resources Conservation Service, U.S. Department of Agriculture. Accessed: October 23, 2017. Available from: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

NRCS, 2017b. WETS Table: N Willamette Exp Stn, OR0595. Accessed: January 10, 2018. Available from: http://agacis.rcc-acis.org/?fips=41005.

NWS (National Weather Service), 2017. Climate Reports for Portland, Oregon. National Oceanic and Atmospheric Administration. Accessed: April 4, 2017. Available from: http://www.weather.gov/climate/index.php?wfo=pqr.

OSU (Oregon State University), 2017a. Oregon Explorer – Map Viewer. Accessed: March 13, 2017. Available from: http://tools.oregonexplorer.info/oe_map_viewer_2_0/viewer.html?Viewer=OE.

OSU, 2017b. Oregon Statewide Composite Historical Vegetation Map. Accessed: June 15, 2017. Available from: http://inr.oregonstate.edu/hvmp/oregon-statewide-historical-vegetation.

OSU, 2017c. Oregon Explorer – Oregon Rapid Wetland Assessment Protocol. Accessed: March 13, 2017. Available from: http://tools.oregonexplorer.info/oe_map_viewer_2_0/Viewer.html?Viewer=orwap.

PHS (Pacific Habitat Services, Inc.), 2014. Memorandum: Wetland Inventory Results – Natural Resources Inventory for Frog Pond and Advance Road Urban Growth Areas in Wilsonville. Prepared for the City of Wilsonville. April 8, 2014. Available from: http://www.ci.wilsonville.or.us/DocumentCenter/View/6280. Accessed: January 9, 2018.

StreamNet, 2017. StreamNet Online Mapper. Accessed: December 5, 2017. Available from: http://psmfc.maps.arcgis.com/apps/webappviewer/index.html?id=3be91b0a32a9488a901c3885bbfc2b0b.

Thorson, T.D., S.A. Bryce, D.A. Lammers, A.J. Woods, J.H. Omernik, J. Kagan, D.E. Pater, and J.A. Comstock, 2003. *Ecoregions of Oregon* (color poster with map, descriptive text, summary tables, and photographs). U.S. Geological Survey (map scale 1:1,500,000).

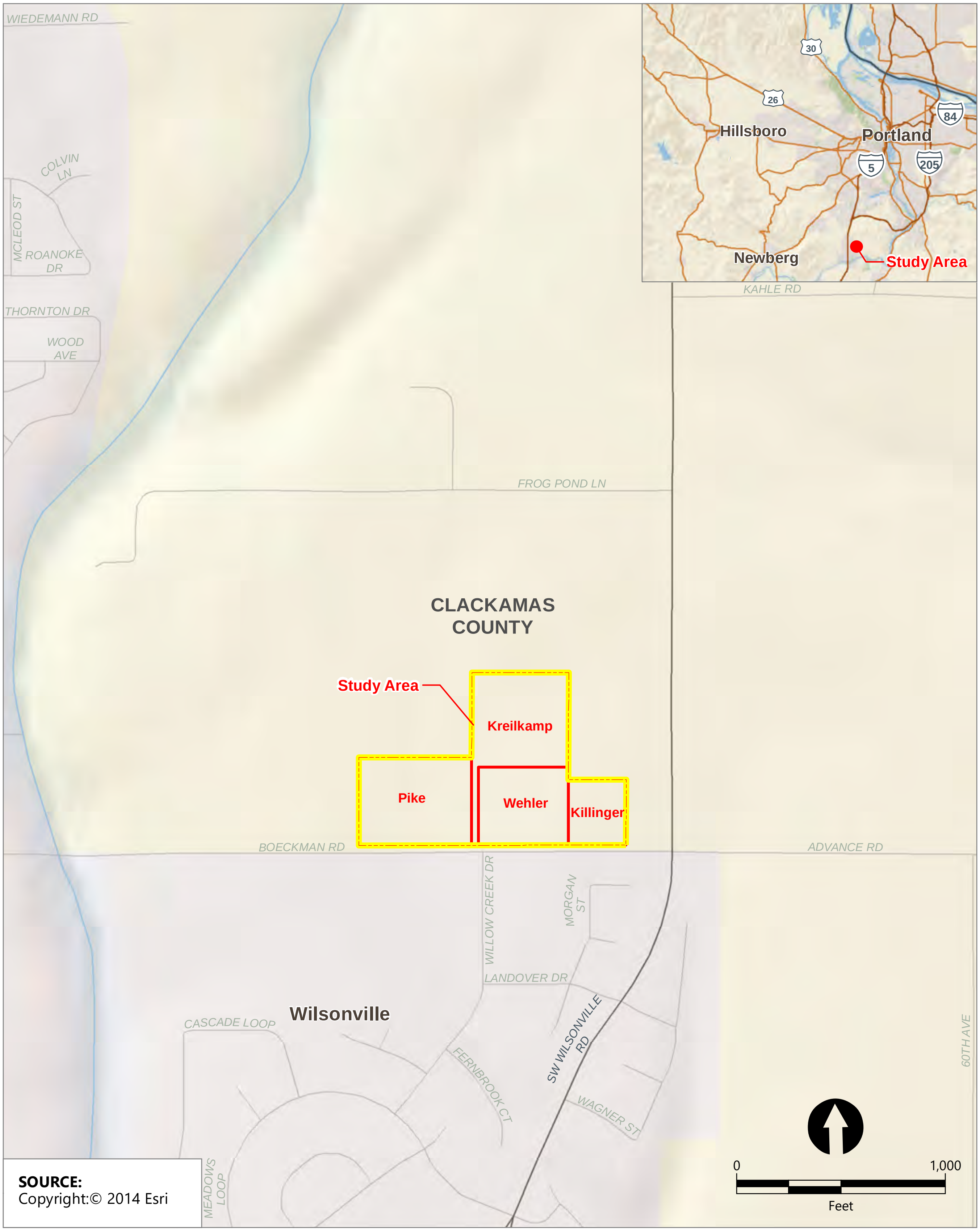
USACE (U.S. Army Corps of Engineers), 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0), edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-10-3. Final Report. U.S. Army Engineer Research and Development Center. May 2010.

USFWS (U.S. Fish and Wildlife Service), 2017. National Wetlands Inventory Wetlands Mapper. Updated: March 20, 2017. Accessed: March 6, 2017. Available from: http://www.fws.gov/wetlands/Data/Mapper.html

USGS (U.S. Geological Survey), 2017a. The National Hydrography Dataset (NHD). Accessed: June 16, 2017. Available from: http://nhd.usgs.gov/data.html.

USGS (U.S. Geological Survey), 2017b. US Topo 7.5-Minute Maps for Canby and Sherwood Quadrangles, Clackamas County, Oregon. U.S. Department of the Interior. U.S. Geological Survey.

Figures



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Publish Date: 2018/01/11, 2:51 PM | User: lhudson
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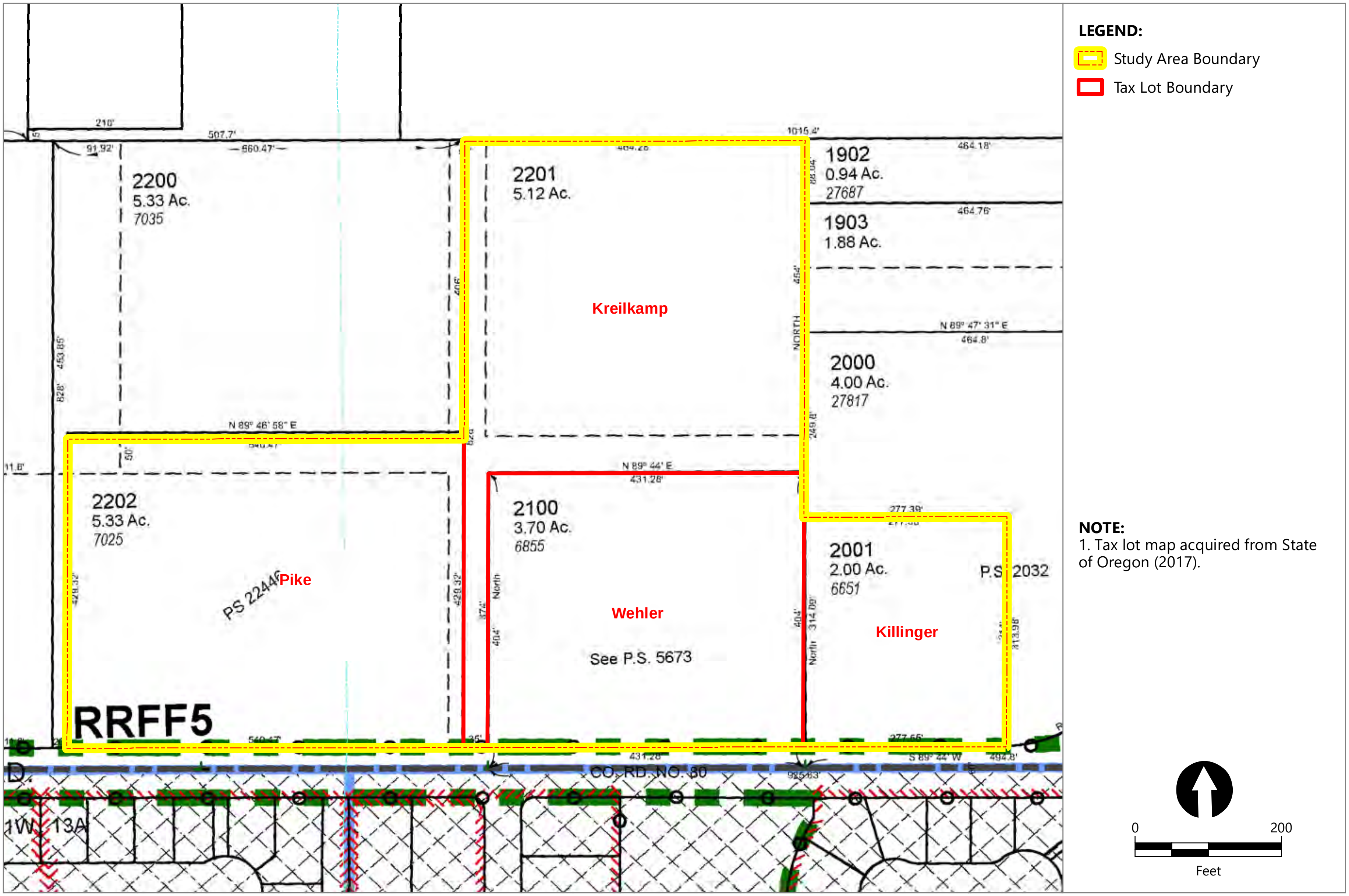
ANCHOR QEA

Figure 1
Site Location Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



NOTE:
1. Tax lot map acquired from State of Oregon (2017).

Publish Date: 2018/01/11, 2:53 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig2_TaxLotMap.mxd

ANCHOR QEA

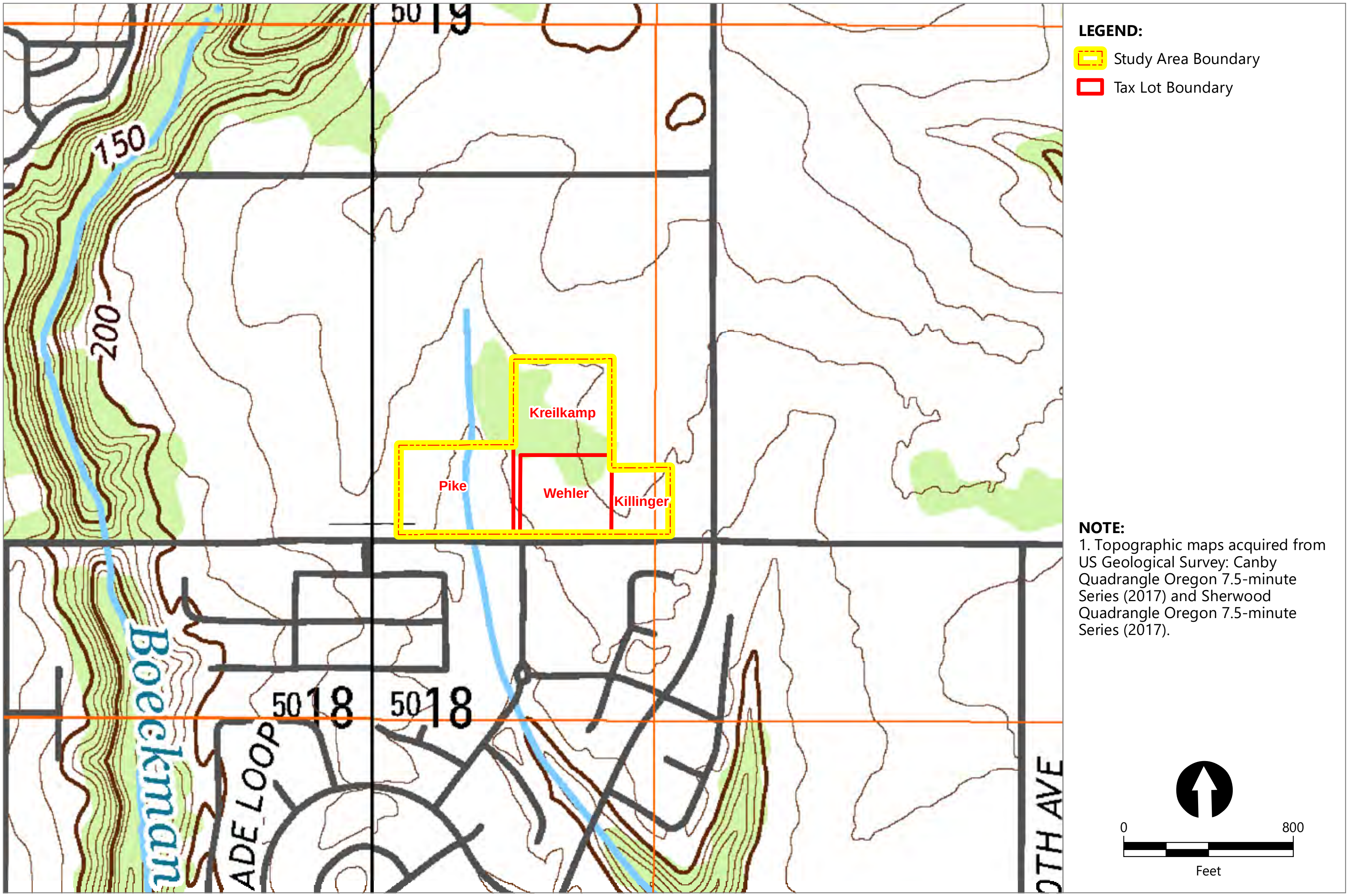
Figure 2
Tax Lot Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

NOTE:
1. Aerial imagery acquired from Google Earth (2017).

Publish Date: 2018/01/11, 2:59 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig3_AerialOverviewMap.mxd

ANCHOR
QEA

Figure 3
2017 Aerial Overview Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



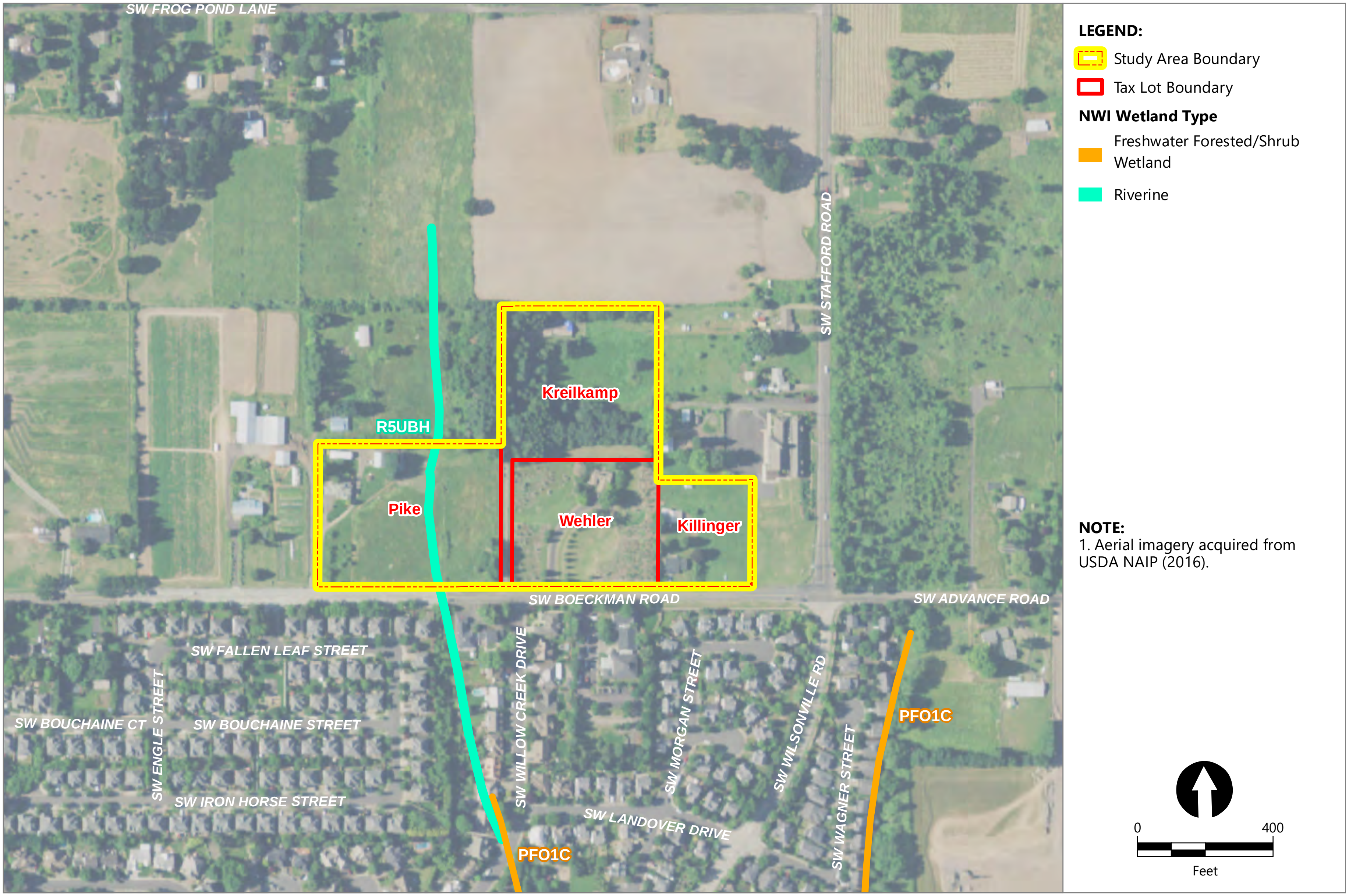
NOTE:

1. Topographic maps acquired from US Geological Survey: Canby Quadrangle Oregon 7.5-minute Series (2017) and Sherwood Quadrangle Oregon 7.5-minute Series (2017).

Publish Date: 2018/01/11, 3:00 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig4_USGStopoMap.mxd

ANCHOR QEA

Figure 4
USGS Topographic Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

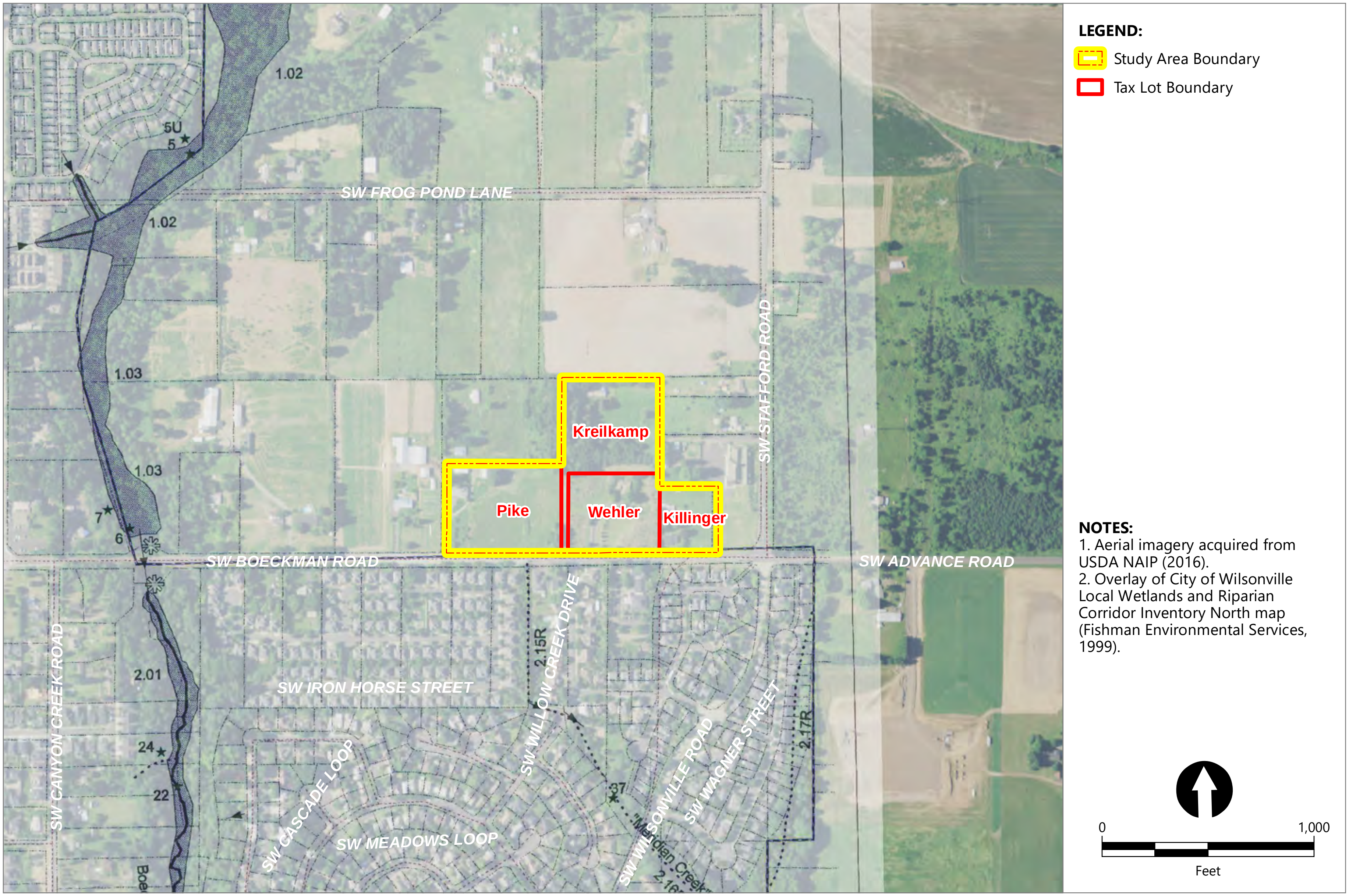


NOTE:
1. Aerial imagery acquired from USDA NAIP (2016).

Publish Date: 2018/01/11, 3:10 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig5_NWImap.mxd

ANCHOR QEA

Figure 5
National Wetlands Inventory Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Study Area Boundary
🟥 Tax Lot Boundary

NOTES:

1. Aerial imagery acquired from USDA NAIP (2016).
2. Overlay of City of Wilsonville Local Wetlands and Riparian Corridor Inventory North map (Fishman Environmental Services, 1999).

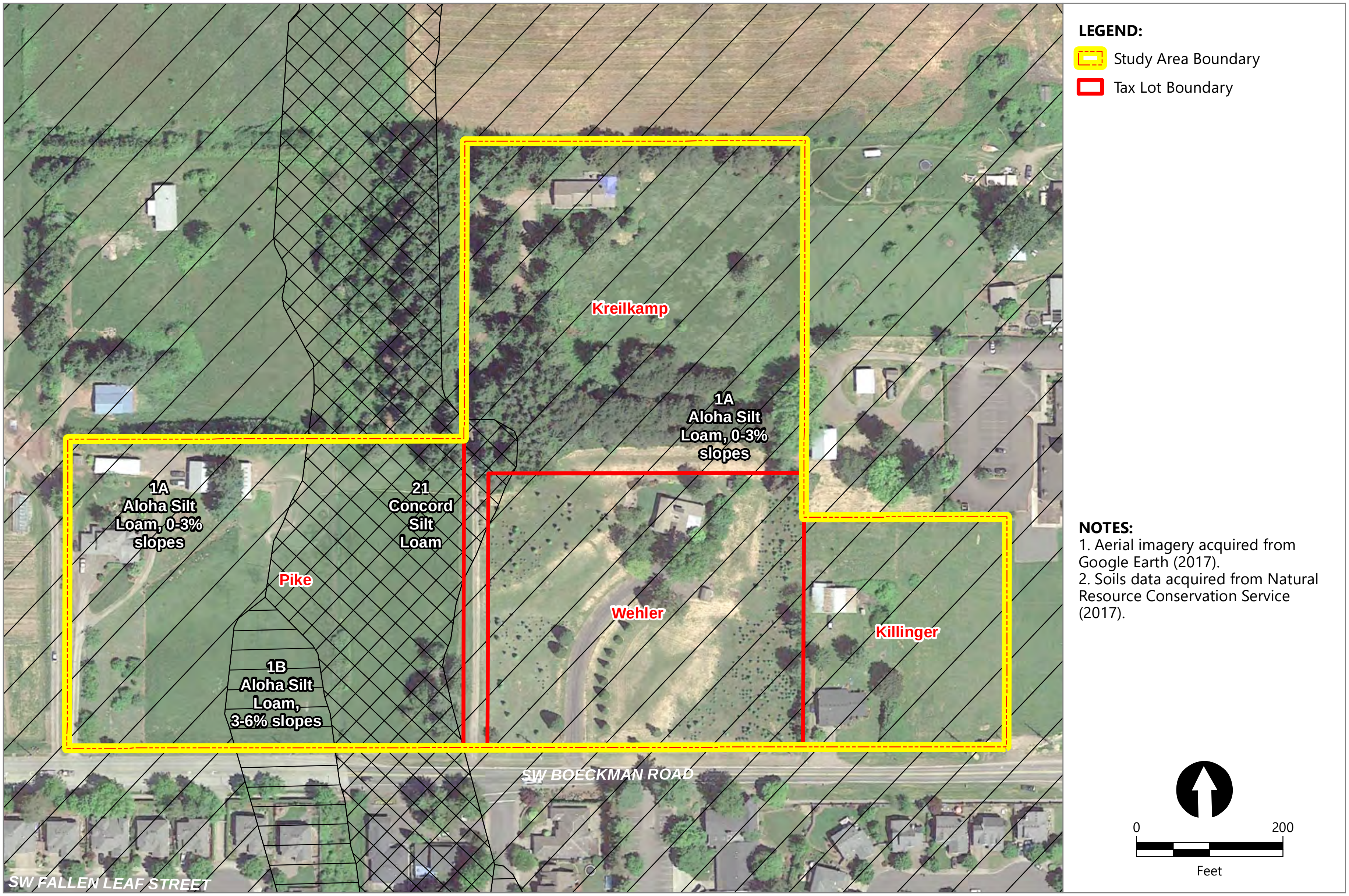
Publish Date: 2018/01/11, 3:11 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig6_LWImap.mxd

ANCHOR QEA

Figure 6

Local Wetlands Inventory Map

Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

- 🟨 Study Area Boundary
- 🟥 Tax Lot Boundary

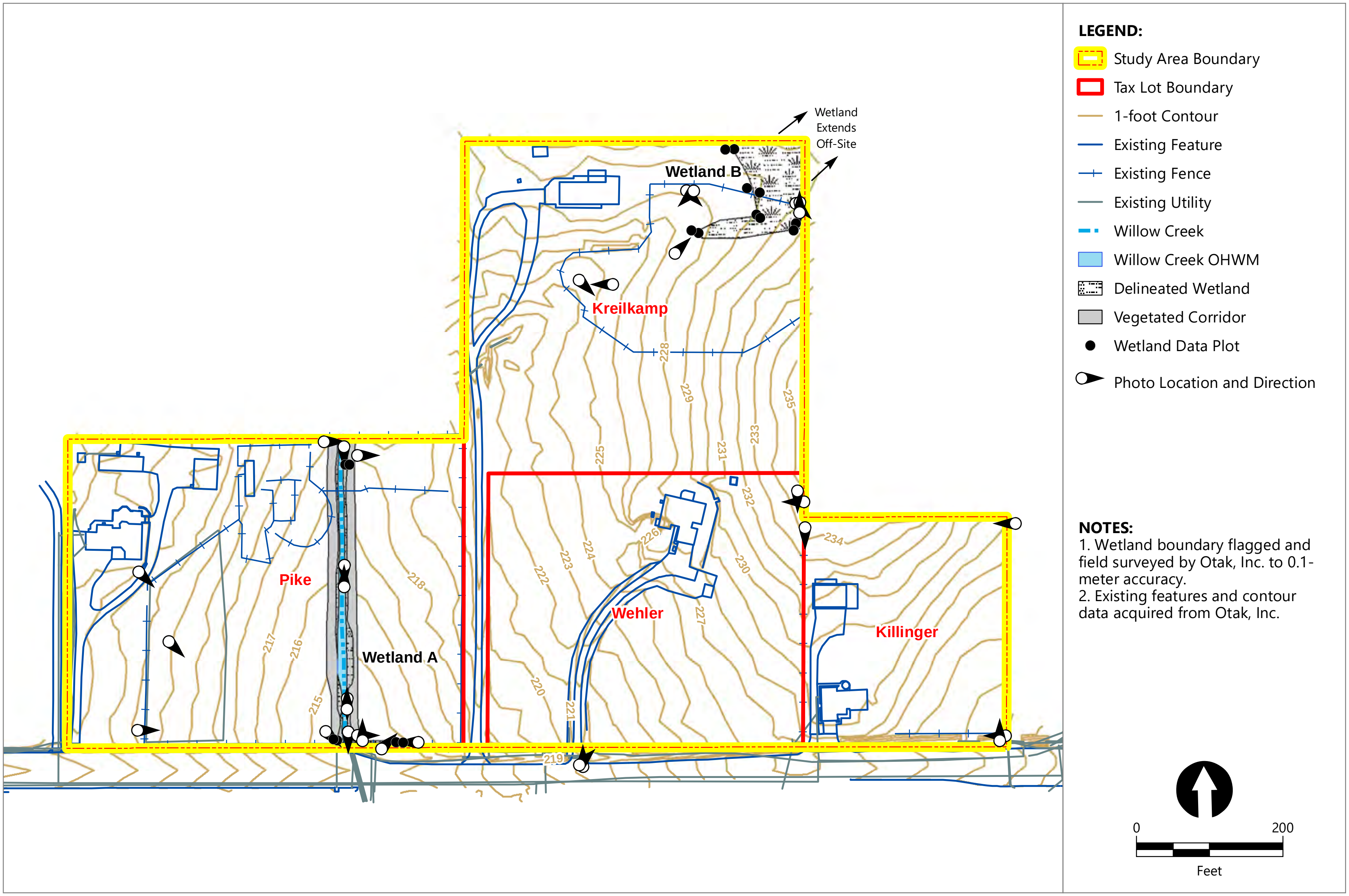
NOTES:

1. Aerial imagery acquired from Google Earth (2017).
2. Soils data acquired from Natural Resource Conservation Service (2017).

Publish Date: 2018/01/11, 3:18 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig7_SoilsMap.mxd

ANCHOR QEA

Figure 7
Soils Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



NOTES:

1. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.
2. Existing features and contour data acquired from Otak, Inc.

Publish Date: 2018/01/12, 1:50 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig8_WetlandDelineationOverviewMap.mxd

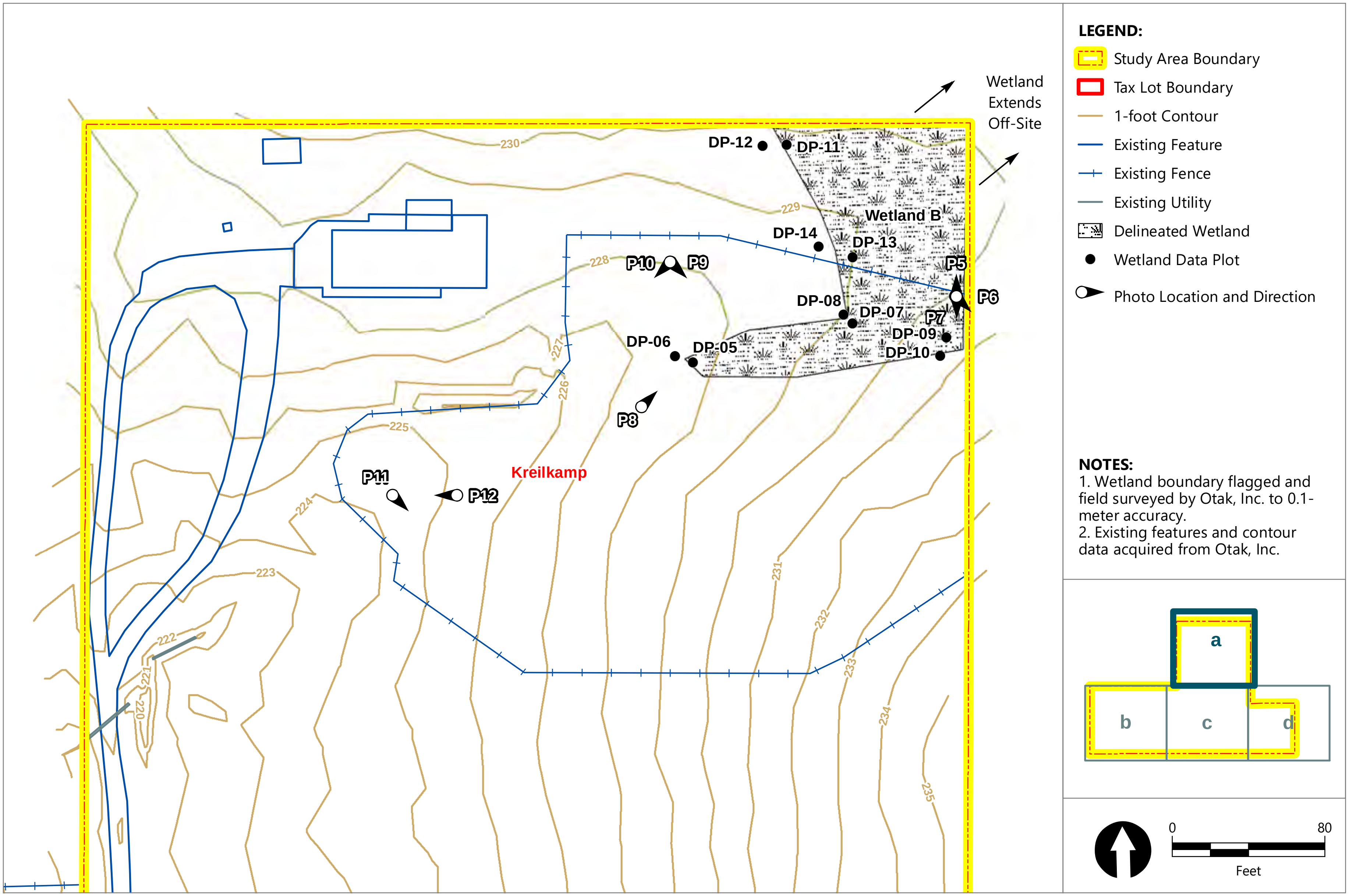
ANCHOR QEA

Figure 8

Wetland Delineation Overview Map

Wetland Delineation Report

West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

- 🟨 Study Area Boundary
- 🟥 Tax Lot Boundary
- 1-foot Contour
- Existing Feature
- Existing Fence
- Existing Utility
- ▨ Delineated Wetland
- ● Wetland Data Plot
- Photo Location and Direction

NOTES:

1. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.
2. Existing features and contour data acquired from Otak, Inc.

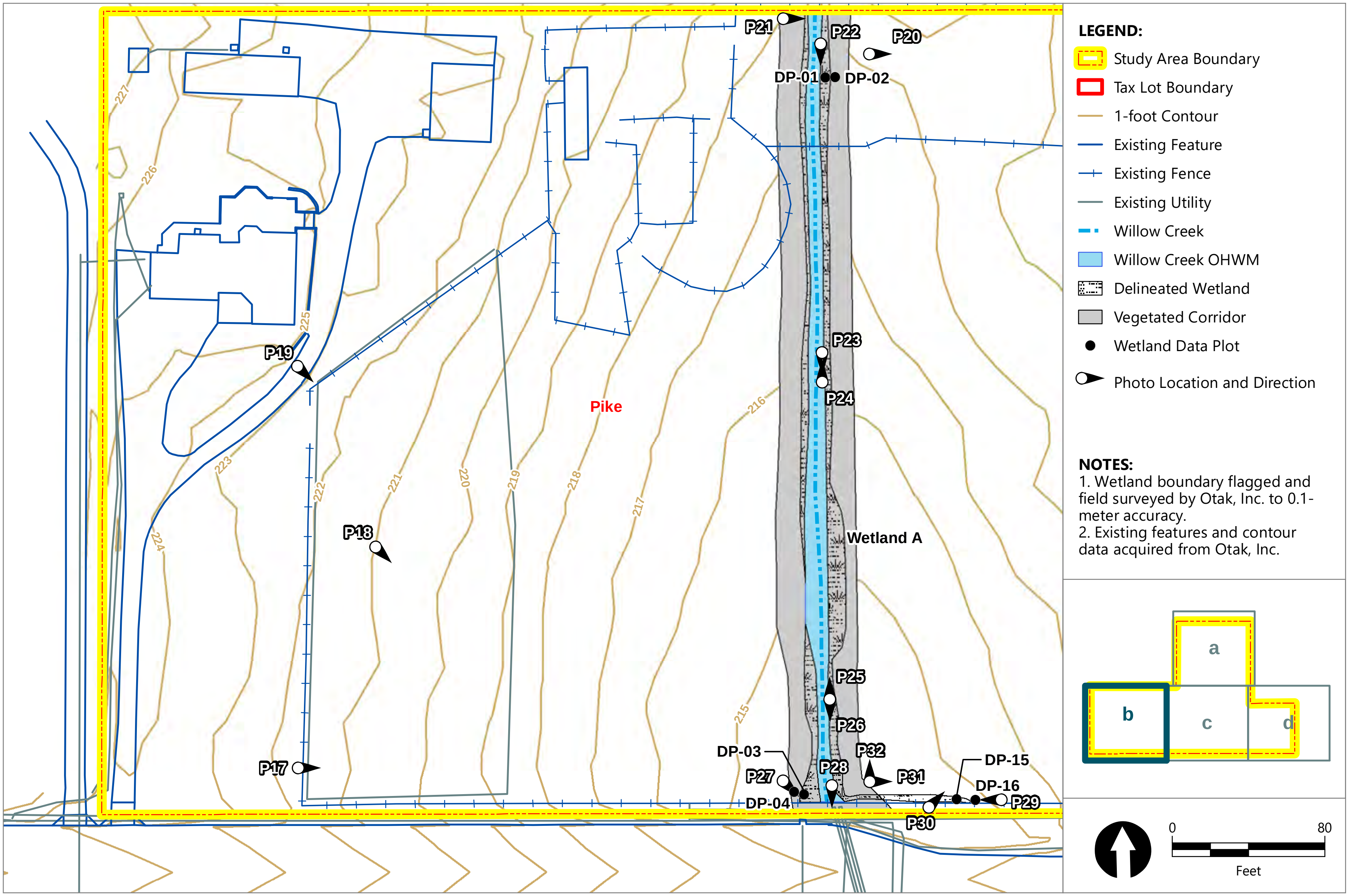
Publish Date: 2018/01/12, 1:56 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig9_WetlandDelineationDetailMap.mxd

ANCHOR QEA

Figure 9a

Wetland Delineation Detail Map

Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



NOTES:

1. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.
2. Existing features and contour data acquired from Otak, Inc.

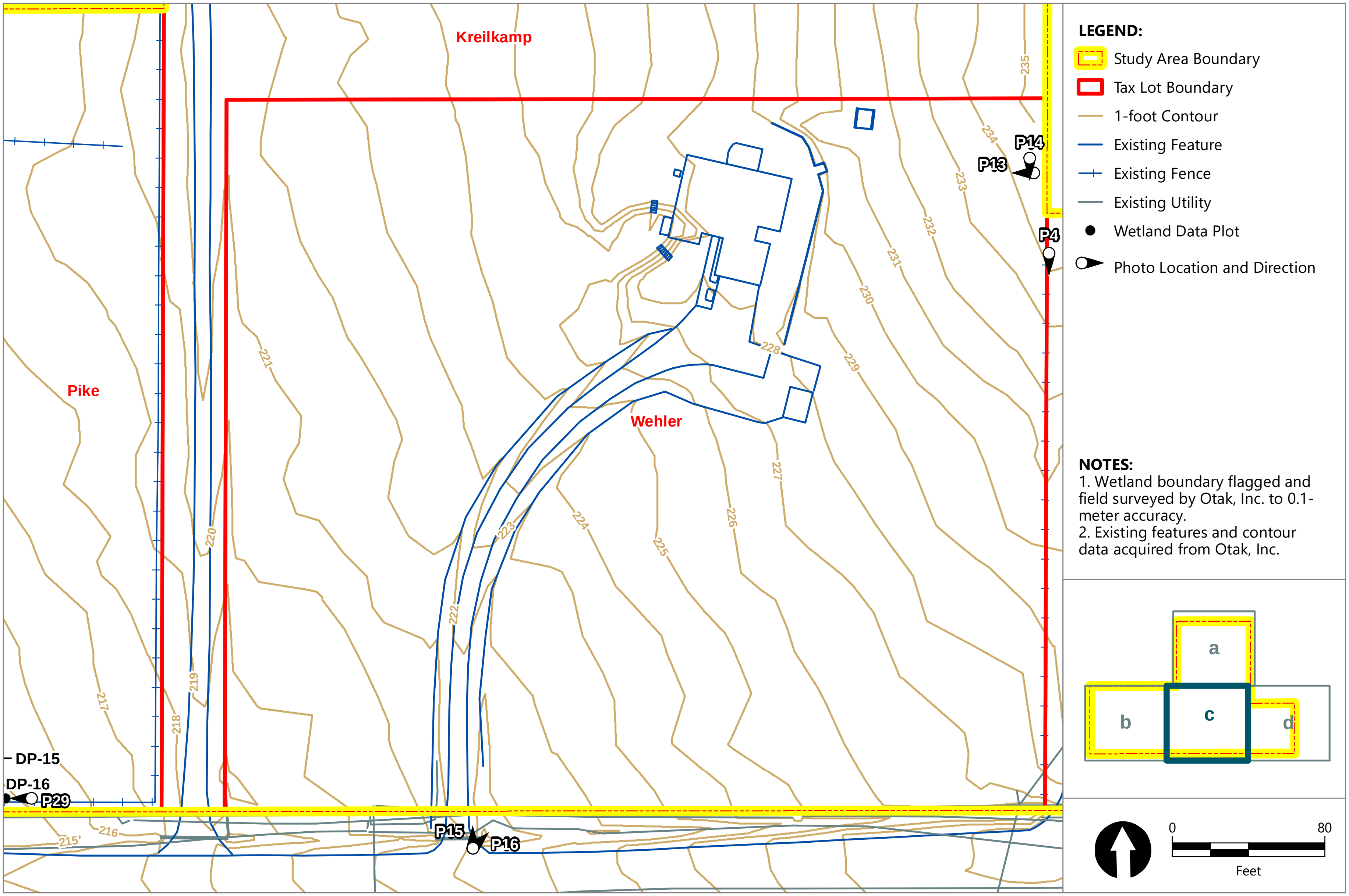
Publish Date: 2018/01/12, 1:56 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig9_WetlandDelineationDetailMap.mxd

ANCHOR QEA

Figure 9b

Wetland Delineation Detail Map

Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



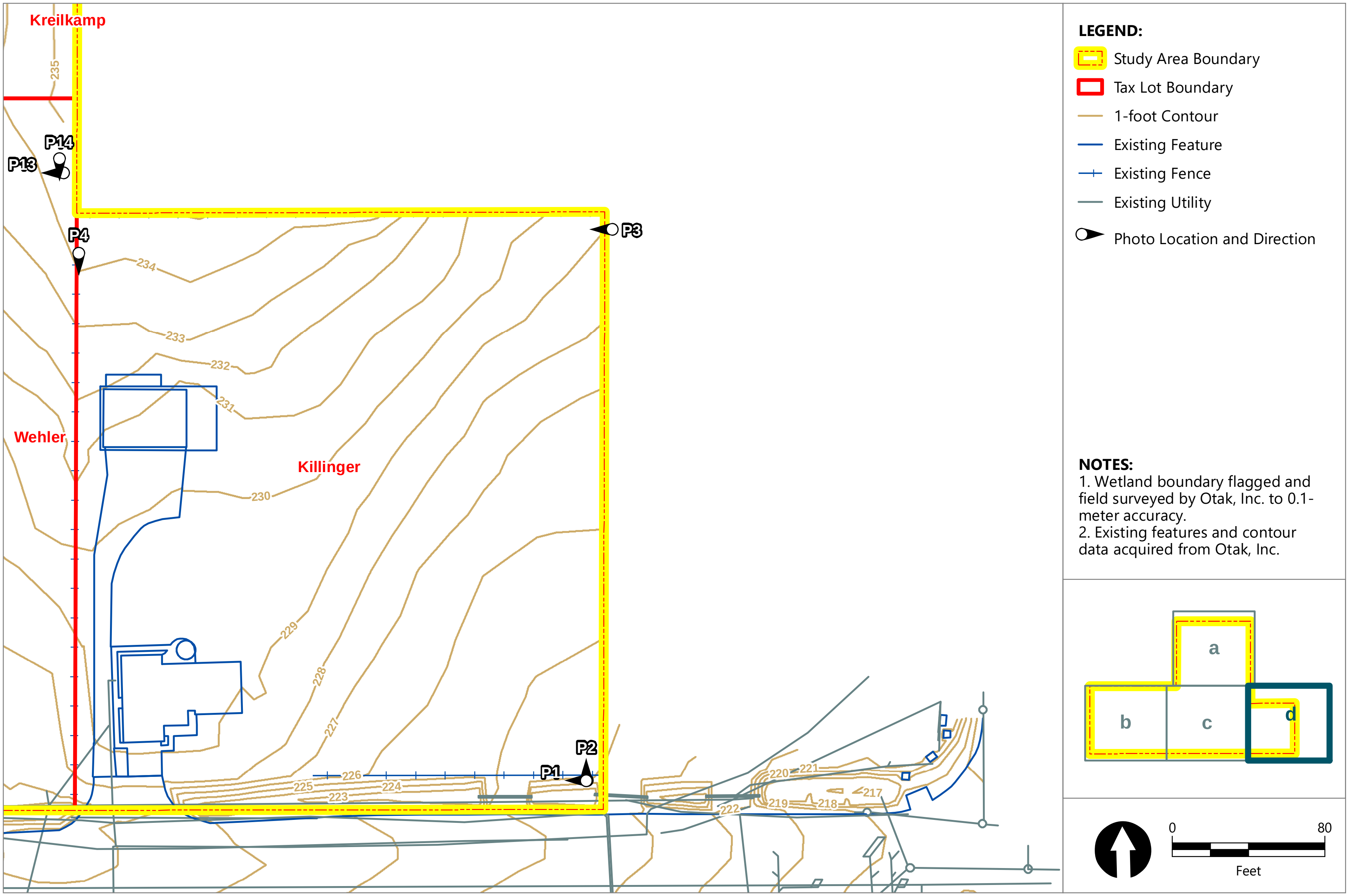
NOTES:

1. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.
2. Existing features and contour data acquired from Otak, Inc.

Publish Date: 2018/01/12, 1:56 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig9_WetlandDelineationDetailMap.mxd

ANCHOR QEA

Figure 9c
Wetland Delineation Detail Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Study Area Boundary

🟥 Tax Lot Boundary

— 1-foot Contour

— Existing Feature

-+- Existing Fence

— Existing Utility

➤ Photo Location and Direction

NOTES:
1. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.
2. Existing features and contour data acquired from Otak, Inc.

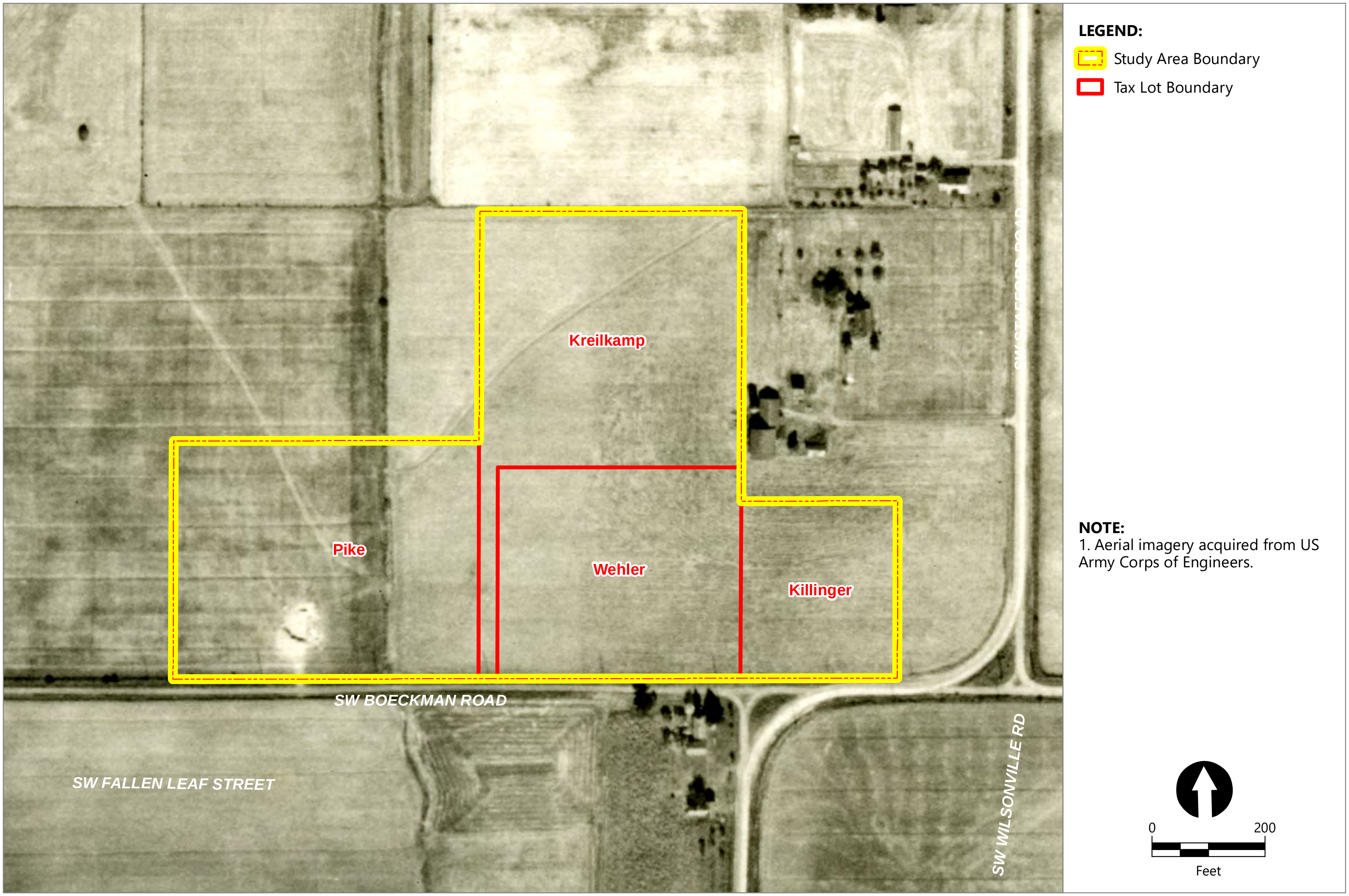
Publish Date: 2018/01/12, 1:56 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\PKKW_WDR_Fig9_WetlandDelineationDetailMap.mxd

ANCHOR QEA

Figure 9d
Wetland Delineation Detail Map
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

Appendix A

Historical Aerial Photographs

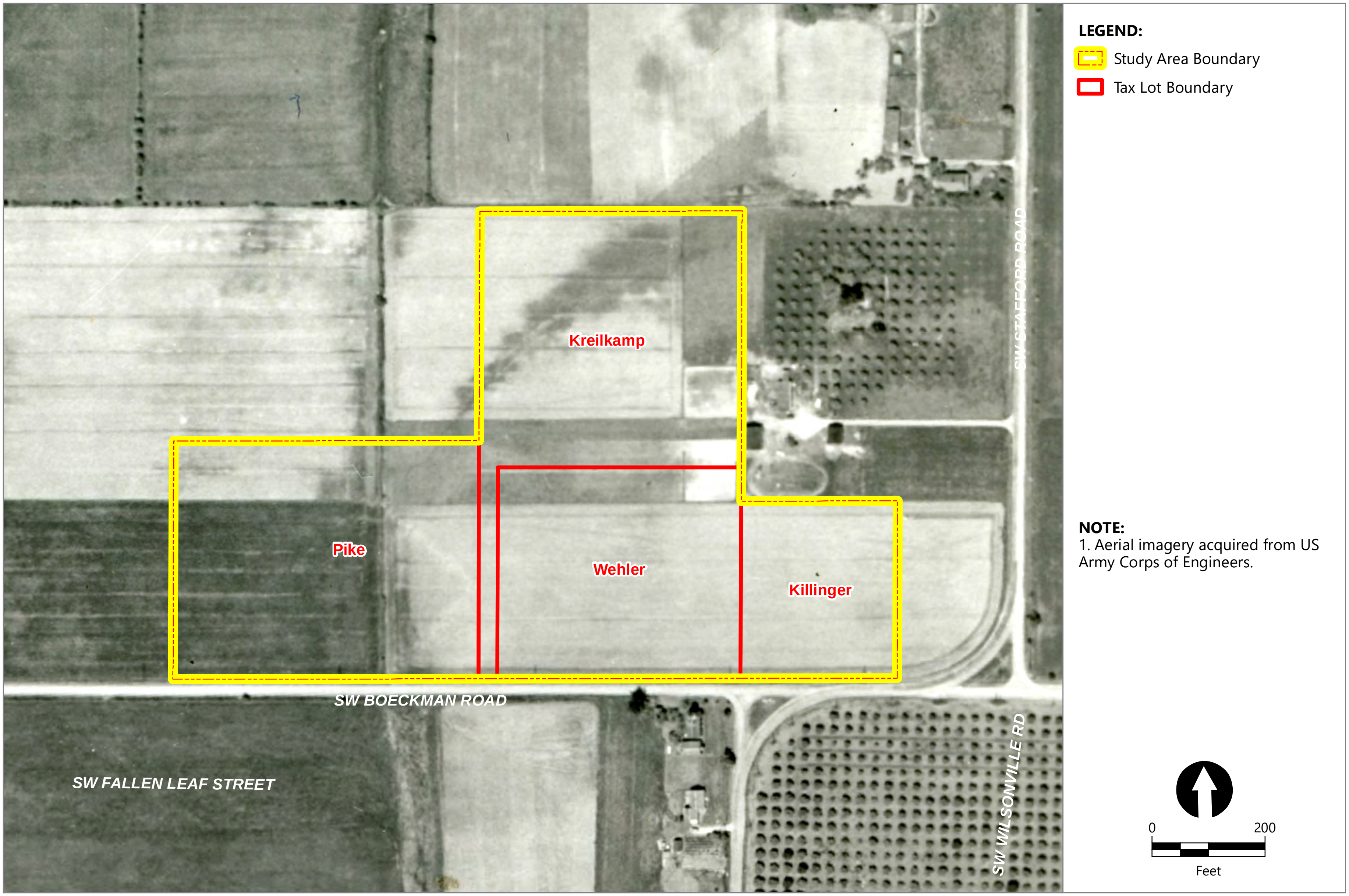


NOTE:
1. Aerial imagery acquired from US Army Corps of Engineers.

Publish Date: 2018/01/11, 6:10 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A1
Historical Aerial – 1936
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



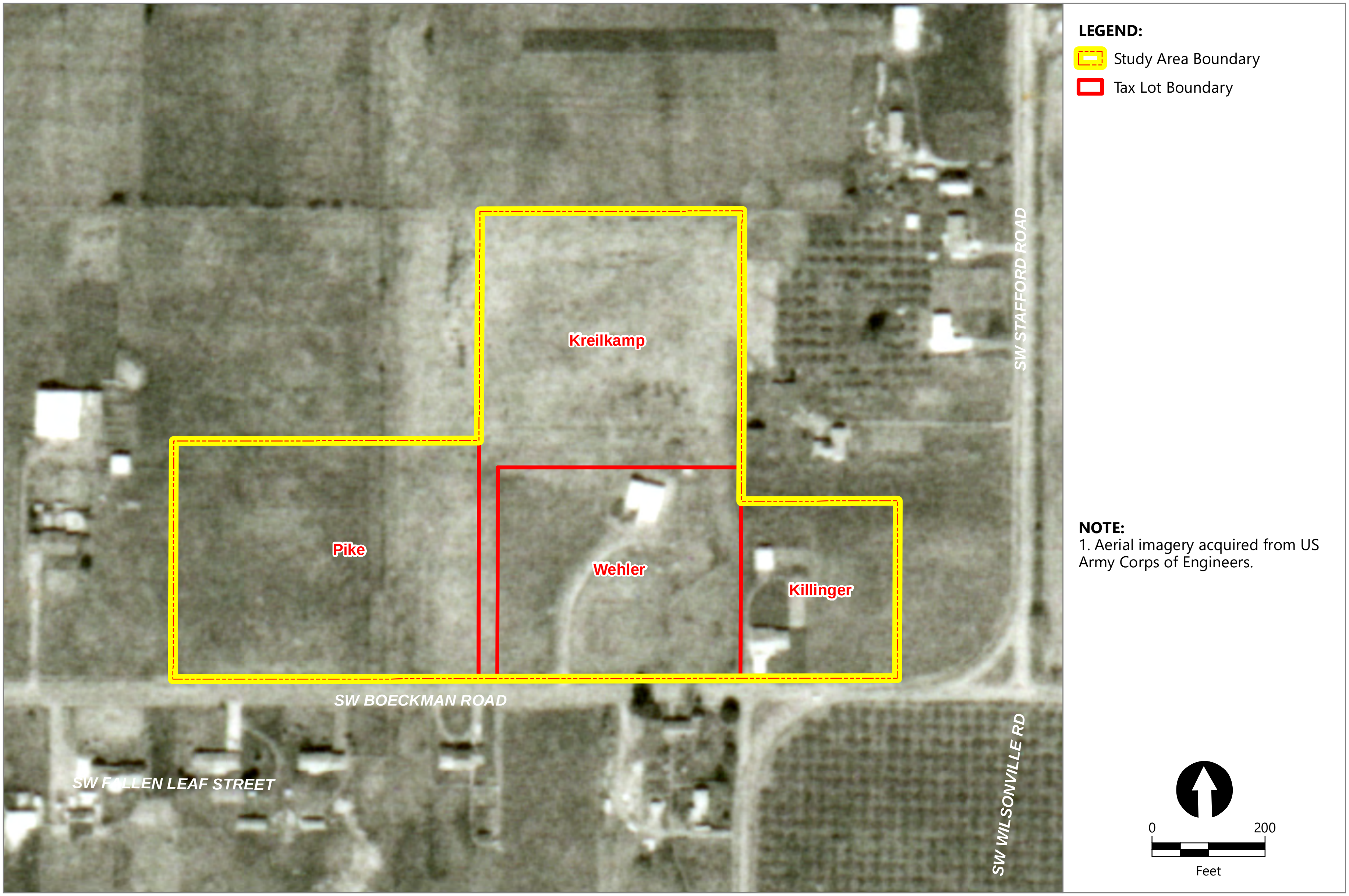
NOTE:
1. Aerial imagery acquired from US Army Corps of Engineers.

Publish Date: 2018/01/11, 6:10 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A2
Historical Aerial – 1953

Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



NOTE:
1. Aerial imagery acquired from US Army Corps of Engineers.

Publish Date: 2018/01/11, 6:10 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A3
Historical Aerial – 1976
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

LEGEND:

🟨 Study Area Boundary

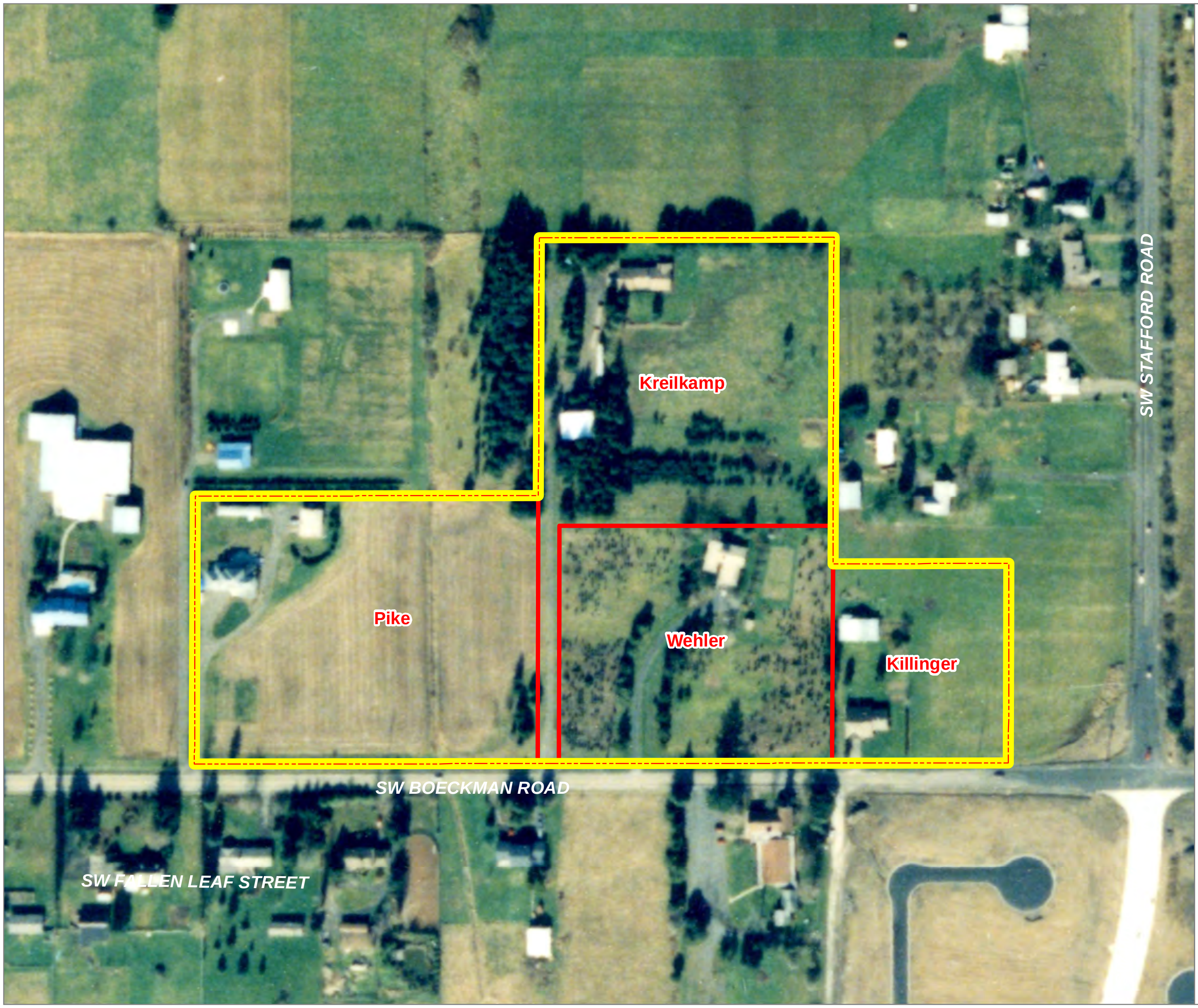
🟥 Tax Lot Boundary

NOTE:
1. Aerial imagery acquired from US Army Corps of Engineers.

Publish Date: 2018/01/11, 6:11 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A4
Historical Aerial – 1983
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Study Area Boundary

🟥 Tax Lot Boundary

NOTE:
1. Aerial imagery acquired from US Army Corps of Engineers.

Publish Date: 2018/01/11, 6:11 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

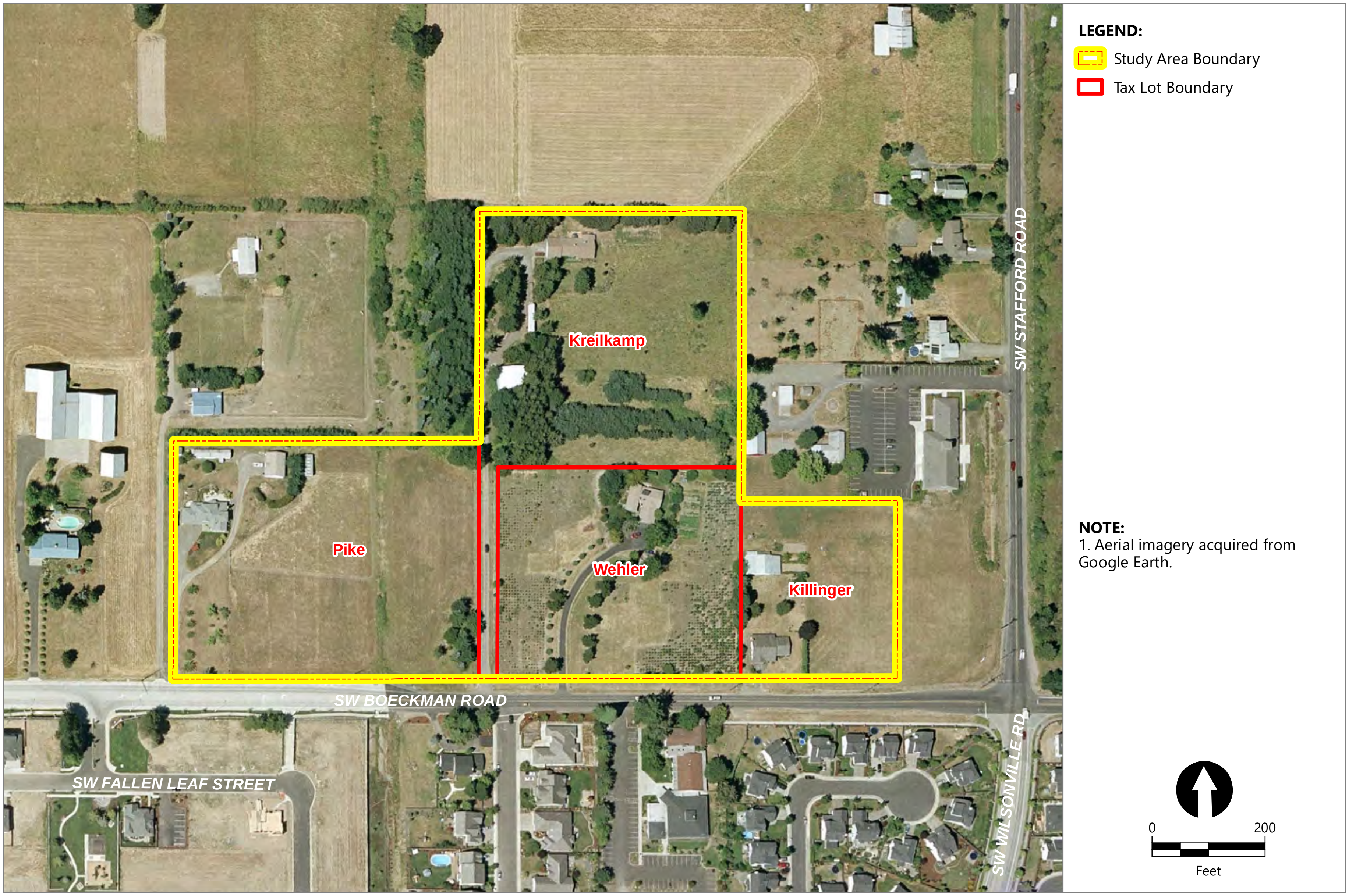
ANCHOR QEA

Figure A5

Historical Aerial – 1996

Wetland Delineation Report

West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Study Area Boundary

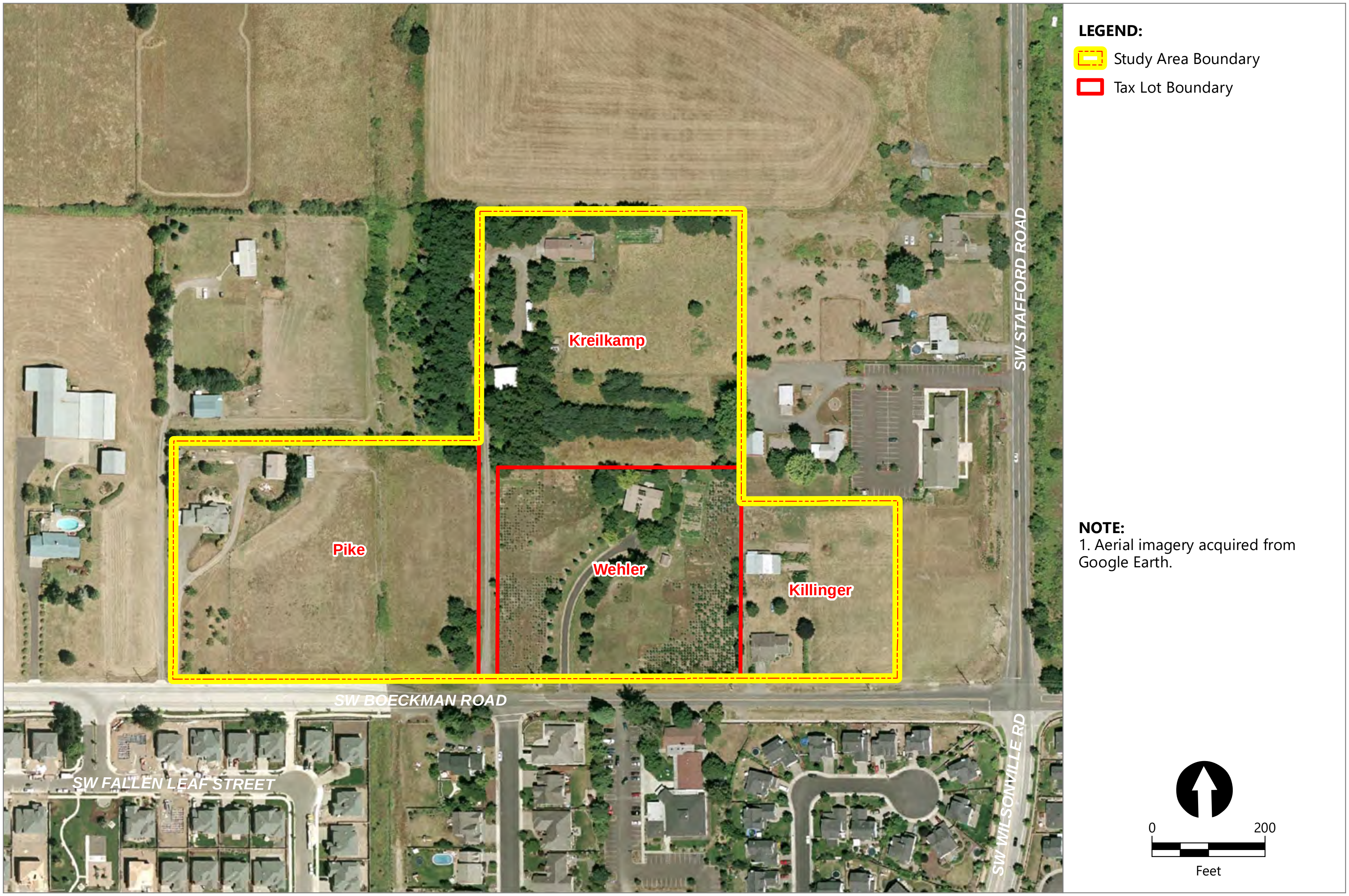
🟥 Tax Lot Boundary

NOTE:
1. Aerial imagery acquired from Google Earth.

Publish Date: 2018/01/11, 6:12 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A6
Historical Aerial – 2003
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

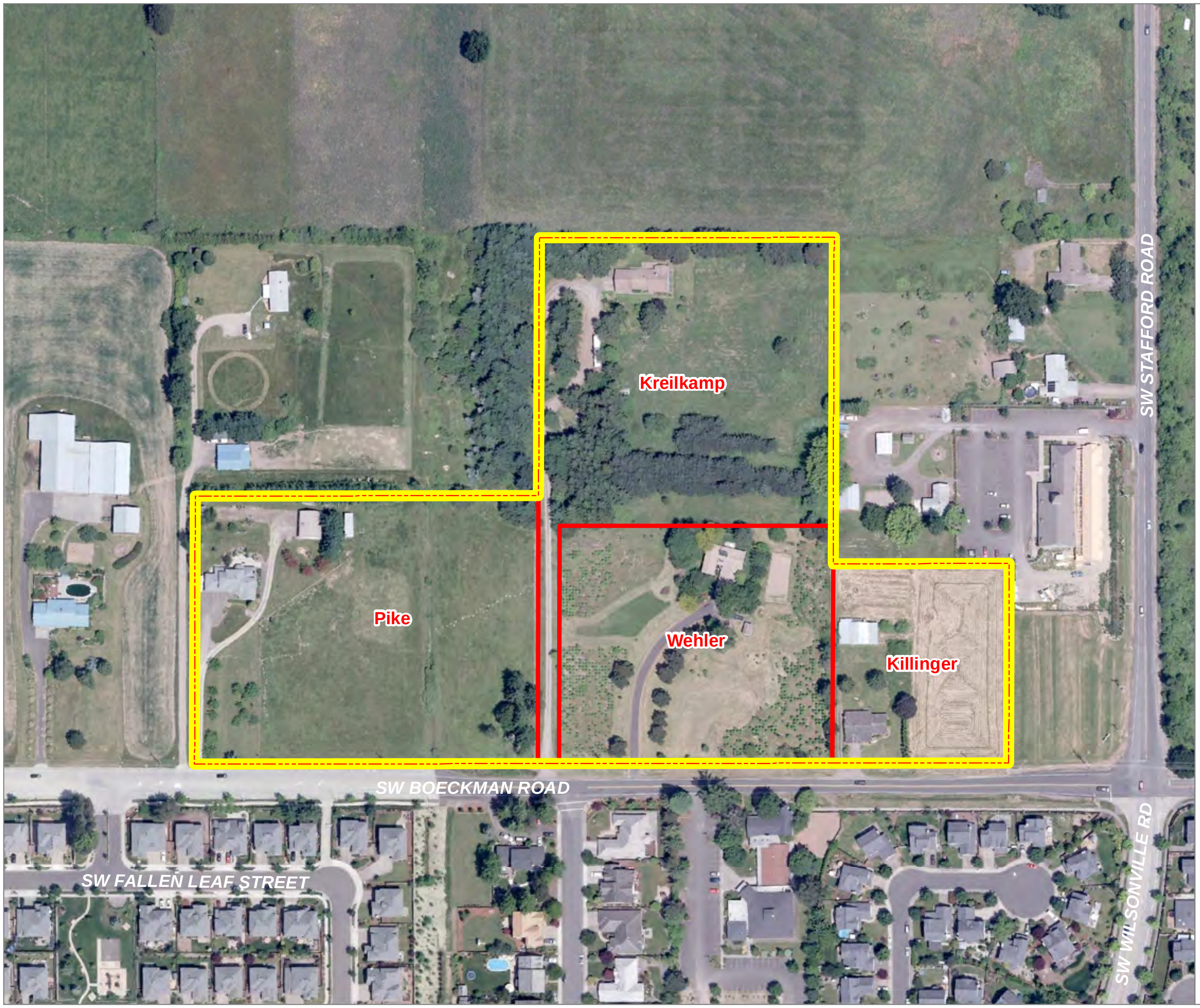


NOTE:
1. Aerial imagery acquired from Google Earth.

Publish Date: 2018/01/11, 6:12 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A7
Historical Aerial – 2004
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Study Area Boundary

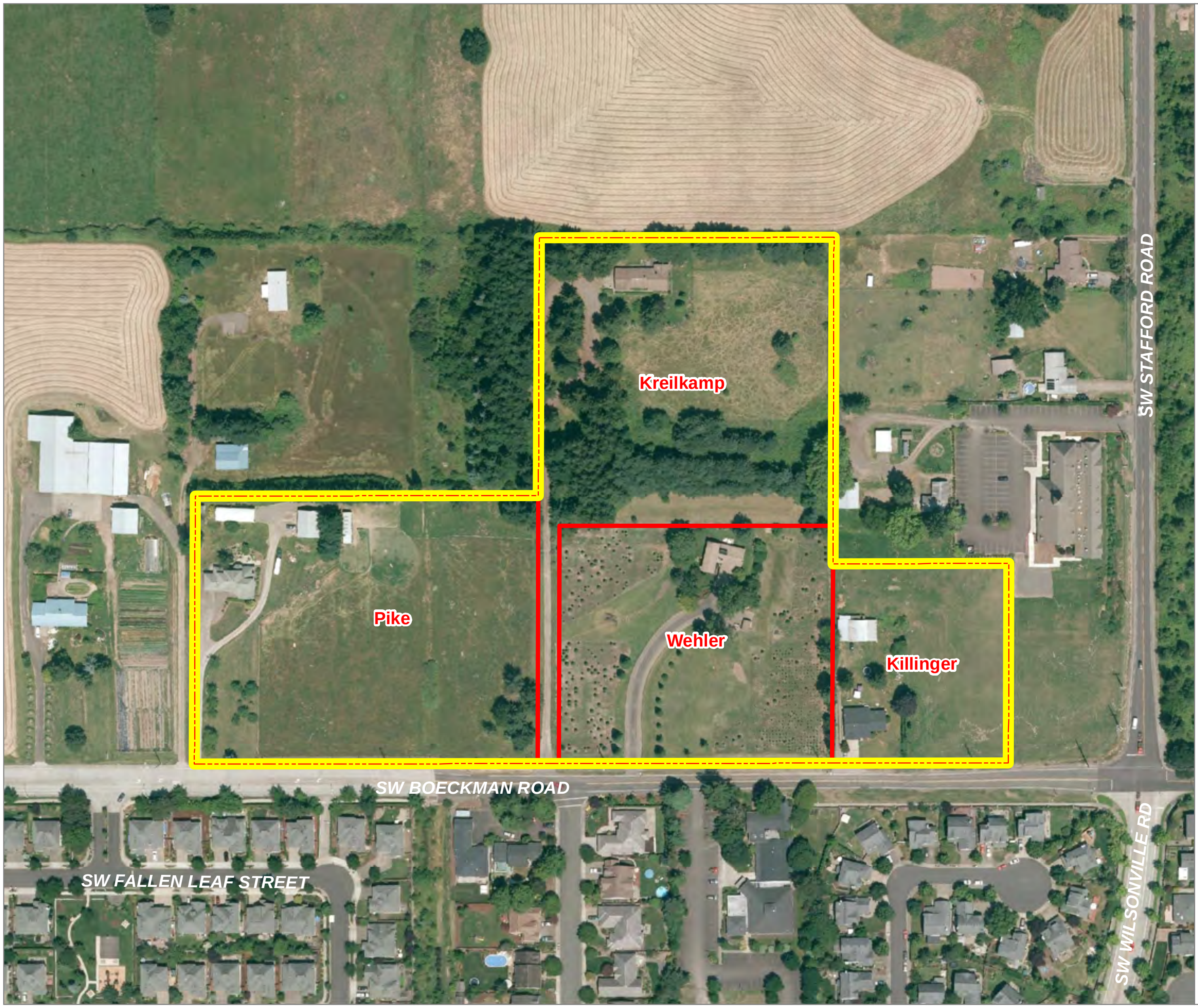
🟥 Tax Lot Boundary

NOTE:
1. Aerial imagery acquired from Google Earth.

Publish Date: 2018/01/11, 6:13 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A8
Historical Aerial – 2008
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Study Area Boundary

🟥 Tax Lot Boundary

NOTE:
1. Aerial imagery acquired from Google Earth.

Publish Date: 2018/01/11, 6:13 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

ANCHOR QEA

Figure A9

Historical Aerial – 2012

Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

NOTE:
1. Aerial imagery acquired from Google Earth.

Publish Date: 2018/01/11, 6:13 PM | User: lhudson
Filepath: \\orcas\gis\Jobs\West_Hills_Development_1015\Pike_Kreilkamp_Killinger_Wehler\Maps\WetlandDelineationReport\AppendixA_HistoricalAerials\PKKW_WDR_AppxA_HistoricalAerials_DDP.mxd

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ANCHOR QEA

Figure A10
Historical Aerial – 2016
Wetland Delineation Report
West Hills Land Development: Stafford Meadows Residential Development

Appendix B

Precipitation Data

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

Climatological Report (Daily)

```
699
CDUS46 KPQR 061143
CLIPDX


CLIMATE REPORT
NATIONAL WEATHER SERVICE PORTLAND OREGON
343 AM PST WED DEC 6 2017


...................................

...THE PORTLAND OR CLIMATE SUMMARY FOR DECEMBER 5 2017...

CLIMATE NORMAL PERIOD 1981 TO 2010
CLIMATE RECORD PERIOD 1940 TO 2017


WEATHER ITEM   OBSERVED TIME   RECORD YEAR NORMAL DEPARTURE LAST
                VALUE   (LST)  VALUE       VALUE  FROM      YEAR
                                                  NORMAL
.................................................................
TEMPERATURE (F)
 YESTERDAY
  MAXIMUM         50    340 PM  59    1970  47      3       39
  MINIMUM         34    844 AM  19    2013  36     -2       35
  AVERAGE         42                        42      0       37

PRECIPITATION (IN)
  YESTERDAY        0.00          1.80 1981   0.19  -0.19     0.25
  MONTH TO DATE    0.37                      1.00  -0.63     1.03
  SINCE OCT 1     11.38                      9.63   1.75    16.17
  SINCE JAN 1     43.08                     31.54  11.54    39.77

SNOWFALL (IN)
  YESTERDAY        0.0           1.5  1972
  MONTH TO DATE    0.0
```

```
  SINCE DEC 1      0.0
  SINCE JUL 1      0.0

DEGREE DAYS
 HEATING
  YESTERDAY       23                        23      0       28
  MONTH TO DATE  105                       114     -9      111
  SINCE DEC 1    105                       114     -9      111
  SINCE JUL 1   1030                      1083    -53      821

 COOLING
  YESTERDAY        0                         0      0        0
  MONTH TO DATE    0                         0      0        0
  SINCE DEC 1      0                         0      0        0
  SINCE JAN 1    700                       424    276      548
..................................................................


WIND (MPH)
  HIGHEST WIND SPEED    17   HIGHEST WIND DIRECTION     E (90)
  HIGHEST GUST SPEED    22   HIGHEST GUST DIRECTION     E (80)
  AVERAGE WIND SPEED     4.2


SKY COVER
  POSSIBLE SUNSHINE  MM
  AVERAGE SKY COVER 0.4


WEATHER CONDITIONS
 THE FOLLOWING WEATHER WAS RECORDED YESTERDAY.
  FOG


RELATIVE HUMIDITY (PERCENT)
 HIGHEST   100          1200 AM
 LOWEST     52           300 PM
 AVERAGE    76

..........................................................


THE PORTLAND OR CLIMATE NORMALS FOR TODAY
                         NORMAL    RECORD    YEAR
 MAXIMUM TEMPERATURE (F)   47         60      1988
 MINIMUM TEMPERATURE (F)   36         22      1972
                                              1959
```

```
SUNRISE AND SUNSET
DECEMBER  6 2017......SUNRISE   736 AM PST   SUNSET   427 PM PST
DECEMBER  7 2017......SUNRISE   737 AM PST   SUNSET   427 PM PST


-  INDICATES NEGATIVE NUMBERS.
R  INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T  INDICATES TRACE AMOUNT.
```

The U.S. Naval Observatory (USNO) computes astronomical data. Therefore, the NWS does not record, certify, or authenticate astronomical data. Computed times of sunrise, sunset, moonrise, moonset; and twilight, moon phases and other astronomical data are available from USNO's Astronomical Applications Department (http://www.usno.navy.mil). See http://www.usno.navy.mil/USNO/astronomical-applications/astronomical-information-center/litigation
for information on using these data for legal purposes.

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }        These
data are preliminary and have not undergone final quality control by the
National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.
Climatological Report (Daily)

538
CDUS46 KPQR 071157
CLIPDX


CLIMATE REPORT
NATIONAL WEATHER SERVICE PORTLAND OREGON
357 AM PST THU DEC 7 2017


...................................

...THE PORTLAND OR CLIMATE SUMMARY FOR DECEMBER 6 2017...

CLIMATE NORMAL PERIOD 1981 TO 2010
CLIMATE RECORD PERIOD 1940 TO 2017


WEATHER ITEM   OBSERVED TIME   RECORD YEAR NORMAL DEPARTURE LAST
                VALUE   (LST)  VALUE       VALUE  FROM      YEAR
                                                  NORMAL
..................................................................
TEMPERATURE (F)
 YESTERDAY
  MAXIMUM         52    306 PM  60    1988  47      5       45
  MINIMUM         38    504 AM  22    1972  36      2       29
                                      1959
  AVERAGE         45                          42      3       37

PRECIPITATION (IN)
  YESTERDAY        0.00          1.12 1991   0.19  -0.19      T
  MONTH TO DATE    0.37                      1.19  -0.82     1.03
  SINCE OCT 1     11.38                      9.82   1.56    16.17
  SINCE JAN 1     43.08                     31.73  11.35    39.77

SNOWFALL (IN)
  YESTERDAY        0.0           2.0  1942
```

```
  MONTH TO DATE    0.0
  SINCE DEC 1      0.0
  SINCE JUL 1      0.0

DEGREE DAYS
 HEATING
  YESTERDAY       20                        24     -4       28
  MONTH TO DATE  125                       138    -13      139
  SINCE DEC 1    125                       138    -13      139
  SINCE JUL 1   1050                      1107    -57      849

 COOLING
  YESTERDAY        0                         0      0        0
  MONTH TO DATE    0                         0      0        0
  SINCE DEC 1      0                         0      0        0
  SINCE JAN 1    700                       424    276      548
..................................................................


WIND (MPH)
  HIGHEST WIND SPEED    35   HIGHEST WIND DIRECTION     E (90)
  HIGHEST GUST SPEED    41   HIGHEST GUST DIRECTION     E (90)
  AVERAGE WIND SPEED    15.8


SKY COVER
  POSSIBLE SUNSHINE  MM
  AVERAGE SKY COVER 0.0


WEATHER CONDITIONS
 THE FOLLOWING WEATHER WAS RECORDED YESTERDAY.
  NO SIGNIFICANT WEATHER WAS OBSERVED.


RELATIVE HUMIDITY (PERCENT)
 HIGHEST    76           100 AM
 LOWEST     44           200 PM
 AVERAGE    60

..........................................................


THE PORTLAND OR CLIMATE NORMALS FOR TODAY
                         NORMAL    RECORD    YEAR
 MAXIMUM TEMPERATURE (F)   47        63      2015
 MINIMUM TEMPERATURE (F)   36        15      2013
```

```
SUNRISE AND SUNSET
DECEMBER  7 2017......SUNRISE   737 AM PST   SUNSET   427 PM PST
DECEMBER  8 2017......SUNRISE   738 AM PST   SUNSET   427 PM PST


-  INDICATES NEGATIVE NUMBERS.
R  INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T  INDICATES TRACE AMOUNT.
```

The U.S. Naval Observatory (USNO) computes astronomical data. Therefore, the NWS does not record, certify, or authenticate astronomical data. Computed times of sunrise, sunset, moonrise, moonset; and twilight, moon phases and other astronomical data are available from USNO's Astronomical Applications Department (http://www.usno.navy.mil). See http://www.usno.navy.mil/USNO/astronomical-applications/astronomical-information-center/litigation for information on using these data for legal purposes.

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }        These
data are preliminary and have not undergone final quality control by the
National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.
Climatological Report (Daily)

964
CDUS46 KPQR 141216
CLIPDX


CLIMATE REPORT
NATIONAL WEATHER SERVICE PORTLAND OREGON
415 AM PST THU DEC 14 2017


...................................

...THE PORTLAND OR CLIMATE SUMMARY FOR DECEMBER 13 2017...

CLIMATE NORMAL PERIOD 1981 TO 2010
CLIMATE RECORD PERIOD 1940 TO 2017


WEATHER ITEM   OBSERVED TIME   RECORD YEAR NORMAL DEPARTURE LAST
                VALUE   (LST)  VALUE       VALUE  FROM      YEAR
                                                  NORMAL
..................................................................
TEMPERATURE (F)
 YESTERDAY
  MAXIMUM         46    129 PM  61    2010  46      0       41
                                      1977
  MINIMUM         29    751 AM  18    1972  35     -6       34
  AVERAGE         38                        40     -2       38

PRECIPITATION (IN)
  YESTERDAY        0.00          1.84 1977   0.17  -0.17     0.00
  MONTH TO DATE    0.37                      2.44  -2.07     2.55
  SINCE OCT 1     11.38                     11.07   0.31    17.69
  SINCE JAN 1     43.08                     32.98  10.10    41.29

SNOWFALL (IN)
  YESTERDAY        0.0           0.7  1961
```

```
  MONTH TO DATE    0.0
  SINCE DEC 1      0.0
  SINCE JUL 1      0.0

DEGREE DAYS
 HEATING
  YESTERDAY       27                        25      2       27
  MONTH TO DATE  315                       308      7      332
  SINCE DEC 1    315                       308      7      332
  SINCE JUL 1   1240                      1277    -37     1042

 COOLING
  YESTERDAY        0                         0      0        0
  MONTH TO DATE    0                         0      0        0
  SINCE DEC 1      0                         0      0        0
  SINCE JAN 1    700                       424    276      548
..................................................................


WIND (MPH)
  HIGHEST WIND SPEED    20   HIGHEST WIND DIRECTION     E (110)
  HIGHEST GUST SPEED    23   HIGHEST GUST DIRECTION    SE (120)
  AVERAGE WIND SPEED     7.8


SKY COVER
  POSSIBLE SUNSHINE  MM
  AVERAGE SKY COVER 0.3


WEATHER CONDITIONS
 THE FOLLOWING WEATHER WAS RECORDED YESTERDAY.
  NO SIGNIFICANT WEATHER WAS OBSERVED.


RELATIVE HUMIDITY (PERCENT)
 HIGHEST    85           700 AM
 LOWEST     53           300 PM
 AVERAGE    69

..........................................................


THE PORTLAND OR CLIMATE NORMALS FOR TODAY
                         NORMAL    RECORD    YEAR
 MAXIMUM TEMPERATURE (F)   45        60      2006
                                             2002
 MINIMUM TEMPERATURE (F)   35        23      2008
```

```
                1972


SUNRISE AND SUNSET
DECEMBER 14 2017......SUNRISE   743 AM PST   SUNSET   427 PM PST
DECEMBER 15 2017......SUNRISE   744 AM PST   SUNSET   427 PM PST


-  INDICATES NEGATIVE NUMBERS.
R  INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T  INDICATES TRACE AMOUNT.
```

 The U.S. Naval Observatory (USNO) computes astronomical data.
Therefore, the NWS does not record, certify, or authenticate astronomical data.
Computed times of sunrise, sunset, moonrise, moonset; and twilight, moon phases
and other astronomical data are available from USNO's Astronomical Applications
Department (http://www.usno.navy.mil). See
http://www.usno.navy.mil/USNO/astronomical-applications/astronomical-information-center/litigation
for information on using these data for legal purposes.

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }        These
data are preliminary and have not undergone final quality control by the
National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.
Climatological Report (Daily)

000
CDUS46 KPQR 151144
CLIPDX


CLIMATE REPORT
NATIONAL WEATHER SERVICE PORTLAND OREGON
343 AM PST FRI DEC 15 2017


...................................

...THE PORTLAND OR CLIMATE SUMMARY FOR DECEMBER 14 2017...

CLIMATE NORMAL PERIOD 1981 TO 2010
CLIMATE RECORD PERIOD 1940 TO 2017


WEATHER ITEM   OBSERVED TIME   RECORD YEAR NORMAL DEPARTURE LAST
                VALUE   (LST)  VALUE       VALUE  FROM      YEAR
                                                  NORMAL
..................................................................
TEMPERATURE (F)
 YESTERDAY
  MAXIMUM         44    148 PM  60    2006  45     -1       35
                                      2002
  MINIMUM         32    342 AM  23    2008  35     -3       27
                                      1972
  AVERAGE         38                        40     -2       31

PRECIPITATION (IN)
  YESTERDAY        0.00          1.35 1946   0.18  -0.18     0.05
  MONTH TO DATE    0.37                      2.62  -2.25     2.60
  SINCE OCT 1     11.38                     11.25   0.13    17.74
  SINCE JAN 1     43.08                     33.16   9.92    41.34

SNOWFALL (IN)
```

```
  YESTERDAY        0.0           2.3  2016
  MONTH TO DATE    0.0
  SINCE DEC 1      0.0
  SINCE JUL 1      0.0

DEGREE DAYS
 HEATING
  YESTERDAY       27                        25      2       34
  MONTH TO DATE  342                       333      9      366
  SINCE DEC 1    342                       333      9      366
  SINCE JUL 1   1267                      1302    -35     1076

 COOLING
  YESTERDAY        0                         0      0        0
  MONTH TO DATE    0                         0      0        0
  SINCE DEC 1      0                         0      0        0
  SINCE JAN 1    700                       424    276      548
..................................................................


WIND (MPH)
  HIGHEST WIND SPEED    22   HIGHEST WIND DIRECTION     E (100)
  HIGHEST GUST SPEED    25   HIGHEST GUST DIRECTION     E (100)
  AVERAGE WIND SPEED    11.0


SKY COVER
  POSSIBLE SUNSHINE  MM
  AVERAGE SKY COVER 0.4


WEATHER CONDITIONS
 THE FOLLOWING WEATHER WAS RECORDED YESTERDAY.
  NO SIGNIFICANT WEATHER WAS OBSERVED.


RELATIVE HUMIDITY (PERCENT)
 HIGHEST    82           300 AM
 LOWEST     57          1000 AM
 AVERAGE    70

..........................................................


THE PORTLAND OR CLIMATE NORMALS FOR TODAY
                         NORMAL    RECORD    YEAR
 MAXIMUM TEMPERATURE (F)   45        59      1959
 MINIMUM TEMPERATURE (F)   35        22      2008
```

```
SUNRISE AND SUNSET
DECEMBER 15 2017......SUNRISE   744 AM PST   SUNSET   427 PM PST
DECEMBER 16 2017......SUNRISE   745 AM PST   SUNSET   427 PM PST


-  INDICATES NEGATIVE NUMBERS.
R  INDICATES RECORD WAS SET OR TIED.
MM INDICATES DATA IS MISSING.
T  INDICATES TRACE AMOUNT.
```

The U.S. Naval Observatory (USNO) computes astronomical data. Therefore, the NWS does not record, certify, or authenticate astronomical data. Computed times of sunrise, sunset, moonrise, moonset; and twilight, moon phases and other astronomical data are available from USNO's Astronomical Applications Department (http://www.usno.navy.mil). See
http://www.usno.navy.mil/USNO/astronomical-applications/astronomical-information-center/litigation
for information on using these data for legal purposes.

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
000
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     OCTOBER
                                          YEAR:      2015
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16    17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  76  50  63   3   2   0 0.00  0.0    0  4.3 12 300   M    M   3 128    15 300
 2  63  50  57  -3   8   0 0.02  0.0    0  2.9 14 320   M    M   8 18     19 340
 3  71  46  59   0   6   0 0.00  0.0    0  6.1 16 310   M    M   2        22 320
 4  81  49  65   6   0   0 0.00  0.0    0  5.2 15 280   M    M   1        17  70
 5  85  50  68  10   0   3 0.00  0.0    0  5.3 12 120   M    M   2        13 130
 6  77  54  66   8   0   1 0.00  0.0    0  6.4 15 220   M    M   8        18 250
 7  66  60  63   5   2   0 0.07  0.0    0  2.8  9  90   M    M  10 1      10 100
 8  75  57  66   9   0   1 0.00  0.0    0  3.3  9 110   M    M   7 128    11 100
 9  71  54  63   6   2   0    T  0.0    0  5.1 16 100   M    M   7 1      19 110
10  72  55  64   7   1   0 0.29  0.0    0  8.3 24 250   M    M   7 18     31 260
11  68  50  59   3   6   0 0.00  0.0    0  4.0 13 280   M    M   6 12     14 280
12  71  47  59   3   6   0 0.00    M    0  2.3  8 190   M    M   3 1      10 200
13  72  50  61   5   4   0 0.00    M    0  4.8 12 300   M    M   2 1      15 310
14  72  51  62   7   3   0 0.00    M    0  5.4 12 310   M    M   7        15 320
15  80  49  65  10   0   0 0.00  0.0    0  7.6 23 100   M    M   4        30 100
16  74  50  62   7   3   0 0.00  0.0    0  3.2 13 200   M    M   6        15 190
17  67  57  62   8   3   0 0.01  0.0    0  4.3 13  80   M    M   9 3      14  80
```

```
18  66  58  62   8   3   0 0.04  0.0    0  2.3  8 310   M    M   9 1       10  60
19  64  56  60   6   5   0    T  0.0    0  6.4 15 190   M    M   9         18 190
20  67  50  59   5   6   0    T  0.0    0  3.2 10 280   M    M   6         13 280
21  66  47  57   4   8   0 0.00  0.0    0  4.5 15 320   M    M   8 12      18 310
22  66  46  56   3   9   0 0.00  0.0    0  5.1 15 310   M    M   4 1       19 310
23  63  42  53   0  12   0 0.00  0.0    0  3.4 10 280   M    M   7         13 280
24  69  50  60   8   5   0 0.00  0.0    0  7.3 18 110   M    M   7         21 100
25  62  53  58   6   7   0 0.64  0.0    0 14.4 24 100   M    M   9 1       29 120
26  63  46  55   3  10   0 0.01    M    0  6.7 16 190   M    M   6 1       20 190
27  63  44  54   2  11   0 0.00  0.0    0  3.8 14 110   M    M   8 12      16 110
28  59  52  56   5   9   0 0.29  0.0    0  4.5 12 100   M    M   9 1       13 130
29  64  54  59   8   6   0 0.01  0.0    0  6.1 16 190   M    M   8 1       18 180
30  62  56  59   8   6   0 0.34  0.0    0 15.7 30 200   M    M  10 1       35 200
31  64  53  59   8   6   0 1.97  0.0    0 10.7 25 190   M    M  10 1       38 180
================================================================================
SM 2139 1586       149   5  3.69     0.0 175.4          M      202
================================================================================
AV 69.0 51.2                               5.7 FASTST   M    M   7    MAX(MPH)
                                 MISC ---->  # 30 200               # 38  180
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    OCTOBER
                                          YEAR:     2015
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 60.1   TOTAL FOR MONTH:   3.69    1 = FOG OR MIST
DPTR FM NORMAL:   5.2   DPTR FM NORMAL:    0.69    2 = FOG REDUCING VISIBILITY
HIGHEST:    85 ON  5   GRTST 24HR  2.15 ON 30-31      TO 1/4 MILE OR LESS
LOWEST:     42 ON 23                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO

MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  11
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   5
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   2
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   1

[HDD (BASE 65) ]
TOTAL THIS MO.   149    CLEAR  (SCALE 0-3)   6
DPTR FM NORMAL  -166    PTCLDY (SCALE 4-7)  15
TOTAL FM JUL 1   225    CLOUDY (SCALE 8-10) 10
DPTR FM NORMAL  -193

[CDD (BASE 65) ]
TOTAL THIS MO.     5
DPTR FM NORMAL     3    [PRESSURE DATA]
TOTAL FM JAN 1   785    HIGHEST SLP 30.27 ON 22
DPTR FM NORMAL   361    LOWEST  SLP 29.66 ON 25

[REMARKS]
#FINAL-10-15#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

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WFO Monthly/Daily Climate Data

```
000
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     NOVEMBER
                                          YEAR:      2015
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16    17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  63  51  57   7   8   0 0.19  0.0    0  9.2 22 220   M    M   8 1      32 200
 2  58  47  53   3  12   0    T    M    0  3.5 10 260   M    M   7        13 220
 3  57  40  49  -1  16   0 0.00  0.0    0  3.9 16 310   M    M   4 1      20 320
 4  53  37  45  -5  20   0 0.00  0.0    0  2.8  9 150   M    M   7        10 150
 5  53  47  50   1  15   0 0.02    M    0  5.8 15 200   M    M  10        18 190
 6  64  47  56   7   9   0    T    M    0  3.6  9 120   M    M   5 1      11 110
 7  53  43  48  -1  17   0 0.57    M    0  7.4 15 120   M    M   8 1      17 120
 8  55  46  51   2  14   0 0.33    M    0  4.2 17 180   M    M   9 1      21 180
 9  55  40  48   0  17   0 0.02    M    0  2.3  9 120   M    M   7 1      11 120
10  49  42  46  -2  19   0 0.01    M    0  5.2 18 190   M    M   9 1      27 190
11  55  43  49   1  16   0 0.20    M    0  6.9 21 220   M    M   8 1      28 220
12  51  38  45  -3  20   0 0.08    M    0  8.3 23 200   M    M   9 1      30 200
13  58  51  55   8  10   0 0.05    M    M 15.7 25 200   M    M   8        31 200
14  60  55  58  11   7   0    T    M    M 13.0 25 180   M    M  10        35 180
15  56  40  48   1  17   0 0.30    M    M  8.3 24 310   M    M   8 18     30 310
16  50  39  45  -2  20   0 0.38    M    0 10.6 29 190   M    M   9 1      36 200
17  58  47  53   7  12   0 0.84    M    0 19.4 32 200   M    M  10 1      43 190
```

```
18  52  39  46   0  19   0 0.25    M    0  5.1 16 230   M    M   8 1      21 230
19  48  40  44  -2  21   0 0.54    M    0  5.6 17 100   M    M   9 1      21 100
20  52  37  45  -1  20   0 0.00  0.0    0 11.4 26  70   M    M   8        33 100
21  51  32  42  -3  23   0 0.00  0.0    0  4.8 21 100   M    M   1        26 100
22  46  28  37  -8  28   0 0.00  0.0    0  4.4 12 140   M    M   6 12     15 130
23  44  30  37  -8  28   0 0.41    M    0  4.4 18 100   M    M   5 18     22 110
24  43  34  39  -5  26   0 0.30    M    0  5.2 20 310   M    M   9 1      28 310
25  49  30  40  -4  25   0 0.00  0.0    0  4.3 10  40   M    M   2        14  10
26  51  24  38  -6  27   0 0.00  0.0    0  6.9 26  80   M    M   0 1      36  80
27  50  25  38  -6  27   0 0.00  0.0    0  6.3 17 100   M    M   0        20 110
28  47  31  39  -4  26   0 0.00  0.0    0  9.1 20 110   M    M   0        23 110
29  41  29  35  -8  30   0 0.00  0.0    0 12.3 18 120   M    M   0        23 120
30  37  24  31 -12  34   0    T    M    0 10.0 20 110   M    M   6 4      23 100
================================================================================
SM 1559 1156       583   0  4.49     0.0 219.9         M      190
================================================================================
AV 52.0 38.5                               7.3 FASTST   M    M   6    MAX(MPH)
                                 MISC ---->  # 32 200               # 43  190
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    NOVEMBER
                                          YEAR:     2015
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]       [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 45.2    TOTAL FOR MONTH:   4.49    1 = FOG OR MIST
DPTR FM NORMAL:  -1.3    DPTR FM NORMAL:   -1.14    2 = FOG REDUCING VISIBILITY
HIGHEST:    64 ON  6     GRTST 24HR  1.91 ON 31- 1      TO 1/4 MILE OR LESS
LOWEST:     24 ON 30,26                             3 = THUNDER
                         SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                         TOTAL MONTH:   0.0 INCH    5 = HAIL
                         GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                         GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                        VSBY 1/2 MILE OR LESS
                                                    8 = SMOKE OR HAZE
[NO. OF DAYS WITH]       [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                    X = TORNADO

MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  16
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  11
```

```
MIN 32 OR BELOW:   9    0.50 INCH OR MORE:   3
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   583    CLEAR  (SCALE 0-3)   6
DPTR FM NORMAL    32    PTCLDY (SCALE 4-7)  12
TOTAL FM JUL 1   808    CLOUDY (SCALE 8-10) 12
DPTR FM NORMAL  -161

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1   785    HIGHEST SLP 30.48 ON 20
DPTR FM NORMAL   361    LOWEST  SLP 29.45 ON 15

[REMARKS]
#FINAL-11-15#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

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WFO Monthly/Daily Climate Data

```
000
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     DECEMBER
                                          YEAR:      2015
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                      12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  42  34  38  -5  27   0 0.52    M    0 14.5 23 110   M    M   9 1       27 100
 2  42  35  39  -3  26   0 0.30    M    0 13.8 23 110   M    M  10 1       27 110
 3  52  38  45   3  20   0 0.53    M    0 15.6 29 120   M    M  10 1       35 120
 4  50  43  47   5  18   0 0.26    M    M  9.9 20 190   M    M   9 1       25 190
 5  47  43  45   3  20   0 0.39    M    0 17.1 24 120   M    M  10         29 120
 6  57  44  51   9  14   0 0.75    M    0 13.2 28 190   M    M  10 1       42 160
 7  63  46  55  14  10   0 2.67    M    0 11.9 26 200   M    M   9 1       42 220
 8  62  56  59  18   6   0 1.66  0.0    0 15.1 31 190   M    M  10 1       41 200
 9  59  47  53  12  12   0 0.40    M    0 12.3 33 290   M    M   8 1       46 290
10  53  44  49   8  16   0 0.65    M    0 14.1 29 190   M    M  10 1       44 180
11  46  43  45   5  20   0 0.72    M    0 10.6 22 100   M    M  10 1       27 110
12  50  43  47   7  18   0 0.72    M    0 10.3 25 180   M    M   9 1       33 160
13  49  42  46   6  19   0 0.63    M    0 10.1 24 200   M    M  10 1       30 210
14  44  35  40   0  25   0 0.02    M    0  3.7 12 240   M    M   7 1       14 250
15  42  35  39  -1  26   0 0.12    M    0  3.6 10 200   M    M  10 1       12 200
16  45  41  43   3  22   0 0.10    M    0  6.1 18 110   M    M  10 1       21 110
17  55  38  47   7  18   0 1.87    M    0 16.9 23 110   M    M  10 1       29 180
```

```
18  54  42  48   8  17   0 0.23    M    0 10.0 24 190   M    M   9 1      30 190
19  49  40  45   5  20   0 0.15    M    0  7.7 17 210   M    M   9 1      22 220
20  49  41  45   5  20   0 0.35    M    0  9.6 21 160   M    M   8 1      28 140
21  52  40  46   6  19   0 0.80    M    0 15.1 39 240   M    M   9 1      55 240
22  46  37  42   2  23   0 0.20    M    0  4.9 17 270   M    M   8 1      20 280
23  43  37  40   0  25   0 0.59    M    0 12.7 21 200   M    M   9 1      28 280
24  42  37  40   0  25   0 0.06    M    0  3.7 16 190   M    M   9 1      20 190
25  43  35  39  -1  26   0 0.01    M    0  3.7  8 200   M    M   9 12     10 200
26  41  34  38  -2  27   0    T    M    0  7.5 24 100   M    M   9 1      29 100
27  41  34  38  -2  27   0 0.27    M    0 11.5 21 120   M    M  10 1      25 120
28  40  35  38  -2  27   0 0.03    M    0  3.2  9 130   M    M   9 1      10 130
29  39  32  36  -4  29   0 0.24    M    0  8.4 17 110   M    M  10 1      22 110
30  44  29  37  -3  28   0 0.00  0.0    0 10.3 23 100   M    M   3 12     27  90
31  39  33  36  -4  29   0 0.00  0.0    0 20.5 36  80   M    M   1        42  80
================================================================================
SM 1480 1213       659   0 15.24     0.0 327.6          M      273
================================================================================
AV 47.7 39.1                              10.6 FASTST   M    M   9    MAX(MPH)
                                 MISC ---->  # 39 240              # 55  240
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    DECEMBER
                                          YEAR:     2015
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 43.4   TOTAL FOR MONTH:  15.24    1 = FOG OR MIST
DPTR FM NORMAL:   3.0   DPTR FM NORMAL:    9.75    2 = FOG REDUCING VISIBILITY
HIGHEST:    63 ON  7    GRTST 24HR  3.22 ON  6- 7      TO 1/4 MILE OR LESS
LOWEST:     29 ON 30                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  28
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  24
MIN 32 OR BELOW:   2    0.50 INCH OR MORE:  12
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   3

[HDD (BASE 65) ]
TOTAL THIS MO.   659    CLEAR  (SCALE 0-3)   2
DPTR FM NORMAL  -104    PTCLDY (SCALE 4-7)   2
TOTAL FM JUL 1  1467    CLOUDY (SCALE 8-10) 27
DPTR FM NORMAL  -265

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1   785    HIGHEST SLP 30.59 ON 26
DPTR FM NORMAL   361    LOWEST  SLP 29.17 ON 21

[REMARKS]
#FINAL-12-15#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS56 KPQR 011709
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     JANUARY
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:        :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  37  31  34  -6  31   0 0.00  0.0    0 25.3 36 100   M    M   1        44 100
 2  36  28  32  -8  33   0 0.00  0.0    0 24.1 35  90   M    M   1        43 100
 3  32  28  30 -10  35   0 0.31  1.3    1 11.7 25  90   M    M   8 1469   33  80
 4  36  31  34  -6  31   0 0.01    T    1  4.0 12 130   M    M   9 16      M  M
 5  40  31  36  -4  29   0 0.17  0.0    0  7.1 22 110   M    M   9 1      27 120
 6  43  30  37  -3  28   0 0.00  0.0    0  5.1 15 120   M    M   7 1      18 120
 7  47  34  41   1  24   0    T  0.0    0  2.0  9 100   M    M   6        10 100
 8  47  29  38  -3  27   0 0.00  0.0    0  3.5 13 110   M    M   4 1      15 110
 9  46  33  40  -1  25   0 0.03  0.0    0 10.4 21 110   M    M  10        24 110
10  50  29  40  -1  25   0 0.00  0.0    0 10.4 23 100   M    M   1 1      27  90
11  42  38  40  -1  25   0 0.20  0.0    0 12.0 21 100   M    M   8 1      26 100
12  43  39  41   0  24   0 0.84  0.0    0 14.2 26 110   M    M   9 1      33 110
13  49  41  45   4  20   0 0.86  0.0    0  8.0 23 110   M    M   9 1      26 110
14  46  40  43   2  22   0 0.29  0.0    0  8.1 16 110   M    M   9 1      21 100
15  47  39  43   2  22   0 0.10  0.0    0 11.5 18 120   M    M   8 1      22 120
16  52  42  47   5  18   0 0.52  0.0    0 13.3 24 190   M    M   9 1      32 200
17  47  42  45   3  20   0 0.87  0.0    0 13.3 25 110   M    M   8 1      31 120
```

```
18  51  40  46   4  19   0 0.25  0.0    0 11.2 20 110   M    M   8 1      23 120
19  48  42  45   3  20   0 0.64  0.0    0 10.4 22 210   M    M  10 1      28 210
20  50  42  46   4  19   0 0.15  0.0    0 10.9 23  70   M    M   9        29  80
21  52  45  49   7  16   0 0.25  0.0    0 15.7 23 110   M    M  10 1      28 110
22  59  44  52  10  13   0 0.30  0.0    0  9.1 21 110   M    M   8 1      25 110
23  52  44  48   6  17   0 0.21  0.0    0  5.5 14 100   M    M  10 1      17 210
24  50  38  44   2  21   0    T  0.0    0  3.9 10  80   M    M   8        13 190
25  56  42  49   7  16   0    T  0.0    0  8.7 17 110   M    M   7        21 110
26  49  44  47   5  18   0 0.08  0.0    0  9.5 23 110   M    M  10 1      26 110
27  54  47  51   9  14   0 0.03  0.0    0 14.5 25 110   M    M   9        29 110
28  59  45  52  10  13   0 0.56  0.0    0 10.8 24 110   M    M   7 1      28 110
29  53  41  47   5  18   0 0.28  0.0    0 10.7 21 220   M    M   9 1      27 210
30  47  39  43   0  22   0 0.15  0.0    0  6.6 14 310   M    M   8 1      16 190
31  44  39  42  -1  23   0 0.13  0.0    0  3.2  9  90   M    M   9 18     10  90
================================================================================
SM 1464 1177       688   0  7.23    1.3 314.7           M      238
================================================================================
AV 47.2 38.0                              10.2 FASTST   M    M   8    MAX(MPH)
                                 MISC ---->  # 36 100               # 44  100
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    JANUARY
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 42.6   TOTAL FOR MONTH:   7.23    1 = FOG OR MIST
DPTR FM NORMAL:   1.2   DPTR FM NORMAL:    2.35    2 = FOG REDUCING VISIBILITY
HIGHEST:    59 ON 28,22 GRTST 24HR  1.42 ON 12-13      TO 1/4 MILE OR LESS
LOWEST:     28 ON  3, 2                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   1.3 INCHES  5 = HAIL
                        GRTST 24HR   1.3 ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   1 ON  4, 3  7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   1    0.01 INCH OR MORE:  23
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  19
MIN 32 OR BELOW:   8    0.50 INCH OR MORE:   6
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   688    CLEAR  (SCALE 0-3)   3
DPTR FM NORMAL   -44    PTCLDY (SCALE 4-7)   9
TOTAL FM JUL 1  2155    CLOUDY (SCALE 8-10) 19
DPTR FM NORMAL  -309

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.51 ON  1
DPTR FM NORMAL     0    LOWEST  SLP 29.54 ON  5

[REMARKS]
#FINAL-01-16#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
000
CXUS56 KPQR 011717
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     FEBRUARY
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                         12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  47  38  43   0  22   0 0.05  0.0    0  6.3 15 210   M    M   9 1       17 200
 2  49  32  41  -2  24   0    T  0.0    0  8.1 16 110   M    M   5 1       19 110
 3  49  41  45   2  20   0 0.26  0.0    0 14.8 23 200   M    M  10 1       29 210
 4  56  44  50   7  15   0 0.40  0.0    0  9.3 20 200   M    M   7 1       27 200
 5  58  40  49   6  16   0 0.12  0.0    0  8.7 26 210   M    M   8 1       34 220
 6  52  41  47   4  18   0 0.00  0.0    0  3.8 15 190   M    M   9         19 190
 7  62  44  53  10  12   0 0.00  0.0    0  1.8  8 140   M    M   7          9 150
 8  62  37  50   7  15   0 0.00  0.0    0  4.0 17 110   M    M   2 1       19 100
 9  60  43  52   9  13   0 0.00  0.0    0  8.9 17 110   M    M   3         22 110
10  62  42  52   9  13   0    T  0.0    0  6.8 18 110   M    M   8         23 130
11  58  46  52   9  13   0 0.13  0.0    0  7.3 18 110   M    M  10 1       23 110
12  56  47  52   9  13   0 0.27  0.0    0 10.7 20 120   M    M   8 1       25 120
13  53  45  49   5  16   0 0.26  0.0    0  8.7 20 190   M    M   9         28 180
14  58  50  54  10  11   0 0.19  0.0    0  8.1 17 210   M    M  10 1       26 200
15  61  50  56  12   9   0 0.00  0.0    0  7.4 17 200   M    M   8         23 200
16  56  47  52   8  13   0 0.35  0.0    0  4.4 15 210   M    M  10 1       20 220
17  63  46  55  11  10   0 0.35  0.0    0  8.9 22 140   M    M  10 1       27 140
```

```
18  50  42  46   2  19   0 0.42  0.0    0 10.0 23 210   M    M   9 1      32 210
19  52  43  48   4  17   0 0.24  0.0    0 14.3 31 200   M    M   8        39 180
20  53  39  46   2  19   0 0.05  0.0    0  4.6 18 200   M    M   7 1      24 200
21  53  35  44   0  21   0 0.10  0.0    0  6.5 18 250   M    M   5 1      23 250
22  54  36  45   1  20   0    T  0.0    0  2.8  9 310   M    M   6 12     10 310
23  59  33  46   1  19   0 0.00  0.0    0 12.3 25 110   M    M   7 12     32  80
24  62  42  52   7  13   0 0.00  0.0    0  6.8 16 100   M    M   8        17 100
25  64  37  51   6  14   0 0.00  0.0    0  4.7 14 110   M    M   3        16 110
26  60  43  52   7  13   0 0.38  0.0    0  5.1 15 110   M    M   9 1      18 120
27  59  48  54   9  11   0 0.13  0.0    0  9.8 22 200   M    M   6 1      28 190
28  57  47  52   6  13   0 0.08  0.0    0 13.2 32 230   M    M   8 1      40 230
29  52  45  49   3  16   0 0.32  0.0    0  8.0 17 120   M    M  10 1      21 110
================================================================================
SM 1637 1223       448   0  4.10     0.0 226.1          M      219
================================================================================
AV 56.4 42.2                               7.8 FASTST   M    M   8     MAX(MPH)
                                 MISC ---->  # 32 230               # 40  230
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    FEBRUARY
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 49.3   TOTAL FOR MONTH:   4.10    1 = FOG OR MIST
DPTR FM NORMAL:   5.5   DPTR FM NORMAL:    0.44    2 = FOG REDUCING VISIBILITY
HIGHEST:    64 ON 25    GRTST 24HR  0.65 ON  3- 4      TO 1/4 MILE OR LESS
LOWEST:     32 ON  2                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  18
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  15
MIN 32 OR BELOW:   1    0.50 INCH OR MORE:   0
```

```
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   448    CLEAR  (SCALE 0-3)   3
DPTR FM NORMAL  -146    PTCLDY (SCALE 4-7)  12
TOTAL FM JUL 1  2603    CLOUDY (SCALE 8-10) 14
DPTR FM NORMAL  -474

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.55 ON  7
DPTR FM NORMAL     0    LOWEST  SLP 29.16 ON 17

[REMARKS]
#FINAL-02-16#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

538
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     MARCH
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  59  46  53   7  12   0 0.31  0.0    0 16.8 37 250   M    M  10 1      49 250
 2  57  44  51   5  14   0 0.36  0.0    0  9.3 23 120   M    M  10 1      29 180
 3  62  46  54   8  11   0 0.05  0.0    0  8.2 17 220   M    M   5 8      22 220
 4  59  42  51   5  14   0    T  0.0    0  7.8 20 110   M    M   8        23 110
 5  61  49  55   9  10   0 0.33  0.0    0 11.2 24 230   M    M   9        34 200
 6  55  47  51   5  14   0 0.25  0.0    0 11.8 30 190   M    M   7 158    40 190
 7  54  43  49   2  16   0 0.04  0.0    0  9.6 29 180   M    M   8        41 180
 8  47  38  43  -4  22   0 0.11  0.0    0  8.2 16 110   M    M   9 1      19 110
 9  51  44  48   1  17   0 0.60  0.0    0 15.2 29 110   M    M  10 1      35 110
10  57  44  51   4  14   0 0.24  0.0    0 11.5 28 200   M    M   7 1      35 200
11  54  40  47   0  18   0 0.16  0.0    0  8.3 18 100   M    M   8 12     23 100
12  51  44  48   0  17   0 0.34  0.0    0 12.2 26 210   M    M   9 1      39 200
13  53  43  48   0  17   0 0.55  0.0    0 13.8 30 220   M    M   9 1      39 190
14  51  42  47  -1  18   0 0.34  0.0    0 11.4 24 190   M    M   9 1      29 200
15  48  42  45  -3  20   0 0.25  0.0    0  5.3 13 200   M    M   9 1      15 210
16  57  41  49   1  16   0 0.06  0.0    0  4.5 12 290   M    M   6 18     14 280
17  61  33  47  -1  18   0 0.00  0.0    0 12.9 29  90   M    M   2        38 100
```

```
18  61  47  54   5  11   0 0.00  0.0    0 20.6 32 100   M    M   6        42 100
19  67  46  57   8   8   0    T  0.0    0  8.0 15 140   M    M   8        18 120
20  57  49  53   4  12   0 0.23  0.0    0  9.5 20 110   M    M   9 135    25 200
21  54  46  50   1  15   0 0.14  0.0    0  9.8 18 210   M    M   9 1      24 210
22  56  45  51   2  14   0 0.11  0.0    0  6.6 16 200   M    M   8 18     19 200
23  54  46  50   1  15   0 0.09  0.0    0 10.5 18 200   M    M  10 1      25 220
24  57  45  51   2  14   0 0.03  0.0    0  9.8 21 290   M    M   8 1      26 280
25  57  42  50   0  15   0 0.01  0.0    M  2.9 12 110   M    M   7        14 280
26  59  41  50   0  15   0 0.05  0.0    M  7.0 16 210   M    M   8 1      22 160
27  54  42  48  -2  17   0 0.08  0.0    M  9.3 22 320   M    M   8        30 320
28  58  38  48  -2  17   0    T  0.0    M  5.0 20 310   M    M   6        26 320
29  65  35  50   0  15   0 0.00  0.0    0  5.6 16 310   M    M   2 12     19 310
30  74  39  57   7   8   0 0.00  0.0    0  4.7 13 280   M    M   1        14 280
31  75  44  60  10   5   0 0.00  0.0    0  3.7  9 280   M    M   3        12 280
================================================================================
SM 1785 1333       449   0  4.73     0.0 291.0          M      228
================================================================================
AV 57.6 43.0                               9.4 FASTST   M    M   7    MAX(MPH)
                                 MISC ---->  # 37 250               # 49  250
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    MARCH
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 50.3   TOTAL FOR MONTH:   4.73    1 = FOG OR MIST
DPTR FM NORMAL:   2.1   DPTR FM NORMAL:    1.05    2 = FOG REDUCING VISIBILITY
HIGHEST:    75 ON 31    GRTST 24HR  0.71 ON  9-10      TO 1/4 MILE OR LESS
LOWEST:     33 ON 17                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  23
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  15
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   2
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   449    CLEAR  (SCALE 0-3)   4
DPTR FM NORMAL   -73    PTCLDY (SCALE 4-7)  11
TOTAL FM JUL 1  3052    CLOUDY (SCALE 8-10) 16
DPTR FM NORMAL  -528

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.35 ON 23
DPTR FM NORMAL     0    LOWEST  SLP 29.19 ON  5

[REMARKS]
#FINAL-03-16#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
619
CXUS56 KPQR 021548
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     APRIL
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  76  46  61  11   4   0 0.00  0.0    0  4.1  9 280   M    M   1 18     12 290
 2  70  46  58   8   7   0 0.00  0.0    0  3.8  9 320   M    M   3        14 350
 3  73  44  59   9   6   0 0.06  0.0    0  7.2 20 260   M    M   6        26 250
 4  61  47  54   3  11   0 0.05  0.0    0  8.5 22 290   M    M   7 1      26 290
 5  61  46  54   3  11   0    T  0.0    0  2.8  9 110   M    M   8        12  50
 6  74  39  57   6   8   0 0.00  0.0    0  4.1 10 320   M    M   4 1      13 320
 7  85  47  66  15   0   1 0.00  0.0    0  7.5 20 100   M    M   1        24 100
 8  83  51  67  16   0   2 0.00  0.0    0  6.7 20 320   M    M   2        25 320
 9  68  50  59   8   6   0 0.00  0.0    0  3.3 12 320   M    M   5        16 320
10  61  50  56   5   9   0 0.00  0.0    0  4.1 10 340   M    M   9        15 350
11  62  51  57   6   8   0 0.00  0.0    0  5.2  9 320   M    M   9        13 310
12  60  48  54   2  11   0 0.19  0.0    0  8.2 24 260   M    M  10 1      30 260
13  59  46  53   1  12   0 0.18  0.0    0  9.3 18 180   M    M   9 1      25 210
14  54  46  50  -2  15   0 0.66  0.0    0  9.2 25 210   M    M   9 1      32 200
15  61  42  52   0  13   0 0.00  0.0    0  3.0  8  70   M    M   7         9  70
16  71  40  56   4   9   0 0.00  0.0    0  3.2 10 310   M    M   4        12 310
17  81  47  64  12   1   0 0.00  0.0    0 10.6 26  90   M    M   4        30 100
```

```
18  87  52  70  18   0   5 0.00  0.0    0  4.3 12 130   M    M   3        13 130
19  89  54  72  19   0   7 0.00  0.0    0  3.9  9 130   M    M   2        11 130
20  82  53  68  15   0   3 0.01  0.0    0  5.2 24 160   M    M   4 3      29 140
21  76  51  64  11   1   0 0.20  0.0    0  3.9 28 250   M    M   7 1      34 250
22  65  52  59   6   6   0 0.41  0.0    0  6.9 23 230   M    M   8 1      28 230
23  62  52  57   4   8   0 0.05  0.0    0  7.8 18 240   M    M   9        23 220
24  57  43  50  -4  15   0 0.05  0.0    0  7.3 23 310   M    M   8        27 310
25  63  40  52  -2  13   0 0.00  0.0    0  6.7 20 320   M    M   5        23 310
26  60  40  50  -4  15   0    T  0.0    0  4.1 12 320   M    M   6        14 320
27  61  48  55   1  10   0 0.02  0.0    0  4.1 17 280   M    M   8        17 280
28  63  48  56   2   9   0    T  0.0    0  3.5 14 320   M    M   9        17 320
29  60  49  55   0  10   0 0.08  0.0    0  5.1 13 310   M    M   9 18     15 310
30  70  42  56   1   9   0 0.00  0.0    0  4.6 17 310   M    M   5        21 310
================================================================================
SM 2055 1410       227  18  1.96     0.0 168.2          M      181
================================================================================
AV 68.5 47.0                               5.6 FASTST   M    M   6    MAX(MPH)
                                 MISC ---->  # 28 250               # 34  250
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    APRIL
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 57.8   TOTAL FOR MONTH:   1.96    1 = FOG OR MIST
DPTR FM NORMAL:   5.5   DPTR FM NORMAL:   -0.77    2 = FOG REDUCING VISIBILITY
HIGHEST:    89 ON 19    GRTST 24HR  0.81 ON 13-14      TO 1/4 MILE OR LESS
LOWEST:     39 ON  6                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  12
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   5
```

```
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   1
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   227    CLEAR  (SCALE 0-3)   5
DPTR FM NORMAL  -156    PTCLDY (SCALE 4-7)  16
TOTAL FM JUL 1  3279    CLOUDY (SCALE 8-10)  9
DPTR FM NORMAL  -684

[CDD (BASE 65) ]
TOTAL THIS MO.    18
DPTR FM NORMAL    17    [PRESSURE DATA]
TOTAL FM JAN 1    18    HIGHEST SLP 30.59 ON  5
DPTR FM NORMAL    17    LOWEST  SLP 29.58 ON 22

[REMARKS]
#FINAL-04-16#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

457
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     MAY
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8    9   10  11  12  13   14  15    16   17  18
                                      12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  82  46  64   9   1   0 0.00  0.0    0  8.6 24  80   M    M   1         30 100
 2  88  53  71  16   0   6 0.00  0.0    0  4.8 14 130   M    M   4         17 320
 3  74  55  65   9   0   0 0.09  0.0    0  5.0 14 320   M    M   9 1       18 320
 4  64  53  59   3   6   0    T  0.0    0  9.2 16 320   M    M   9         22 320
 5  73  53  63   7   2   0 0.00  0.0    0  7.1 18 310   M    M   8         23 320
 6  82  53  68  12   0   3 0.00  0.0    0  7.9 17 330   M    M   3         26 330
 7  86  55  71  15   0   6 0.00  0.0    0  7.5 25 310   M    M   2         31 310
 8  66  53  60   3   5   0 0.00  0.0    0 12.7 23 310   M    M   5         28 310
 9  70  52  61   4   4   0 0.00  0.0    0  7.6 17 320   M    M   6         25 330
10  80  47  64   7   1   0 0.00  0.0    0  5.6 15 310   M    M   1         19 320
11  85  49  67  10   0   2 0.00  0.0    0  3.6  9 320   M    M   2         12 320
12  84  50  67   9   0   2 0.00  0.0    0  4.5 12 320   M    M   2         14 310
13  89  53  71  13   0   6 0.00  0.0    0  5.7 17 320   M    M   3         21 320
14  59  54  57  -1   8   0 0.10  0.0    0  3.7 10 180   M    M  10 18      12  80
15  58  54  56  -2   9   0 0.64  0.0    0  3.4  8 240   M    M  10 1       10 240
16  62  54  58   0   7   0 0.00  0.0    0  5.9 13 310   M    M  10         15 300
17  76  54  65   6   0   0 0.00  0.0    0  5.4 15 320   M    M   7         20 320
```

```
18  75  54  65   6   0   0 0.00  0.0    0  7.3 24 320   M    M   5        30 320
19  57  50  54  -5  11   0 0.43  0.0    0  7.3 16 300   M    M   9 1      20 330
20  66  49  58  -1   7   0 0.00  0.0    0  3.2 12  70   M    M   8        18  10
21  58  53  56  -3   9   0 0.25  0.0    0  5.1 15 310   M    M  10 1      21 320
22  64  51  58  -2   7   0 0.15  0.0    0  7.4 17 180   M    M   9        22 180
23  68  53  61   1   4   0    T  0.0    0  5.5 14 180   M    M   8        15 180
24  73  55  64   4   1   0 0.00  0.0    0  7.6 16 300   M    M   7        20 300
25  68  55  62   2   3   0 0.00  0.0    0  5.7 17 310   M    M   9        22 330
26  62  54  58  -2   7   0 0.00  0.0    0  6.2 18 310   M    M   9        23 310
27  63  49  56  -4   9   0 0.06  0.0    0  4.4 17 310   M    M   8 1      21 310
28  73  48  61   0   4   0 0.00  0.0    0  5.0 12 320   M    M   7        18 350
29  71  54  63   2   2   0 0.00  0.0    0  6.9 15 310   M    M   7        20 330
30  77  49  63   2   2   0 0.00  0.0    0  7.5 15 310   M    M   5        20 320
31  88  53  71  10   0   6 0.00  0.0    0  5.7 13 320   M    M   5        16 310
================================================================================
SM 2241 1615       109  31  1.72    0.0 193.0           M      198
================================================================================
AV 72.3 52.1                               6.2 FASTST   M    M   6    MAX(MPH)
                                 MISC ---->  # 25 310               # 31  310
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    MAY
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 62.2   TOTAL FOR MONTH:   1.72    1 = FOG OR MIST
DPTR FM NORMAL:   3.9   DPTR FM NORMAL:   -0.75    2 = FOG REDUCING VISIBILITY
HIGHEST:    89 ON 13    GRTST 24HR  0.65 ON 14-15      TO 1/4 MILE OR LESS
LOWEST:     46 ON  1                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   7
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   5
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   1
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   109    CLEAR  (SCALE 0-3)   6
DPTR FM NORMAL  -115    PTCLDY (SCALE 4-7)  14
TOTAL FM JUL 1  3388    CLOUDY (SCALE 8-10) 11
DPTR FM NORMAL  -799

[CDD (BASE 65) ]
TOTAL THIS MO.    31
DPTR FM NORMAL    15    [PRESSURE DATA]
TOTAL FM JAN 1    49    HIGHEST SLP 30.27 ON 30
DPTR FM NORMAL    32    LOWEST  SLP 29.72 ON 20

[REMARKS]
#FINAL-05-16#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

746
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     JUNE
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8    9   10  11  12  13   14  15   16    17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  82  58  70   9   0   5    T  0.0    0  4.7 10 320   M    M   8        16 320
 2  70  59  65   4   0   0 0.19  0.0    0  4.2 10 190   M    M   9 1      13 180
 3  89  56  73  11   0   8 0.00  0.0    0  7.0 15 320   M    M   3        20 310
 4  98  63  81  19   0  16 0.00  0.0    0  6.0 14 290   M    M   4        16 290
 5 100  66  83  21   0  18 0.00  0.0    0  4.7 15 310   M    M   2        18 320
 6  91  63  77  15   0  12 0.00  0.0    0  8.1 21 310   M    M   2        25 320
 7  89  59  74  12   0   9 0.00  0.0    0  6.5 16 320   M    M   4        21 320
 8  74  58  66   4   0   1 0.00  0.0    0  7.3 13 330   M    M   5        20 220
 9  62  55  59  -3   6   0 0.08  0.0    0  5.4 15 260   M    M  10        18 200
10  65  51  58  -4   7   0 0.22  0.0    0 10.4 24 180   M    M   8        32 190
11  67  53  60  -3   5   0    T  0.0    0  5.8 16 290   M    M   6        20 280
12  76  50  63   0   2   0 0.00  0.0    0  6.9 15 320   M    M   3        21 320
13  65  53  59  -4   6   0 0.01  0.0    0  7.0 21 260   M    M   8 8      25 260
14  63  50  57  -6   8   0 0.10  0.0    0 10.0 25 230   M    M   7 15     30 220
15  65  48  57  -6   8   0 0.05  0.0    0  5.7 16 300   M    M   8        20 290
16  68  50  59  -5   6   0 0.01  0.0    0  5.5 17 260   M    M   7        21 260
17  71  53  62  -2   3   0    T  0.0    0  4.5 16 320   M    M   7        19 310
```

```
18  67  50  59  -5   6   0 0.19  0.0    0  4.6 21 190   M    M   7        27 180
19  78  48  63  -1   2   0 0.00  0.0    0  5.9 16 320   M    M   6        21 310
20  81  59  70   6   0   5    T  0.0    0  6.2 23 310   M    M   6        29 310
21  76  58  67   3   0   2 0.00  0.0    0  7.4 16 320   M    M   6        22 330
22  80  54  67   2   0   2 0.00  0.0    0  5.0 14 320   M    M   6 8      18 320
23  66  55  61  -4   4   0 0.53  0.0    0  7.8 16 200   M    M  10 18     21 210
24  68  54  61  -4   4   0 0.04  0.0    0  4.5 17 230   M    M   7        20 230
25  79  51  65   0   0   0 0.00  0.0    0  7.7 18 320   M    M   2        24 320
26  89  58  74   8   0   9 0.00  0.0    0  7.5 18 310   M    M   1        22 310
27  87  60  74   8   0   9 0.00  0.0    0  7.0 16 320   M    M   1        23 320
28  80  56  68   2   0   3 0.00  0.0    0  7.8 15 330   M    M   2        22 320
29  78  57  68   2   0   3    T  0.0    0  7.6 17 320   M    M   6        21 320
30  79  56  68   2   0   3 0.00  0.0    0  8.3 18 320   M    M   4        24 320
================================================================================
SM 2303 1661        67 105  1.42     0.0 197.0          M      165
================================================================================
AV 76.8 55.4                               6.6 FASTST   M    M   6    MAX(MPH)
                                 MISC ---->  # 25 230               # 32  190
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    JUNE
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 66.1   TOTAL FOR MONTH:   1.42    1 = FOG OR MIST
DPTR FM NORMAL:   2.5   DPTR FM NORMAL:   -0.28    2 = FOG REDUCING VISIBILITY
HIGHEST:   100 ON  5    GRTST 24HR  0.54 ON 23-24      TO 1/4 MILE OR LESS
LOWEST:     48 ON 19,15                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO

MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  10
MAX 90 OR ABOVE:   3    0.10 INCH OR MORE:   5
```

```
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   1
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.    67    CLEAR  (SCALE 0-3)   8
DPTR FM NORMAL   -24    PTCLDY (SCALE 4-7)  18
TOTAL FM JUL 1  3455    CLOUDY (SCALE 8-10)  4
DPTR FM NORMAL  -823

[CDD (BASE 65) ]
TOTAL THIS MO.   105
DPTR FM NORMAL    58    [PRESSURE DATA]
TOTAL FM JAN 1   154    HIGHEST SLP 30.40 ON 19
DPTR FM NORMAL    90    LOWEST  SLP 29.70 ON  7

[REMARKS]
#FINAL-06-16#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
985
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     JULY
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9  10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  81  55  68   1   0   3 0.00  0.0    0  6.2 16 320   M    M   4        22 320
 2  82  60  71   4   0   6 0.00  0.0    0  6.9 15 320   M    M   4        21 320
 3  77  58  68   1   0   3    T  0.0    0  7.2 20 310   M    M   5        24 310
 4  70  57  64  -3   1   0 0.00  0.0    0  6.3 16 320   M    M   7 8      19 310
 5  73  54  64  -4   1   0 0.00  0.0    0  5.9 13 320   M    M   6        16 350
 6  80  57  69   1   0   4 0.00  0.0    0  4.7 12 310   M    M   5        18 290
 7  72  61  67  -1   0   2 0.07  0.0    0  5.6 14 250   M    M   9 1      16 250
 8  75  59  67  -1   0   2 0.23  0.0    0  7.8 18 160   M    M   9 1      22 150
 9  74  58  66  -2   0   1 0.03  0.0    0  9.4 21 190   M    M   8 1      26 200
10  72  57  65  -3   0   0 0.02  0.0    0  7.8 17 190   M    M   9        22 190
11  75  59  67  -2   0   2 0.00  0.0    0  5.6 12 310   M    M   7        15 300
12  74  61  68  -1   0   3 0.01  0.0    0  5.6 14 330   M    M   8        18 330
13  79  60  70   1   0   5 0.00  0.0    0  8.5 17 310   M    M   4        21 320
14  81  58  70   1   0   5 0.00  0.0    0  8.8 23 310   M    M   1        26 310
15  74  54  64  -5   1   0 0.00  0.0    0  5.3 15 310   M    M   5        18 310
16  75  60  68  -2   0   3 0.00  0.0    0  4.7 10 320   M    M   7        15 330
17  73  60  67  -3   0   2 0.00  0.0    0  4.5 12 320   M    M   9        14 290
```

```
18  77  63  70   0   0   5 0.00  0.0    0  6.2 16 180   M    M   9        19 250
19  78  62  70   0   0   5 0.00  0.0    0  4.6 13 310   M    M   7        17 320
20  84  57  71   1   0   6 0.00  0.0    0  5.4 14 300   M    M   2        18 300
21  89  61  75   5   0  10 0.00  0.0    0  5.4 25 320   M    M   4        28 320
22  71  60  66  -4   0   1 0.30  0.0    0  4.0 10 360   M    M   8 18     14 340
23  74  61  68  -2   0   3 0.00  0.0    0  7.1 16 310   M    M   6        22 310
24  88  57  73   3   0   8 0.00  0.0    0  7.5 18 310   M    M   1        25 320
25  87  61  74   4   0   9 0.00  0.0    0  7.8 17 320   M    M   3        24 290
26  84  60  72   2   0   7 0.00  0.0    0  6.8 17 320   M    M   3        28 260
27  88  59  74   3   0   9 0.00  0.0    0  6.3 21 310   M    M   4        24 310
28  94  61  78   7   0  13 0.00  0.0    0  8.1 18 320   M    M   0        25 320
29  94  65  80   9   0  15 0.00  0.0    0  7.3 20 320   M    M   1        24 320
30  81  58  70  -1   0   5 0.00  0.0    0  8.2 20 310   M    M   2        24 320
31  76  59  68  -3   0   3 0.00  0.0    0  6.4 15 290   M    M   5        22 320
================================================================================
SM 2452 1832         3 140  0.66     0.0 201.9           M      162
================================================================================
AV 79.1 59.1                               6.5 FASTST   M    M   5    MAX(MPH)
                                 MISC ---->  # 25 320               # 28  320
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    JULY
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 69.1   TOTAL FOR MONTH:   0.66    1 = FOG OR MIST
DPTR FM NORMAL:  -0.1   DPTR FM NORMAL:    0.01    2 = FOG REDUCING VISIBILITY
HIGHEST:    94 ON 29,28 GRTST 24HR  0.30 ON 22-22      TO 1/4 MILE OR LESS
LOWEST:     54 ON 15, 5                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   6
```

```
MAX 90 OR ABOVE:   2    0.10 INCH OR MORE:   2
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.     3    CLEAR  (SCALE 0-3)   7
DPTR FM NORMAL   -14    PTCLDY (SCALE 4-7)  17
TOTAL FM JUL 1     3    CLOUDY (SCALE 8-10)  7
DPTR FM NORMAL   -14

[CDD (BASE 65) ]
TOTAL THIS MO.   140
DPTR FM NORMAL    -7    [PRESSURE DATA]
TOTAL FM JAN 1   294    HIGHEST SLP 30.30 ON 22
DPTR FM NORMAL    83    LOWEST  SLP 29.85 ON 29

[REMARKS]
#FINAL-07-16#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
710
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     AUGUST
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  80  56  68  -3   0   3 0.00  0.0    0  7.4 15 320   M    M   4         19 320
 2  76  59  68  -3   0   3 0.00  0.0    0  7.8 20 320   M    M   6         24 320
 3  81  53  67  -4   0   2 0.00  0.0    0  7.8 18 320   M    M   3         27 320
 4  90  61  76   6   0  11 0.00  0.0    0  9.1 21 320   M    M   0         28 310
 5  81  59  70   0   0   5 0.00  0.0    0  8.8 18 310   M    M   1         24 320
 6  75  57  66  -4   0   1 0.00  0.0    0  5.4 13 310   M    M   3         17 300
 7  74  59  67  -3   0   2    T  0.0    0  6.6 18 270   M    M   7         22 270
 8  70  60  65  -5   0   0 0.08  0.0    0  3.8 10 300   M    M   8         12 310
 9  70  57  64  -6   1   0 0.01  0.0    0  5.2 12 310   M    M   9 1       13 310
10  80  59  70   0   0   5 0.00  0.0    0  5.5 15 320   M    M   5         19 330
11  89  61  75   5   0  10 0.00  0.0    0  7.4 15 320   M    M   3         19 320
12  98  64  81  11   0  16 0.00  0.0    0  4.6 13 300   M    M   1         17 280
13  94  66  80  10   0  15 0.00  0.0    0  5.3 13 340   M    M   6         18 320
14  88  60  74   4   0   9 0.00  0.0    0  8.7 18 310   M    M   1         24 320
15  87  60  74   4   0   9 0.00  0.0    0  7.2 17 320   M    M   2         21 320
16  86  59  73   3   0   8 0.00  0.0    0  7.9 17 330   M    M   4         23 320
17  82  59  71   1   0   6 0.00  0.0    0  6.4 14 290   M    M   1         17 320
```

```
18  99  61  80  10   0  15 0.00  0.0    0  7.0 17 320   M    M   1        24 320
19 100  64  82  13   0  17 0.00  0.0    0  7.3 21  90   M    M   1        26  90
20 100  64  82  13   0  17 0.00  0.0    0  4.3 12 350   M    M   1        17 340
21  81  58  70   1   0   5 0.00  0.0    0  7.8 18 320   M    M   3        23 320
22  75  53  64  -5   1   0 0.00  0.0    0  6.7 15 300   M    M   4        20 300
23  85  55  70   1   0   5 0.00  0.0    0  6.7 16 320   M    M   2        19 320
24  92  59  76   7   0  11 0.00  0.0    0  6.1 17 320   M    M   1        22 320
25  95  60  78   9   0  13 0.00  0.0    0  4.9 16 310   M    M   2        20 300
26  97  61  79  10   0  14 0.00  0.0    0  4.5 13 300   M    M   4        15 300
27  83  61  72   4   0   7 0.00  0.0    0  5.9 18 310   M    M   3        23 320
28  84  57  71   3   0   6 0.00  0.0    0  5.7 13 320   M    M   3        15 310
29  86  59  73   5   0   8 0.00  0.0    0  4.6 18 320   M    M   3        25 320
30  73  58  66  -2   0   1 0.00  0.0    0  7.2 12  70   M    M   6        14  70
31  70  58  64  -4   1   0    T  0.0    0  5.3 14 280   M    M   7 8      15 280
================================================================================
SM 2621 1837         3 224  0.09     0.0 198.9          M      105
================================================================================
AV 84.5 59.3                               6.4 FASTST   M    M   3    MAX(MPH)
                                 MISC ---->  # 21 320               # 28  310
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    AUGUST
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 71.9   TOTAL FOR MONTH:   0.09    1 = FOG OR MIST
DPTR FM NORMAL:   2.4   DPTR FM NORMAL:   -0.58    2 = FOG REDUCING VISIBILITY
HIGHEST:   100 ON 20,19 GRTST 24HR  0.09 ON  8- 9      TO 1/4 MILE OR LESS
LOWEST:     53 ON 22, 3                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   2
```

```
MAX 90 OR ABOVE:   9    0.10 INCH OR MORE:   0
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.     3    CLEAR  (SCALE 0-3)  19
DPTR FM NORMAL    -7    PTCLDY (SCALE 4-7)  11
TOTAL FM JUL 1     6    CLOUDY (SCALE 8-10)  1
DPTR FM NORMAL   -21

[CDD (BASE 65) ]
TOTAL THIS MO.   224
DPTR FM NORMAL    72    [PRESSURE DATA]
TOTAL FM JAN 1   518    HIGHEST SLP 30.28 ON  3
DPTR FM NORMAL   155    LOWEST  SLP 29.76 ON 20

[REMARKS]
#FINAL-08-16#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
396
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     SEPTEMBER
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  69  58  64  -4   1   0 0.06  0.0    0  5.3 17 260   M    M   9 1      22 270
 2  70  54  62  -6   3   0 0.54  0.0    0  5.5 20 200   M    M   7 18     24 210
 3  70  50  60  -7   5   0 0.01  0.0    0  3.7 14 310   M    M   5 1      17 310
 4  71  53  62  -5   3   0 0.00  0.0    0  6.5 14 320   M    M   5        17 320
 5  71  51  61  -6   4   0    T  0.0    0  2.9 10 310   M    M   6        13 300
 6  68  56  62  -5   3   0 0.16  0.0    0  5.5 14 180   M    M   8 18     18 180
 7  75  60  68   1   0   3    T  0.0    0  3.2  9 330   M    M   7        15 340
 8  75  58  67   1   0   2    T  0.0    0  6.0 15 310   M    M   6        20 320
 9  84  52  68   2   0   3 0.00  0.0    0  5.7 14 320   M    M   2        20 310
10  86  52  69   3   0   4 0.00  0.0    0  4.1 17 320   M    M   1        23 330
11  73  52  63  -3   2   0 0.00  0.0    0  5.9 13 330   M    M   3        17 320
12  80  49  65  -1   0   0 0.00  0.0    0  5.5 16 100   M    M   1        21 100
13  82  52  67   2   0   2 0.00  0.0    0  7.1 20  90   M    M   0        25 100
14  80  49  65   0   0   0 0.00  0.0    0  4.3 10  80   M    M   1        14 340
15  80  53  67   2   0   2 0.00  0.0    0  3.8 10 320   M    M   3        15 320
16  83  53  68   3   0   3 0.00  0.0    0  3.1 10 310   M    M   6 1      13 320
17  63  56  60  -4   5   0 0.88  0.0    0  5.6 14 110   M    M  10 1      17 120
```

```
18  72  54  63  -1   2   0    T  0.0    0  3.4 10 310   M    M   7        13 320
19  67  51  59  -5   6   0    T  0.0    0  4.0  9 190   M    M   7        13 190
20  72  49  61  -3   4   0 0.00  0.0    0  4.9 17 300   M    M   3        22 310
21  74  51  63   0   2   0 0.00  0.0    0  4.3 16 330   M    M   4        22 320
22  66  47  57  -6   8   0 0.00  0.0    0  2.2 10  80   M    M   5        14  80
23  62  51  57  -5   8   0 0.04  0.0    0  6.9 21 200   M    M  10 1      27 200
24  70  52  61  -1   4   0 0.00  0.0    0  3.1  9 310   M    M   5 12     11 300
25  83  50  67   5   0   2 0.00  0.0    0  4.1 10 300   M    M   3        14 270
26  89  55  72  10   0   7 0.00  0.0    0  5.6 16 320   M    M   1        21 320
27  74  59  67   6   0   2 0.00  0.0    0  8.4 14 320   M    M   5        21 330
28  75  50  63   2   2   0 0.00  0.0    0  5.1 16 340   M    M   2        18 320
29  70  53  62   2   3   0 0.00  0.0    0  5.1 13 310   M    M   5        19 330
30  70  45  58  -2   7   0    T  0.0    0  5.5 17 210   M    M   6 1      24 200
================================================================================
SM 2224 1575        72  30  1.69     0.0 146.3          M      143
================================================================================
AV 74.1 52.5                               4.9 FASTST   M    M   5    MAX(MPH)
                                 MISC ---->  # 21 200               # 27  200
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    SEPTEMBER
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 63.3   TOTAL FOR MONTH:   1.69    1 = FOG OR MIST
DPTR FM NORMAL:  -1.2   DPTR FM NORMAL:    0.22    2 = FOG REDUCING VISIBILITY
HIGHEST:    89 ON 26    GRTST 24HR  0.88 ON 17-17      TO 1/4 MILE OR LESS
LOWEST:     45 ON 30                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO

MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   6
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   3
```

```
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   2
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.    72    CLEAR  (SCALE 0-3)  10
DPTR FM NORMAL    -4    PTCLDY (SCALE 4-7)  16
TOTAL FM JUL 1    78    CLOUDY (SCALE 8-10)  4
DPTR FM NORMAL   -25

[CDD (BASE 65) ]
TOTAL THIS MO.    30
DPTR FM NORMAL   -29    [PRESSURE DATA]
TOTAL FM JAN 1   548    HIGHEST SLP 30.41 ON 24
DPTR FM NORMAL   126    LOWEST  SLP 29.88 ON 13

[REMARKS]
#FINAL-09-16#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
194
CXUS56 KPQR 021433
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     OCTOBER
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  64  52  58  -2   7   0 0.12  0.0    0 10.4 23 200   M    M   8 1       32 210
 2  60  51  56  -4   9   0 0.22  0.0    0  4.5 12 170   M    M   9 1       15 170
 3  61  47  54  -5  11   0 0.01  0.0    0  5.1 15 200   M    M   9 1       19 200
 4  63  53  58  -1   7   0 0.15  0.0    0  9.2 22 210   M    M   8 1       31 210
 5  63  54  59   1   6   0 0.25  0.0    0 10.8 21 180   M    M  10 1       27 180
 6  62  55  59   1   6   0 0.14  0.0    0  8.2 17 170   M    M  10 1       24 160
 7  62  55  59   1   6   0 0.25  0.0    0  6.7 21 200   M    M  10 1       26 190
 8  70  57  64   7   1   0 0.11  0.0    0  7.7 15 200   M    M  10 1       20 210
 9  62  51  57   0   8   0 0.85  0.0    0  7.5 20 210   M    M  10 1       25 310
10  62  44  53  -4  12   0 0.00  0.0    0  3.0  9 310   M    M   4 12      12 280
11  66  42  54  -2  11   0 0.00  0.0    0  8.4 20 100   M    M   3 12      25  80
12  65  41  53  -3  12   0 0.03  0.0    0  8.0 18 120   M    M   6         22 110
13  60  51  56   0   9   0 1.99  0.0    0 14.4 28 220   M    M  10 1       36 230
14  66  54  60   5   5   0 0.49  0.0    0 13.0 30 200   M    M   8 135     40 200
15  65  53  59   4   6   0 0.51  0.0    0 14.9 40 200   M    M   9 1       53 210
16  60  52  56   1   9   0 0.25  0.0    0 11.5 18 200   M    M   8 1       25 150
17  61  50  56   2   9   0 0.44  0.0    0 12.6 24 200   M    M   7 13      29 200
```

```
18  59  48  54   0  11   0 0.05  0.0    0  5.4 12 200   M    M   7 1      16 190
19  61  45  53  -1  12   0 0.23  0.0    0  8.2 15 150   M    M   8 1      18 120
20  63  53  58   4   7   0 0.26  0.0    0  6.2 20 240   M    M   8 1      24 240
21  63  52  58   5   7   0 0.48  0.0    0  4.0 21 260   M    M  10 1      25 270
22  64  50  57   4   8   0 0.04  0.0    0  7.0 15 120   M    M   6        18 130
23  63  52  58   5   7   0 0.07  0.0    0  5.7 14 110   M    M   9 1      17 120
24  62  49  56   4   9   0 0.07  0.0    0 11.6 22 120   M    M   8        27 120
25  63  49  56   4   9   0    T  0.0    0  5.6 14 120   M    M   9        18 120
26  63  54  59   7   6   0 0.67  0.0    0  8.8 18 120   M    M   9 1      22 110
27  59  53  56   4   9   0 0.16  0.0    0  7.9 15 210   M    M  10 1      19 210
28  66  52  59   8   6   0 0.01  0.0    0 10.5 18 100   M    M   7        22 120
29  61  50  56   5   9   0 0.16  0.0    0  8.3 18 120   M    M   8 1      22 130
30  56  46  51   0  14   0 0.11  0.0    0  6.9 22 190   M    M   9 1      29 190
31  56  52  54   3  11   0 0.19  0.0    0  9.4 24 190   M    M  10 1      34 180
================================================================================
SM 1931 1567       259   0  8.31     0.0 261.4          M      257
================================================================================
AV 62.3 50.6                               8.4 FASTST   M    M   8    MAX(MPH)
                                 MISC ---->  # 40 200               # 53  210
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    OCTOBER
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 56.4   TOTAL FOR MONTH:   8.31    1 = FOG OR MIST
DPTR FM NORMAL:   1.5   DPTR FM NORMAL:    5.31    2 = FOG REDUCING VISIBILITY
HIGHEST:    70 ON  8    GRTST 24HR  2.01 ON 12-13      TO 1/4 MILE OR LESS
LOWEST:     41 ON 12                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  28
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  21
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   4
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   1

[HDD (BASE 65) ]
TOTAL THIS MO.   259    CLEAR  (SCALE 0-3)   0
DPTR FM NORMAL   -56    PTCLDY (SCALE 4-7)  13
TOTAL FM JUL 1   337    CLOUDY (SCALE 8-10) 18
DPTR FM NORMAL   -81

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL    -2    [PRESSURE DATA]
TOTAL FM JAN 1   548    HIGHEST SLP 30.34 ON 19
DPTR FM NORMAL   124    LOWEST  SLP 29.22 ON 15

[REMARKS]
#FINAL-10-16#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

685
CXUS56 KPQR 011622
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     NOVEMBER
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  61  50  56   6   9   0    T  0.0    0  9.6 18 200   M    M   9        24 200
 2  66  52  59   9   6   0 0.05  0.0    0  8.9 17 110   M    M  10        21 110
 3  64  47  56   6   9   0 0.00  0.0    0  3.1 12 110   M    M   6 1      12 110
 4  69  45  57   7   8   0 0.00  0.0    0  8.7 20 110   M    M   5 1      25 120
 5  58  53  56   7   9   0 1.06  0.0    0 10.0 21 110   M    M  10 1      25 110
 6  62  51  57   8   8   0    T  0.0    0  8.2 16 110   M    M   8        19 120
 7  63  53  58   9   7   0 0.00  0.0    0  8.0 18 120   M    M   9        23 120
 8  68  46  57   8   8   0 0.00  0.0    0  6.8 20 120   M    M   2        23 120
 9  66  52  59  11   6   0 0.06  0.0    0  5.5 14 120   M    M   7 12     16 110
10  68  46  57   9   8   0 0.00  0.0    0  6.4 17 130   M    M   6 12     22 130
11  63  51  57   9   8   0    T  0.0    0  4.2 15 110   M    M   9        18 110
12  64  49  57   9   8   0 0.07  0.0    0  9.7 23 190   M    M   8 1      30 190
13  57  49  53   6  12   0 0.09  0.0    0  7.7 25 190   M    M  10        34 190
14  56  54  55   8  10   0 1.03  0.0    0 10.3 20 190   M    M  10 1      27 170
15  60  46  53   6  12   0 0.10  0.0    0 10.1 22 250   M    M   7 1      31 270
16  51  42  47   0  18   0 0.05  0.0    0  5.6 13 200   M    M   9        17 190
17  54  39  47   1  18   0 0.02  0.0    0  4.2  9 120   M    M   6 1      13 150
```

```
18  52  39  46   0  19   0 0.00  0.0    0 17.3 30  90   M    M   9 1      38  90
19  55  45  50   4  15   0 0.11  0.0    0 13.3 23 110   M    M   9        30 110
20  55  48  52   6  13   0 0.15  0.0    0 10.7 21 120   M    M   9 1      26 120
21  57  44  51   6  14   0    T  0.0    0  6.8 14 210   M    M   6        17 220
22  53  44  49   4  16   0 0.60  0.0    0 12.8 21 120   M    M  10 1      25 110
23  51  44  48   3  17   0 0.27  0.0    0 12.2 22 190   M    M   9 1      29 200
24  54  47  51   7  14   0 1.86  0.0    0 12.6 28 190   M    M  10 1      41 190
25  51  46  49   5  16   0 0.33  0.0    0  9.4 17 190   M    M  10 1      24 180
26  56  44  50   6  15   0 0.46  0.0    0  8.6 21 170   M    M   9 1      27 160
27  49  44  47   3  18   0 0.23  0.0    0  9.5 20 190   M    M  10 1      28 170
28  53  43  48   5  17   0 0.07  0.0    0  5.9 20 270   M    M   8 1      23 270
29  52  43  48   5  17   0 0.10  0.0    0  6.1 14 120   M    M   8 1      17 110
30  51  42  47   4  18   0 0.12  0.0    0  7.3 15 220   M    M   9 18     19 210
================================================================================
SM 1739 1398       373   0  6.83     0.0 259.5          M      247
================================================================================
AV 58.0 46.6                               8.6 FASTST   M    M   8    MAX(MPH)
                                 MISC ---->  # 30  90               # 41  190
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    NOVEMBER
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 52.3   TOTAL FOR MONTH:   6.83    1 = FOG OR MIST
DPTR FM NORMAL:   5.7   DPTR FM NORMAL:    1.20    2 = FOG REDUCING VISIBILITY
HIGHEST:    69 ON  4    GRTST 24HR  2.13 ON 24-25      TO 1/4 MILE OR LESS
LOWEST:     39 ON 18,17                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO

MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  20
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  13
```

```
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   4
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   3

[HDD (BASE 65) ]
TOTAL THIS MO.   373    CLEAR  (SCALE 0-3)   1
DPTR FM NORMAL  -178    PTCLDY (SCALE 4-7)   9
TOTAL FM JUL 1   710    CLOUDY (SCALE 8-10) 20
DPTR FM NORMAL  -259

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1   548    HIGHEST SLP 30.31 ON  3
DPTR FM NORMAL   124    LOWEST  SLP 29.41 ON 26

[REMARKS]
#FINAL-11-16#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

048
CXUS56 KPQR 200703
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     DECEMBER
                                          YEAR:      2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  47  39  43   0  22   0 0.02  0.0    0  4.8  9 190   M    M   8        10 200
 2  48  44  46   4  19   0 0.08  0.0    0  5.7 14 190   M    M  10 1      19 190
 3  52  42  47   5  18   0 0.14  0.0    0  5.5 16 200   M    M   8 1      21 180
 4  48  34  41  -1  24   0 0.54    T    0  6.2 17 190   M    M   8 1      22 200
 5  39  35  37  -5  28   0 0.25    T    0  7.0 20 190   M    M  10 1      23 190
 6  45  29  37  -5  28   0    T  0.0    0  3.7 13  80   M    M   6 1      16 110
 7  40  27  34  -7  31   0 0.00  0.0    0 15.0 33  90   M    M   6 12     41  90
 8  34  30  32  -9  33   0 0.15  0.5    1 26.1 38  90   M    M   9 16     49 110
 9  33  32  33  -8  32   0 0.70  0.0    T 12.8 23 120   M    M  10 16     26 120
10  44  32  38  -3  27   0 0.24  0.0    0  8.3 20 210   M    M  10 16     24 210
11  47  41  44   4  21   0 0.41  0.0    0  7.1 17 200   M    M   8 1      24 240
12  47  38  43   3  22   0 0.02  0.0    0  4.4 12 230   M    M   8 1      14 200
13  41  34  38  -2  27   0 0.00  0.0    0  7.7 23 100   M    M   8 12     29 110
14  35  27  31  -9  34   0 0.05  2.3    2 23.1 33  90   M    M  10 18     42  90
15  33  25  29 -11  36   0 0.01    T    1  4.6 16 120   M    M  10        19 120
16  38  25  32  -8  33   0 0.00  0.0    1  4.8 15 130   M    M   7 12     18 130
17  35  27  31  -9  34   0    T    T    1  5.9 15 130   M    M   9 1      17 130
```

```
18  38  27  33  -7  32   0 0.00  0.0    T  4.9 14 110   M    M   8 1      17 110
19  48  30  39  -1  26   0 0.84    T    0  9.3 17 110   M    M  10 14     23 180
20  52  35  44   4  21   0 0.47  0.0    0  7.8 22 190   M    M   9 1      31 200
21  38  30  34  -6  31   0 0.00  0.0    0  2.8 10 320   M    M   9 12     12 320
22  46  30  38  -2  27   0 0.02  0.0    0  2.9 12  90   M    M   9 1      14 130
23  45  32  39  -1  26   0 0.19  0.0    0  6.0 20 120   M    M   8 1      24 110
24  41  27  34  -6  31   0    T  0.0    0  2.2  8 290   M    M   7 12     10 280
25  44  32  38  -2  27   0 0.00  0.0    0  4.2 12 110   M    M   9 1      14 120
26  40  27  34  -6  31   0 0.21  0.0    0  6.0 16 110   M    M   8 1      22 170
27  47  36  42   2  23   0 0.11  0.0    0  6.2 26 210   M    M   8 1      35 210
28  42  35  39  -1  26   0    T  0.0    0  3.5 12 290   M    M   8 12     14 280
29  42  33  38  -2  27   0 0.06  0.0    0  5.5 17 120   M    M   9 12     21 130
30  44  31  38  -2  27   0 0.01  0.0    0  2.3 13 320   M    M   6 1      15 350
31  37  32  35  -5  30   0 0.09    T    0  5.3 15 180   M    M  10 1      18 180
================================================================================
SM 1310  998       854   0  4.61     2.8 221.6          M      263
================================================================================
AV 42.3 32.2                               7.1 FASTST   M    M   8    MAX(MPH)
                                 MISC ---->  # 38  90               # 49  110
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    DECEMBER
                                          YEAR:     2016
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 37.2   TOTAL FOR MONTH:   4.61    1 = FOG OR MIST
DPTR FM NORMAL:  -3.2   DPTR FM NORMAL:   -0.88    2 = FOG REDUCING VISIBILITY
HIGHEST:    52 ON 20, 3 GRTST 24HR  1.29 ON 19-20      TO 1/4 MILE OR LESS
LOWEST:     25 ON 16,15                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   2.8 INCHES  5 = HAIL
                        GRTST 24HR   2.3 ON   M    6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   2 ON 14     7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  21
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  12
MIN 32 OR BELOW:  19    0.50 INCH OR MORE:   3
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   854    CLEAR  (SCALE 0-3)   0
DPTR FM NORMAL    91    PTCLDY (SCALE 4-7)  12
TOTAL FM JUL 1  1564    CLOUDY (SCALE 8-10) 19
DPTR FM NORMAL  -168

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1   548    HIGHEST SLP 30.60 ON 18
DPTR FM NORMAL   124    LOWEST  SLP 29.51 ON 23

[REMARKS]
#FINAL-12-16#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

001
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     JANUARY
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  40  32  36  -4  29   0 0.05    T    0  7.8 17 210   M    M   8 1      22 210
 2  35  29  32  -8  33   0 0.00  0.0    0 19.4 28  90   M    M   8        36  90
 3  34  27  31  -9  34   0 0.00  0.0    0 23.1 35  90   M    M   1        45  80
 4  33  27  30 -10  35   0 0.00  0.0    0 21.2 33  80   M    M   5        48  70
 5  35  17  26 -14  39   0 0.00  0.0    0  7.1 15 120   M    M   0        18 130
 6  34  17  26 -14  39   0 0.00  0.0    0 12.7 20 110   M    M   1        24 130
 7  30  24  27 -13  38   0 0.02  0.4    T 17.6 36 100   M    M  10 16     44 100
 8  34  28  31 -10  34   0 0.53  0.0    0 15.2 32 100   M    M  10 16     42 100
 9  41  30  36  -5  29   0 0.28  0.0    0  9.8 17 190   M    M  10 16     23 180
10  38  31  35  -6  30   0 0.65  6.5    7 13.3 28 100   M    M  10 1      35 100
11  32  26  29 -12  36   0 0.07  1.5    6 12.2 24  90   M    M  10 1      29  90
12  33  18  26 -15  39   0 0.00  0.0    5  5.0 13 130   M    M   4        15 130
13  29  11  20 -21  45   0 0.00  0.0    5  6.8 17 120   M    M   7 1      21 130
14  29  19  24 -17  41   0 0.00  0.0    4 14.2 23 120   M    M   2        29 110
15  28  19  24 -17  41   0 0.00  0.0    4 10.9 23 140   M    M   4        25 140
16  29  22  26 -16  39   0 0.00  0.0    3 14.2 22 130   M    M   8        26 130
17  34  24  29 -13  36   0 0.70  0.0    3 18.2 32 120   M    M   9 16     36 110
```

```
18  47  33  40  -2  25   0 1.06  0.0    T 15.0 30 110   M    M  10 1      35 110
19  52  35  44   2  21   0    T  0.0    0 11.9 23 200   M    M   8         28 210
20  42  37  40  -2  25   0 0.26  0.0    0 11.4 20 120   M    M  10 1      23 120
21  47  36  42   0  23   0 0.33  0.0    0 11.6 22 110   M    M   8 1      25 120
22  46  36  41  -1  24   0 0.15  0.0    0  9.9 23  80   M    M   9 1      26  70
23  50  32  41  -1  24   0    T  0.0    0  5.8 15  80   M    M   7         18  90
24  41  26  34  -8  31   0    T  0.0    0  2.7  8 290   M    M   6 1      10 290
25  45  35  40  -2  25   0 0.01    M    0  2.7  9 100   M    M  10 1      10 100
26  48  35  42   0  23   0    T  0.0    0  4.2 10 110   M    M   8 1      11 110
27  48  29  39  -3  26   0 0.00  0.0    0  6.7 16 120   M    M   5 12     20 110
28  44  31  38  -4  27   0 0.00  0.0    0  8.0 17 120   M    M   7         20 110
29  46  33  40  -2  25   0 0.01  0.0    0  7.5 17 110   M    M   9 1      21 120
30  44  35  40  -3  25   0    T  0.0    0  4.0 12 110   M    M  10 1      13 120
31  41  33  37  -6  28   0 0.01  0.0    0  7.9 16  80   M    M   8 1      21  70
================================================================================
SM 1209  867       969   0  4.13     8.4 338.0          M      222
================================================================================
AV 39.0 28.0                              10.9 FASTST   M    M   7    MAX(MPH)
                                 MISC ---->  # 36 100               # 48   70
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    JANUARY
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 33.5   TOTAL FOR MONTH:   4.13    1 = FOG OR MIST
DPTR FM NORMAL:  -7.9   DPTR FM NORMAL:   -0.75    2 = FOG REDUCING VISIBILITY
HIGHEST:    52 ON 19    GRTST 24HR  1.42 ON 17-18      TO 1/4 MILE OR LESS
LOWEST:     11 ON 13                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   8.4 INCHES  5 = HAIL
                        GRTST 24HR   6.5 ON 10-10  6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   7 ON 10     7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   6    0.01 INCH OR MORE:  14
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   8
MIN 32 OR BELOW:  21    0.50 INCH OR MORE:   4
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   1

[HDD (BASE 65) ]
TOTAL THIS MO.   969    CLEAR  (SCALE 0-3)   4
DPTR FM NORMAL   237    PTCLDY (SCALE 4-7)  13
TOTAL FM JUL 1  2533    CLOUDY (SCALE 8-10) 14
DPTR FM NORMAL    69

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1     0    HIGHEST SLP 30.70 ON 27
DPTR FM NORMAL     0    LOWEST  SLP 29.09 ON 20

[REMARKS]
#FINAL-01-17#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

885
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     JULY
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8    9   10  11  12  13    14  15    16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  76  57  67   0   0   2 0.00  0.0    0  4.7 12 310   M    M   5          15 320
 2  83  54  69   2   0   4 0.00  0.0    0  7.6 16 320   M    M   2          21 320
 3  78  58  68   1   0   3 0.00  0.0    0  9.4 17 320   M    M   5          22 330
 4  84  55  70   3   0   5 0.00  0.0    0  6.2 14 320   M    M   3          17 320
 5  91  58  75   7   0  10 0.00  0.0    0  6.2 15 320   M    M   1          18 310
 6  89  57  73   5   0   8 0.00  0.0    0  6.0 13 320   M    M   1          15 320
 7  72  56  64  -4   1   0 0.00  0.0    0  6.6 15 320   M    M   5          19 320
 8  87  54  71   3   0   6 0.00  0.0    0  7.0 17 320   M    M   1          22 310
 9  84  58  71   3   0   6 0.00  0.0    0  7.9 16 320   M    M   3          24 320
10  78  57  68   0   0   3 0.00  0.0    0  8.5 16 320   M    M   4          22 320
11  79  54  67  -2   0   2 0.00  0.0    0  6.6 14 320   M    M   2          18 310
12  82  55  69   0   0   4 0.00  0.0    0  7.0 13 320   M    M   1          16 280
13  76  58  67  -2   0   2 0.00  0.0    0  5.0 15 300   M    M   4          18 300
14  86  56  71   2   0   6 0.00  0.0    0  6.8 14 330   M    M   1          18 330
15  80  57  69   0   0   4 0.00  0.0    0  8.7 21 320   M    M   2          25 310
16  74  56  65  -5   0   0 0.00  0.0    0  9.4 20 310   M    M   3          26 320
17  81  55  68  -2   0   3 0.00  0.0    0  6.9 17 310   M    M   1          21 320
```

```
18  84  57  71   1   0   6 0.00  0.0    0  7.0 15 320   M    M   0        22 310
19  82  56  69  -1   0   4 0.00  0.0    0  4.9 15 320   M    M   2        20 320
20  75  60  68  -2   0   3    T  0.0    0  6.7 14 300   M    M   6        18 320
21  82  57  70   0   0   5 0.00  0.0    0  4.9 10 300   M    M   2        13 330
22  90  62  76   6   0  11 0.00  0.0    0  7.3 18 320   M    M   1        24 320
23  83  62  73   3   0   8 0.00  0.0    0 10.1 23 310   M    M   4        26 310
24  88  58  73   3   0   8 0.00  0.0    0  8.9 22 320   M    M   1        28 320
25  89  60  75   5   0  10 0.00  0.0    0  6.2 17 320   M    M   3        23 320
26  86  58  72   2   0   7 0.00  0.0    0  6.9 15 330   M    M   3        21 330
27  78  59  69  -2   0   4 0.00  0.0    0  7.2 16 310   M    M   4        19 320
28  82  56  69  -2   0   4 0.00  0.0    0  7.9 16 320   M    M   2        20 320
29  86  56  71   0   0   6 0.00  0.0    0  8.6 16 320   M    M   0        21 330
30  88  61  75   4   0  10 0.00  0.0    0  8.3 18 320   M    M   2        23 290
31  91  59  75   4   0  10 0.00  0.0    0  8.1 22 320   M    M   0        28 320
================================================================================
SM 2564 1776         1 164    T      0.0 223.5         M       74
================================================================================
AV 82.7 57.3                               7.2 FASTST   M    M   2    MAX(MPH)
                                 MISC ---->  # 23 310               # 28  320
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    JULY
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 70.0   TOTAL FOR MONTH:      T    1 = FOG OR MIST
DPTR FM NORMAL:   0.8   DPTR FM NORMAL:   -0.65    2 = FOG REDUCING VISIBILITY
HIGHEST:    91 ON 31, 5 GRTST 24HR    T  ON 20-20      TO 1/4 MILE OR LESS
LOWEST:     54 ON 11, 8                            3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   0
```

```
MAX 90 OR ABOVE:   3    0.10 INCH OR MORE:   0
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.     1    CLEAR  (SCALE 0-3)  22
DPTR FM NORMAL   -16    PTCLDY (SCALE 4-7)   9
TOTAL FM JUL 1     1    CLOUDY (SCALE 8-10)  0
DPTR FM NORMAL   -16

[CDD (BASE 65) ]
TOTAL THIS MO.   164
DPTR FM NORMAL    17    [PRESSURE DATA]
TOTAL FM JAN 1   293    HIGHEST SLP M ON M
DPTR FM NORMAL    82    LOWEST  SLP 29.84 ON 24

[REMARKS]
#FINAL-07-17#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

536
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     AUGUST
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  97  62  80   9   0  15 0.00  0.0    0  6.2 20 320   M    M   0          24 310
 2 103  65  84  13   0  19 0.00  0.0    0  6.0 15 330   M    M   0 8        19 320
 3 105  66  86  15   0  21 0.00  0.0    0  3.9 12 270   M    M   2 8        14 320
 4  96  64  80  10   0  15 0.00  0.0    0  4.5 16 310   M    M   2 8        18 320
 5  89  59  74   4   0   9 0.00  0.0    0  4.8 12 320   M    M   2          14 320
 6  88  61  75   5   0  10 0.00  0.0    0  5.7 13 310   M    M   7          16 310
 7  89  62  76   6   0  11 0.00  0.0    0  6.2 13 320   M    M   6 8        16 290
 8  92  61  77   7   0  12 0.00  0.0    0  4.9 13 280   M    M   2 18       15 300
 9  94  63  79   9   0  14 0.00  0.0    0  5.6 13 310   M    M   1 8        15 330
10  90  62  76   6   0  11 0.00  0.0    0  5.4 12 290   M    M   1 8        14 270
11  85  62  74   4   0   9 0.00  0.0    0  4.8 12 320   M    M   3          15 320
12  80  60  70   0   0   5    T  0.0    0  5.0 13 320   M    M   8          16 270
13  75  58  67  -3   0   2 0.06  0.0    0  7.8 20 310   M    M   8 1        24 320
14  75  52  64  -6   1   0 0.00  0.0    0  5.1 13 300   M    M   5          15 300
15  83  55  69  -1   0   4 0.00  0.0    0  5.9 16 310   M    M   2          21 300
16  84  58  71   1   0   6 0.00  0.0    0  6.9 14 320   M    M   1          20 350
17  80  62  71   1   0   6 0.00  0.0    0  6.8 13 320   M    M   5          16 320
```

```
18  81  57  69  -1   0   4 0.00  0.0    0  6.9 17 320   M    M   2        23 320
19  79  59  69   0   0   4 0.00  0.0    0 10.5 18 320   M    M   4        23 320
20  81  56  69   0   0   4 0.00  0.0    0  7.0 16 320   M    M   5        22 340
21  91  59  75   6   0  10 0.00  0.0    0  7.1 17 320   M    M   2        20 320
22  88  61  75   6   0  10 0.00  0.0    0  4.4 12 320   M    M   5        14 320
23  83  61  72   3   0   7    T  0.0    0  5.4 16 310   M    M   7        21 320
24  75  61  68  -1   0   3 0.00  0.0    0 10.8 18 310   M    M   4        23 320
25  81  56  69   0   0   4 0.00  0.0    0  6.7 16 310   M    M   1        26 310
26  91  57  74   5   0   9 0.00  0.0    0  6.5 16 320   M    M   0        21 320
27  95  58  77   9   0  12 0.00  0.0    0  3.0  9 270   M    M   3        12 300
28  98  62  80  12   0  15 0.00  0.0    0  1.9  8 100   M    M   4 8       9  90
29  88  62  75   7   0  10 0.00  0.0    0  4.8 14 310   M    M   6 8      16 320
30  80  60  70   2   0   5 0.00  0.0    0  4.3 12 320   M    M   6        17 350
31  83  64  74   6   0   9 0.00  0.0    0  6.3 14 310   M    M   4        17 310
================================================================================
SM 2699 1865         1 275  0.06     0.0 181.1          M      108
================================================================================
AV 87.1 60.2                               5.8 FASTST   M    M   3    MAX(MPH)
                                 MISC ---->  # 20 320               # 26  310
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    AUGUST
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 73.6   TOTAL FOR MONTH:   0.06    1 = FOG OR MIST
DPTR FM NORMAL:   4.1   DPTR FM NORMAL:   -0.61    2 = FOG REDUCING VISIBILITY
HIGHEST:   105 ON  3    GRTST 24HR  0.06 ON 13-13      TO 1/4 MILE OR LESS
LOWEST:     52 ON 14                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   1
```

```
MAX 90 OR ABOVE:  11    0.10 INCH OR MORE:   0
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   0
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.     1    CLEAR  (SCALE 0-3)  15
DPTR FM NORMAL    -9    PTCLDY (SCALE 4-7)  15
TOTAL FM JUL 1     2    CLOUDY (SCALE 8-10)  1
DPTR FM NORMAL   -25

[CDD (BASE 65) ]
TOTAL THIS MO.   275
DPTR FM NORMAL   123    [PRESSURE DATA]
TOTAL FM JAN 1   568    HIGHEST SLP 30.21 ON 19
DPTR FM NORMAL   205    LOWEST  SLP 29.76 ON 28

[REMARKS]
#FINAL-08-17#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

188
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     SEPTEMBER
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  92  59  76   8   0  11 0.00  0.0    0  5.2 17 310   M    M   0         21 320
 2  98  60  79  11   0  14 0.00  0.0    0  4.4 15 320   M    M   1         18 320
 3  95  63  79  12   0  14 0.00  0.0    0  2.8  8 240   M    M   6 8       11 270
 4  91  62  77  10   0  12 0.00  0.0    0  2.5  9 270   M    M   7 8       11 280
 5  91  66  79  12   0  14 0.00  0.0    0  3.1 10 300   M    M  10 8       11 310
 6  82  65  74   7   0   9 0.00  0.0    0  5.5 14 120   M    M  10 8       16 110
 7  83  66  75   8   0  10 0.00  0.0    0  5.8 17 280   M    M   8 8       21 270
 8  76  65  71   5   0   6 0.00  0.0    0  3.9 10 310   M    M   9         13 340
 9  80  63  72   6   0   7 0.15  0.0    0  5.5 18 300   M    M   9 1       23 330
10  77  58  68   2   0   3 0.00  0.0    0  7.0 14 290   M    M   4         17 290
11  91  56  74   8   0   9 0.00  0.0    0  7.1 17 320   M    M   1         24 330
12  86  59  73   7   0   8 0.00  0.0    0  6.4 17 320   M    M   3         23 330
13  75  52  64  -1   1   0 0.00  0.0    0  5.3 13 330   M    M   5         21 330
14  74  56  65   0   0   0 0.00  0.0    0  4.8 13 320   M    M   7 8       16 310
15  80  49  65   0   0   0 0.00  0.0    0  2.4  9 310   M    M   4 8       14 320
16  77  54  66   1   0   1 0.00  0.0    0  3.6 10 320   M    M   9 8       13 320
17  65  54  60  -4   5   0 0.09  0.0    0  8.6 23 210   M    M  10 18      30 220
```

```
18  61  53  57  -7    8   0 0.49  0.0    0  8.2 22 230   M    M   8 1      29 210
19  65  51  58  -6    7   0 0.31  0.0    0 12.0 23 230   M    M   7 1      29 230
20  61  49  55  -9   10   0 1.09  0.0    0  7.8 21 230   M    M   8 13     27 220
21  63  48  56  -7    9   0 0.02  0.0    0  4.0  9 170   M    M   8 1      12 170
22  68  47  58  -5    7   0 0.00  0.0    0  2.8 10 100   M    M   7        12 110
23  71  51  61  -1    4   0 0.00  0.0    0  3.3  9 310   M    M   5        11 320
24  73  46  60  -2    5   0 0.00  0.0    0  2.0  9 310   M    M   4        12 310
25  69  55  62   0    3   0    T  0.0    0  2.4  8  70   M    M   9        11  70
26  80  55  68   6    0   3 0.00  0.0    0  6.1 13 300   M    M   3        15 280
27  86  56  71  10    0   6 0.00  0.0    0  8.0 22  80   M    M   1        27  80
28  86  54  70   9    0   5 0.00  0.0    0  5.3 13 120   M    M   1        16 120
29  64  50  57  -3    8   0 0.20  0.0    0  4.8 14 310   M    M   6 1      18 320
30  65  47  56  -4    9   0 0.03  0.0    0  4.2 18 360   M    M   6        25 360
================================================================================
SM 2325 1669        76 132  2.38     0.0 154.8          M      176
================================================================================
AV 77.5 55.6                               5.2 FASTST   M    M   6    MAX(MPH)
                                 MISC ---->  # 23 210               # 30  220
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    SEPTEMBER
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 66.6   TOTAL FOR MONTH:   2.38    1 = FOG OR MIST
DPTR FM NORMAL:   2.1   DPTR FM NORMAL:    0.91    2 = FOG REDUCING VISIBILITY
HIGHEST:    98 ON  2    GRTST 24HR  1.09 ON 20-20      TO 1/4 MILE OR LESS
LOWEST:     46 ON 24                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:   8
MAX 90 OR ABOVE:   6    0.10 INCH OR MORE:   5
```

```
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   1
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   1

[HDD (BASE 65) ]
TOTAL THIS MO.    76    CLEAR  (SCALE 0-3)   7
DPTR FM NORMAL     0    PTCLDY (SCALE 4-7)  14
TOTAL FM JUL 1    78    CLOUDY (SCALE 8-10)  9
DPTR FM NORMAL   -25

[CDD (BASE 65) ]
TOTAL THIS MO.   132
DPTR FM NORMAL    73    [PRESSURE DATA]
TOTAL FM JAN 1   700    HIGHEST SLP 30.28 ON 10
DPTR FM NORMAL   278    LOWEST  SLP 29.60 ON 20

[REMARKS]
#FINAL-09-17#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
989
CXUS56 KPQR 011544
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     OCTOBER
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  65  49  57  -3   8   0 0.01  0.0    0  4.5 16 320   M    M   6        21 320
 2  65  49  57  -3   8   0 0.02  0.0    0  4.3 15  40   M    M   5        23  40
 3  71  44  58  -1   7   0 0.00  0.0    0  5.4 22 100   M    M   1        29  90
 4  71  42  57  -2   8   0 0.00  0.0    0  4.4 13 290   M    M   2 1      14 300
 5  74  43  59   1   6   0 0.00  0.0    0  3.8 10 300   M    M   1 1      13 310
 6  73  43  58   0   7   0 0.00  0.0    0  4.5 15 270   M    M   4 8      19 230
 7  65  52  59   1   6   0 0.01  0.0    0  7.6 20 280   M    M   8        25 270
 8  64  45  55  -2  10   0 0.02  0.0    0  2.3  8 290   M    M   5 1      11 290
 9  67  39  53  -4  12   0 0.00  0.0    0  4.1 10 290   M    M   7 1      13 280
10  57  43  50  -7  15   0 0.01  0.0    0  3.2 13 270   M    M   7 1      15 270
11  57  45  51  -5  14   0 0.16  0.0    0  4.7 13 190   M    M   7 1      15 200
12  56  46  51  -5  14   0 0.50  0.0    0  8.4 20 260   M    M   8 13     25 250
13  59  40  50  -6  15   0    T  0.0    0  4.6 17 310   M    M   5 3      23 320
14  59  36  48  -7  17   0 0.00  0.0    0  2.8  9 280   M    M   4 1      12 280
15  67  38  53  -2  12   0 0.00  0.0    0  1.7  7 320   M    M   3 18      8 320
16  67  39  53  -2  12   0 0.00  0.0    0  1.8  6 100   M    M   1 128     7  50
17  58  42  50  -4  15   0 0.04  0.0    0  3.3 13 240   M    M   8 12     15 230
```

```
18  64  49  57   3   8   0 0.09  0.0    0  9.5 24 190   M    M  10 1      33 190
19  59  50  55   1  10   0 0.99  0.0    0 10.8 21 160   M    M  10 1      27 200
20  54  48  51  -3  14   0 0.11  0.0    0 11.1 23 270   M    M   7 1      28 280
21  61  47  54   1  11   0 2.13  0.0    0 15.5 26 210   M    M  10 1      37 210
22  61  47  54   1  11   0 0.47  0.0    0  7.5 25 210   M    M   8 12     33 210
23  64  48  56   3   9   0 0.00  0.0    0  2.7 10 290   M    M   5 12     13 290
24  70  44  57   5   8   0 0.00  0.0    0  3.4  9 310   M    M   2 1      10 270
25  62  43  53   1  12   0    T  0.0    0  4.4 12 320   M    M   7 12     15 330
26  71  51  61   9   4   0 0.01  0.0    0  9.2 25  90   M    M   4 1      30  90
27  73  46  60   8   5   0 0.00  0.0    0  8.6 25 100   M    M   0        30 100
28  71  42  57   6   8   0 0.00  0.0    0  3.1  8 130   M    M   0 1       9 130
29  59  49  54   3  11   0    T  0.0    0  4.2  9 320   M    M   6 128    12 310
30  63  41  52   1  13   0 0.00  0.0    0 17.3 29  80   M    M   1 8      38  90
31  62  35  49  -2  16   0 0.00  0.0    0  3.0  8 260   M    M   3         9 310
================================================================================
SM 1989 1375       326   0  4.57     0.0 181.7          M      155
================================================================================
AV 64.2 44.4                               5.9 FASTST   M    M   5    MAX(MPH)
                                 MISC ---->  # 29  80               # 38   90
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    OCTOBER
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 54.3   TOTAL FOR MONTH:   4.57    1 = FOG OR MIST
DPTR FM NORMAL:  -0.6   DPTR FM NORMAL:    1.57    2 = FOG REDUCING VISIBILITY
HIGHEST:    74 ON  5    GRTST 24HR  2.13 ON 21-21      TO 1/4 MILE OR LESS
LOWEST:     35 ON 31                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  14
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   6
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   3
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   1

[HDD (BASE 65) ]
TOTAL THIS MO.   326    CLEAR  (SCALE 0-3)  10
DPTR FM NORMAL    11    PTCLDY (SCALE 4-7)  17
TOTAL FM JUL 1   404    CLOUDY (SCALE 8-10)  4
DPTR FM NORMAL   -14

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL    -2    [PRESSURE DATA]
TOTAL FM JAN 1   700    HIGHEST SLP 30.62 ON 23
DPTR FM NORMAL   276    LOWEST  SLP 29.57 ON 19

[REMARKS]
#FINAL-10-17#
```

National Weather Service - Climate Data select { background-color: #FFFFB3; } function swapURL() { // make sure a new date was chosen if (document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value != "") { // all good // return true; document.myProd.submit(); } else { alert("Please chhose a valid date/time first."); return false; } }   Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

```
595
CXUS56 KPQR 011200
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     NOVEMBER
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  58  47  53   3  12   0    T  0.0    0  5.8 16 280   M    M   8          19 280
 2  55  44  50   0  15   0 0.08  0.0    0  9.7 24 270   M    M   8 1        31 280
 3  50  42  46  -4  19   0 0.01  0.0    0  6.3 14 220   M    M   9          17 240
 4  47  40  44  -6  21   0 0.10  0.0    0  9.1 25 190   M    M  10 1        34 180
 5  51  38  45  -4  20   0 0.15  0.0    0 10.9 25 200   M    M   7          33 200
 6  49  39  44  -5  21   0    T  0.0    0  8.7 21 100   M    M   7          27 100
 7  48  40  44  -5  21   0 0.00  0.0    0 18.8 28 100   M    M   9          35 100
 8  48  43  46  -3  19   0 0.33  0.0    0 18.8 29 110   M    M  10 1        35 110
 9  55  42  49   1  16   0 0.27  0.0    0 11.4 25 110   M    M   9 1        31 130
10  50  44  47  -1  18   0 0.41  0.0    0  5.4 10 100   M    M  10 1         M  M
11  51  44  48   0  17   0 0.13  0.0    0 13.2 23 120   M    M   9 1        27 120
12  54  48  51   3  14   0 0.14  0.0    0 13.7 22 110   M    M   9 1        27 140
13  56  46  51   4  14   0 0.36  0.0    0 13.9 30 180   M    M   8 1        36 190
14  58  45  52   5  13   0    T  0.0    0 12.7 25 180   M    M   8          33 180
15  56  42  49   2  16   0 0.86  0.0    0 11.5 28 190   M    M  10 1        38 180
16  48  43  46  -1  19   0 0.21  0.0    0 10.9 22 210   M    M   9 1        26 210
17  52  41  47   1  18   0 0.11  0.0    0  6.8 18 200   M    M   8 1        21 210
```

```
18  53  36  45  -1  20   0 0.00  0.0    0  3.9 13 120   M    M   6 12     16 110
19  51  35  43  -3  22   0 0.17  0.0    0  7.8 16 110   M    M   9 12     19 180
20  56  43  50   4  15   0 0.92  0.0    0  6.4 22 210   M    M   7 1      31 210
21  51  45  48   3  17   0 0.61  0.0    0 11.4 24 110   M    M   9 1      30 120
22  62  49  56  11   9   0 0.22  0.0    0 12.2 21 110   M    M   9 1      25 110
23  63  46  55  10  10   0 0.18  0.0    0  8.3 21 210   M    M   8 18     29 230
24  56  41  49   5  16   0 0.00  0.0    0  7.5 14 200   M    M   5        18 190
25  49  37  43  -1  22   0 0.12  0.0    0  6.0 18 120   M    M   8 12     23 130
26  55  45  50   6  15   0 0.55  0.0    0  9.9 23 120   M    M   9 1      28 120
27  50  41  46   2  19   0    T  0.0    0  5.5 13 130   M    M   8 12     15 130
28  47  43  45   2  20   0 0.44  0.0    0  6.9 16 310   M    M  10 1      20 310
29  52  37  45   2  20   0 0.00  0.0    0  3.2  9 280   M    M   8 12     11 160
30  47  37  42  -1  23   0 0.07  0.0    0  3.8 13 120   M    M  10 12     15 120
================================================================================
SM 1578 1263       521   0  6.44     0.0 280.4          M      254
================================================================================
AV 52.6 42.1                               9.3 FASTST   M    M   8    MAX(MPH)
                                 MISC ---->  # 30 180               # 38  180
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    NOVEMBER
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 47.4   TOTAL FOR MONTH:   6.44    1 = FOG OR MIST
DPTR FM NORMAL:   0.8   DPTR FM NORMAL:    0.81    2 = FOG REDUCING VISIBILITY
HIGHEST:    63 ON 23    GRTST 24HR  0.92 ON 20-20      TO 1/4 MILE OR LESS
LOWEST:     35 ON 19                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   0.0 INCH    5 = HAIL
                        GRTST 24HR     0.0         6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   0           7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO

MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  22
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:  19
```

```
MIN 32 OR BELOW:   0    0.50 INCH OR MORE:   4
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   521    CLEAR  (SCALE 0-3)   0
DPTR FM NORMAL   -30    PTCLDY (SCALE 4-7)  12
TOTAL FM JUL 1   925    CLOUDY (SCALE 8-10) 18
DPTR FM NORMAL   -44

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1   700    HIGHEST SLP 30.47 ON 29
DPTR FM NORMAL   276    LOWEST  SLP 29.55 ON 20

[REMARKS]
#FINAL-11-17#
```

```
National Weather Service - Climate Data select { background-color: #FFFFB3; }  f
unction swapURL() { // make sure a new date was chosen if
(document.myProd.specdate.options[document.myProd.specdate.selectedIndex].value
!= "") { // all good // return true; document.myProd.submit(); } else {
alert("Please chhose a valid date/time first."); return false; } }   Explanation
of the Preliminary Monthly Climate Data (F6) Product
     These data are preliminary and have not undergone final quality control by
the National Climatic Data Center (NCDC). Therefore, these data are subject to
revision. Final and certified climate data can be accessed at the NCDC -
http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

748
CXUS56 KPQR 020120
CF6PDX
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

                                          STATION:   PORTLAND OR
                                          MONTH:     DECEMBER
                                          YEAR:      2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

  TEMPERATURE IN F:       :PCPN:    SNOW:  WIND      :SUNSHINE: SKY     :PK WND
================================================================================
1   2   3   4   5  6A  6B    7    8   9   10  11  12  13   14  15   16   17  18
                                     12Z  AVG MX 2MIN
DY MAX MIN AVG DEP HDD CDD  WTR  SNW DPTH SPD SPD DIR MIN PSBL S-S WX    SPD DR
================================================================================

 1  50  45  48   5  17   0 0.02  0.0    0  6.5 16 200   M    M  10 1       21 210
 2  47  43  45   3  20   0 0.28  0.0    0  7.5 16 200   M    M  10 1       20 210
 3  47  39  43   1  22   0 0.07  0.0    0  3.8 10 270   M    M   8 1       13 280
 4  46  38  42   0  23   0    T  0.0    0  4.0  9 320   M    M   8         12 320
 5  50  34  42   0  23   0 0.00  0.0    0  4.2 17  90   M    M   4 1       22  80
 6  52  38  45   3  20   0 0.00  0.0    0 15.8 35  90   M    M   0         41  90
 7  50  37  44   3  21   0 0.00  0.0    0 17.1 26 100   M    M   0         35 110
 8  45  33  39  -2  26   0 0.00  0.0    0 10.7 20 130   M    M   3         23 130
 9  46  26  36  -5  29   0 0.00  0.0    0  8.8 20 120   M    M   2         24 110
10  45  27  36  -5  29   0 0.00  0.0    0 11.3 23 110   M    M   2         29 100
11  44  30  37  -3  28   0 0.00  0.0    0 11.6 21 110   M    M   1         27 100
12  45  25  35  -5  30   0 0.00  0.0    0  4.1 12 140   M    M   5         13 140
13  46  29  38  -2  27   0 0.00  0.0    0  7.8 20 110   M    M   3         23 120
14  44  32  38  -2  27   0 0.00  0.0    0 11.0 22 100   M    M   4         25 100
15  40  32  36  -4  29   0    T  0.0    0  3.9 15 120   M    M   8 18      18 120
16  45  37  41   1  24   0 0.02  0.0    0  3.8  9 140   M    M  10 1       12 140
17  49  41  45   5  20   0 0.02  0.0    0  6.6 12 190   M    M  10 1       15 190
```

```
18  53  47  50  10  15   0 0.02  0.0    0  7.3 21 200   M    M  10 1       26 200
19  53  41  47   7  18   0 0.50  0.0    0 12.2 26 190   M    M   9 1       35 180
20  46  30  38  -2  27   0 0.03  0.0    0  8.7 22 200   M    M   5 1       27 200
21  37  26  32  -8  33   0 0.00  0.0    0  3.0  7 260   M    M   8 12       9 130
22  40  34  37  -3  28   0 0.42  0.0    0  4.7 15 110   M    M  10 12      17 110
23  40  34  37  -3  28   0 0.13    T    0 15.1 24 100   M    M   9 1       31  80
24  35  28  32  -8  33   0 0.25  1.0    1 15.7 25 100   M    M   9 156     32 110
25  33  28  31  -9  34   0 0.10  0.0    0  8.1 18 130   M    M  10 16      22 130
26  35  23  29 -11  36   0    T  0.0    0  5.8 14 120   M    M   6 6       17 110
27  37  31  34  -6  31   0 0.05  0.0    0  7.7 13 110   M    M  10 16      16 120
28  53  37  45   5  20   0 0.66  0.0    0  9.3 17 120   M    M  10 1       22 180
29  56  49  53  13  12   0 0.52  0.0    0 13.8 29 200   M    M  10 1       37 190
30  52  34  43   3  22   0 0.00  0.0    0  2.6 15 220   M    M   5 12      17 230
31  50  31  41   1  24   0 0.00  0.0    0  9.2 22 100   M    M   7 2       29 100
================================================================================
SM 1411 1059       776   0  3.09     1.0 261.7          M      206
================================================================================
AV 45.5 34.2                               8.4 FASTST   M    M   7    MAX(MPH)
                                 MISC ---->  # 35  90               # 41   90
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

                                          STATION:  PORTLAND OR
                                          MONTH:    DECEMBER
                                          YEAR:     2017
                                          LATITUDE:   45 35 N
                                          LONGITUDE: 122 36 W

[TEMPERATURE DATA]      [PRECIPITATION DATA]       SYMBOLS USED IN COLUMN 16

AVERAGE MONTHLY: 39.8   TOTAL FOR MONTH:   3.09    1 = FOG OR MIST
DPTR FM NORMAL:  -0.6   DPTR FM NORMAL:   -2.40    2 = FOG REDUCING VISIBILITY
HIGHEST:    56 ON 29    GRTST 24HR  0.66 ON 28-28      TO 1/4 MILE OR LESS
LOWEST:     23 ON 26                               3 = THUNDER
                        SNOW, ICE PELLETS, HAIL    4 = ICE PELLETS
                        TOTAL MONTH:   1.0 INCH    5 = HAIL
                        GRTST 24HR   1.0 ON 24-24  6 = FREEZING RAIN OR DRIZZLE
                        GRTST DEPTH:   1 ON 24     7 = DUSTSTORM OR SANDSTORM:
                                                       VSBY 1/2 MILE OR LESS
                                                   8 = SMOKE OR HAZE
[NO. OF DAYS WITH]      [WEATHER - DAYS WITH]      9 = BLOWING SNOW
                                                   X = TORNADO
MAX 32 OR BELOW:   0    0.01 INCH OR MORE:  15
```

```
MAX 90 OR ABOVE:   0    0.10 INCH OR MORE:   8
MIN 32 OR BELOW:  14    0.50 INCH OR MORE:   3
MIN  0 OR BELOW:   0    1.00 INCH OR MORE:   0

[HDD (BASE 65) ]
TOTAL THIS MO.   776    CLEAR  (SCALE 0-3)   7
DPTR FM NORMAL    13    PTCLDY (SCALE 4-7)  10
TOTAL FM JUL 1  1701    CLOUDY (SCALE 8-10) 14
DPTR FM NORMAL   -31

[CDD (BASE 65) ]
TOTAL THIS MO.     0
DPTR FM NORMAL     0    [PRESSURE DATA]
TOTAL FM JAN 1   700    HIGHEST SLP 30.59 ON  6
DPTR FM NORMAL   276    LOWEST  SLP 29.62 ON 19

[REMARKS]
CORRECTED SNOWFALL
#FINAL-12-17#


2
```

Daily Precipitation Normals and Records

Period of Record: Portland Airport 1941-2015, Portland Downtown 1872-2015

(D= Daily, M= Month to Date, Y= Year to date, W= Water Year to date. Precipitation in units of inches)

DAY	---------- January ----------								---------- February ----------								DAY
	Normals[1] & Cumulative Totals				**Record Daily Rainfall**				**Normals[1] & Cumulative Totals**				**Record Daily Rainfall**				
	AIRPORT				**Airport**		**Downtown**		**AIRPORT**				**Airport**		**Downtown**		
	D	**M**	**Y**	**W**	**Amt**	**Year**	**Amt**	**Year**	**D**	**M**	**Y**	**W**	**Amt**	**Year**	**Amt**	**Year**	
1	.17	.17	.17	14.29	2.49	2009	2.11	1933	.12	.12	5.00	19.12	1.15	1961	2.25	1881	**1**
2	.17	.34	.34	14.46	1.19	1951	1.91	2009	.13	.25	5.13	19.25	1.13	1968	3.81	1890	**2**
3	.17	.51	.51	14.63	1.32	1966	2.84	1907	.13	.38	5.26	19.38	.68	1952	1.46	1890	**3**
4	.17	.68	.68	14.80	1.93	1956	2.08	1956	.13	.51	5.39	19.51	.82	1942	1.20	1907	**4**
5	.17	.85	.85	14.97	.95	1966	1.68	1883	.14	.65	5.53	19.65	1.54	1946	2.11	1940	**5**
6	.17	1.02	1.02	15.14	2.48	1948	5.55	1883	.14	.79	5.67	19.79	2.16	1996	2.30	1996	**6**
7	.17	1.19	1.19	15.31	1.47	1953	1.64	1953	.13	.92	5.80	19.92	1.90	1996	2.21	1996	**7**
8	.17	1.36	1.36	15.48	1.46	1953	1.55	1953	.13	1.05	5.93	20.05	1.86	1996	2.28	1996	**8**
9	.17	1.53	1.53	15.65	1.14	1980	1.57	1980	.14	1.19	6.07	20.19	1.51	1949	1.49	1949	**9**
10	.17	1.70	1.70	15.82	1.35	1979	2.04	1881	.13	1.32	6.20	20.32	1.72	1961	1.84	1961	**10**
11	.17	1.87	1.87	15.99	1.01	1972	1.75	1979	.14	1.46	6.34	20.46	.78	1954	2.74	1879	**11**
12	.17	2.04	2.04	16.16	1.38	1975	1.63	1980	.13	1.59	6.47	20.59	1.21	1954	1.40	1873	**12**
13	.16	2.20	2.20	16.32	1.28	1980	1.75	1872	.13	1.72	6.60	20.72	.90	1959	1.16	1959	**13**
14	.16	2.36	2.36	16.48	1.50	1974	1.78	1988	.13	1.85	6.73	20.85	.76	1947	1.24	1939	**14**
15	.16	2.52	2.52	16.64	1.98	1974	2.52	1974	.13	1.98	6.86	20.98	1.11	1970	1.83	1901	**15**
16	.15	2.67	2.67	16.79	1.13	1982	1.63	1982	.12	2.10	6.98	21.10	1.42	1970	1.55	1970	**16**
17	.16	2.83	2.83	16.95	1.80	2015	2.30	1997	.13	2.23	7.11	21.23	1.78	1949	2.35	1949	**17**
18	.16	2.99	2.99	17.11	1.06	1974	4.50	1911	.13	2.36	7.24	21.36	1.38	1968	1.58	1872	**18**
19	.15	3.14	3.14	17.26	1.98	1950	2.22	2012	.13	2.49	7.37	21.49	1.27	1968	1.70	1884	**19**
20	.15	3.29	3.29	17.41	1.73	1972	1.83	1972	.13	2.62	7.50	21.62	1.71	1982	2.08	1982	**20**
21	.15	3.44	3.44	17.56	1.10	1943	1.52	1919	.13	2.75	7.63	21.75	.77	1949	1.11	1936	**21**
22	.15	3.59	3.59	17.71	2.03	1970	2.03	1970	.13	2.88	7.76	21.88	1.09	1957	.96	1957	**22**
23	.14	3.73	3.73	17.85	1.48	1965	2.65	1887	.13	3.01	7.89	22.01	1.07	1950	1.45	1996	**23**
24	.15	3.88	3.88	18.00	1.20	1964	1.73	1889	.13	3.14	8.02	22.14	1.89	1994	2.10	1994	**24**
25	.15	4.03	4.03	18.15	1.54	1964	3.00	1920	.13	3.27	8.15	22.27	1.30	1957	1.53	1882	**25**
26	.14	4.17	4.17	18.29	1.05	1956	1.15	1933	.13	3.40	8.28	22.40	.73	2000	.96	1879	**26**
27	.15	4.32	4.32	18.44	1.56	1954	1.55	1954	.13	3.53	8.41	22.53	1.32	1976	2.06	1882	**27**
28	.14	4.46	4.46	18.58	1.20	1990	1.79	1890	.13	3.66	8.54	22.66	1.66	2011	2.55	2011	**28**
29	.14	4.60	4.60	18.72	.91	2006	1.99	1890	- -	- -	- -	- -	.25	2004	.62	1880	**29**
30	.14	4.74	4.74	18.86	1.14	1997	1.50	1997	*Normals for 29th Feb are not calculated, and are not part of the climatic normals.*								
31	.14	4.88	4.88	19.00	2.33	1987	2.52	2003									

January	**Airport**		**Downtown**		**February**	**Airport**		**Downtown**	
Normal Precipitation	**4.88”**		**6.14”**		Normal Precipitation	**3.66”**		**4.63”**	
Wettest January	12.83	1953	15.72	1970	Wettest February	10.03	1996	13.36	1881
Driest January	0.06	1985	0.27	1985	Driest February	0.72	1993	0.16	1920
Snowiest January	41.4	1950	35.3	1890	Snowiest February	13.2	1949	20.0	1893

January Airport Records…		**February Airport Records…**	
Greatest Rain in a Day	2.49” on 1st Jan 2009	*Greatest Rain in a Day*	2.16” on 6th Feb 1996
Greatest Rain in 24 hrs	3.13” on 1-2nd Jan 2009	*Greatest Rain in 24 hrs*	2.46” on 23-24th Feb 1994
Greatest Snow in 24 hrs	10.6” on 13-14th Jan 1950	*Greatest Snow in 24 hrs*	6.4” on 18-19th Feb 1993

[1] *Normals listed for the Airport site (1981-2010 normals). Daily and cumulative averages are based on a daily value that is computed from normalizing the monthly total across the days of a month.*

[2] *Last year of multiple occurrences listed.*

Daily Precipitation Normals and Records

Period of Record: Portland Airport 1941-2015, Portland Downtown 1872-2015

(D= Daily, M= Month to Date, Y= Year to date, W= Water Year to date. Precipitation in units of inches)

DAY	---------- May ----------								---------- June ----------								DAY
	Normals[1] & Cumulative Totals				Record Daily Rainfall				Normals[1] & Cumulative Totals				Record Daily Rainfall				
	AIRPORT				Airport		Downtown		AIRPORT				Airport		Downtown		
	D	M	Y	W	Amt	Year	Amt	Year	D	M	Y	W	Amt	Year	Amt	Year	
1	.07	.07	15.02	29.14	1.15	1949	*1.46*	*1949*	.08	.08	17.50	31.62	.97	1968	*.88*	*1968*	**1**
2	.08	.15	15.10	29.22	.71	1975	*.99*	*1889*	.08	.16	17.58	31.70	.67	2010	*.92*	*2010*	**2**
3	.08	.23	15.18	29.30	.76	2012	*.84*	*1948*	.07	.23	17.65	31.77	.71	2008	*.85*	*1894*	**3**
4	.08	.31	15.26	29.38	1.02	2009	*1.29*	*1887*	.08	.31	17.73	31.85	.79	1984	*1.13*	*1984*	**4**
5	.08	.39	15.34	29.46	1.07	1948	*1.33*	*1963*	.07	.38	17.80	31.92	.46	1942	*.51*	*1929*	**5**
6	.08	.47	15.42	29.54	.80	1963	*1.06*	*1963*	.08	.46	17.88	32.00	1.70	1958	*1.60*	*2010*	**6**
7	.07	.54	15.49	29.61	.81	1991	*.91*	*1885*	.07	.53	17.95	32.07	1.02	1981	*2.03*	*1927*	**7**
8	.08	.62	15.57	29.69	.51	1970	*.61*	*1970*	.07	.60	18.02	32.14	.63	2012	*1.92*	*1933*	**8**
9	.08	.70	15.65	29.77	.68	2005	*.80*	*2005*	.07	.67	18.09	32.21	.72	1950	*.74*	*1888*	**9**
10	.08	.78	15.73	29.85	.42	2000	*.71*	*2005*	.07	.74	18.16	32.28	.66	1948	*.66*	*1948*	**10**
11	.08	.86	15.81	29.93	.39	2015	*.51*	*1899*	.06	.80	18.22	32.34	.47	1952	*.89*	*1910*	**11**
12	.07	.93	15.88	30.00	.49	1988	*.52*	*1880*	.07	.87	18.29	32.41	.50	1982	*.54*	*1891*	**12**
13	.08	1.01	15.96	30.08	1.08	1978	*.94*	*1978*	.06	.93	18.35	32.47	.89	1980	*1.18*	*1980*	**13**
14	.08	1.09	16.04	30.16	.70	1959	*.86*	*1978*	.06	.99	18.41	32.53	.55	1978	*.88*	*1888*	**14**
15	.08	1.17	16.12	30.24	.75	2011	*1.65*	*1908*	.06	1.05	18.47	32.59	.56	1954	*1.03*	*1906*	**15**
16	.07	1.24	16.19	30.31	1.34	1945	*.91*	*1972*	.05	1.10	18.52	32.64	.62	2005	*.68*	*1875*	**16**
17	.08	1.32	16.27	30.39	1.20	1991	*1.41*	*1991*	.06	1.16	18.58	32.70	.58	1943	*1.85*	*1873*	**17**
18	.08	1.40	16.35	30.47	1.06	2014	*.96*	*2014*	.06	1.22	18.64	32.76	.54	1995	*.54*	*1921*	**18**
19	.07	1.47	16.42	30.54	1.47	1968	*1.36*	*1879*	.05	1.27	18.69	32.81	.96	2009	*.85*	*1913*	**19**
20	.08	1.55	16.50	30.62	.68	1998	*.75*	*1879*	.05	1.32	18.74	32.86	1.46	1984	*1.65*	*1991*	**20**
21	.08	1.63	16.58	30.70	.74	2006	*.55*	*2013*	.04	1.36	18.78	32.90	.44	1967	*.59*	*1931*	**21**
22	.08	1.71	16.66	30.78	1.19	2013	*1.00*	*2013*	.05	1.41	18.83	32.95	.47	1993	*.82*	*1913*	**22**
23	.08	1.79	16.74	30.86	.96	1997	*1.28*	*2013*	.04	1.45	18.87	32.99	.87	1969	*1.08*	*1969*	**23**
24	.09	1.88	16.83	30.95	.96	2008	*1.01*	*1911*	.04	1.49	18.91	33.03	.82	1971	*.93*	*1876*	**24**
25	.08	1.96	16.91	31.03	.63	1989	*.72*	*1900*	.03	1.52	18.94	33.06	.29	1973	*.53*	*1998*	**25**
26	.09	2.05	17.00	31.12	1.03	2012	*.66*	*1879*	.04	1.56	18.98	33.09	.58	1969	*.62*	*1912*	**26**
27	.08	2.13	17.08	31.20	.88	2013	*.65*	*2013*	.04	1.60	19.02	33.14	.51	2014	*.75*	*1903*	**27**
28	.09	2.22	17.17	31.29	.80	1985	*.68*	*1895*	.03	1.63	19.05	33.17	.91	2002	*.88*	*2002*	**28**
29	.08	2.30	17.25	31.37	.57	1996	*.58*	*1954*	.04	1.67	19.09	33.21	.40	1992	*.64*	*1984*	**29**
30	.09	2.39	17.34	31.46	.58	1943	*.58*	*1943*	.03	1.70	19.12	33.24	.81	1954	*.59*	*1872*	**30**
31	.08	2.47	17.42	31.54	1.45	1997	*1.50*	*1997*									

May	**Airport**		**Downtown**		**June**	**Airport**		**Downtown**	
Normal Precipitation	**2.47”**		**2.55”**		Normal Precipitation	**1.70”**		**1.69”**	
Wettest May	5.55	*1998*	6.60	*1879*	Wettest June	4.27	*2010*	5.38	*1888*
Driest May	0.10	*1992*	0.13	*1992*	Driest June	0.03	*1951*	0.03	*1951*
Snowiest May	- -	- -	- -	- -	Snowiest June	- -	- -	- -	- -

May Airport Records…		**June Airport Records…**	
Greatest Rain in a Day	1.47” on 19th May 1968	*Greatest Rain in a Day*	1.70” on 6th June 1958
Greatest Rain in 24 hrs	1.47” on 19th May 1968	*Greatest Rain in 24 hrs*	1.82” on 5-6th June 1958
Greatest Snow in 24 hrs	no snow reported in May	*Greatest Snow in 24 hrs*	no snow reported in June

[1] *Normals listed for the Airport site (1981-2010 normals). Daily and cumulative averages are based on a daily value that is computed from normalizing the monthly total across the days of a month.*

[2] *Last year of multiple occurrences listed.*

Daily Precipitation Normals and Records

Period of Record: Portland Airport 1941- 2015 Portland Downtown 1872-2015

(D= Daily, M= Month to Date, Y= Year to date, W= Water Year to date. Precipitation in units of inches)

DAY	September								October								DAY
	Normals[1] & Cumulative Totals				Record Daily Rainfall				Normals[1] & Cumulative Totals				Record Daily Rainfall				
	AIRPORT				Airport		Downtown		AIRPORT				Airport		Downtown		
	D	M	Y	W	Amt	Year	Amt	Year	D	M	Y	W	Amt	Year	Amt	Year	
1	.03	.03	20.47	34.59	1.48	1971	*1.52*	*1971*	.06	.06	21.97	.06	.98	1997	*1.35*	*1997*	**1**
2	.04	.07	20.51	34.63	.86	1979	*.71*	*1913*	.07	.13	22.04	.13	.79	1957	*.68*	*1910*	**2**
3	.03	.10	20.54	34.66	1.18	1945	*1.22*	*1945*	.06	.19	22.10	.19	.69	1967	*1.11*	*1905*	**3**
4	.04	.14	20.58	34.70	1.00	1959	*1.68*	*1911*	.07	.26	22.17	.26	1.00	1949	*1.22*	*1949*	**4**
5	.04	.18	20.62	34.74	.75	2009	*1.24*	*1911*	.07	.32	22.23	.32	.80	1950	*1.11*	*1950*	**5**
6	.05	.23	20.67	34.79	.99	2013	*.96*	*2013*	.07	.39	22.30	.39	1.24	1981	*1.73*	*1981*	**6**
7	.04	.27	20.71	34.83	1.55	2010	*.86*	*2010*	.07	.46	22.37	.46	.79	1962	*1.78*	*1893*	**7**
8	.04	.31	20.75	34.87	.27	1952	*.49*	*1893*	.07	.53	22.44	.53	.87	1955	*1.32*	*1873*	**8**
9	.04	.35	20.79	34.91	.84	1972	*.75*	*1874*	.07	.60	22.51	.60	1.66	1955	*1.82*	*1955*	**9**
10	.04	.39	20.83	34.95	1.18	1985	*1.04*	*1985*	.07	.67	22.58	.67	1.65	1959	*2.93*	*1882*	**10**
11	.05	.44	20.88	35.00	.44	1966	*.79*	*1882*	.08	.75	22.66	.75	.82	1968	*1.52*	*1995*	**11**
12	.04	.48	20.92	35.04	.23	1985	*.72*	*1905*	.08	.83	22.74	.83	1.11	2012	*2.31*	*1882*	**12**
13	.04	.52	20.96	35.08	.50	1955	*.82*	*1920*	.08	.91	22.82	.91	.43	2000	*1.36*	*1908*	**13**
14	.05	.57	21.01	35.13	2.03	1996	*1.15*	*1996*	.09	1.00	22.91	1.00	.51	1951	*1.65*	*1908*	**14**
15	.04	.61	21.05	35.17	.57	1955	*1.48*	*1996*	.09	1.09	23.00	1.09	1.06	1947	*1.37*	*1906*	**15**
16	.05	.66	21.10	35.22	.36	2002	*1.03*	*1926*	.09	1.18	23.09	1.18	.76	1956	*1.19*	*1918*	**16**
17	.05	.71	21.15	35.27	2.23	1969	*2.41*	*1969*	.10	1.28	23.19	1.28	.77	1947	*2.11*	*1876*	**17**
18	.05	.76	21.20	35.32	.97	2010	*1.65*	*1921*	.10	1.38	23.29	1.38	1.40	1979	*1.57*	*1882*	**18**
19	.05	.81	21.25	35.39	.97	1988	*.96*	*1988*	.11	1.49	23.40	1.49	1.32	1947	*1.40*	*1947*	**19**
20	.06	.87	21.31	35.43	1.56	1982	*1.44*	*1982*	.11	1.60	23.51	1.60	.99	1956	*1.15*	*1956*	**20**
21	.05	.92	21.36	35.48	.76	1972	*1.27*	*1898*	.11	1.71	23.62	1.71	1.10	1951	*1.64*	*1876*	**21**
22	.06	.98	21.42	35.54	.73	1948	*1.07*	*1872*	.11	1.82	23.73	1.82	1.88	2014	*1.88*	*2014*	**22**
23	.06	1.04	21.48	35.60	.86	1986	*.97*	*1948*	.12	1.94	23.85	1.94	.79	1951	*1.12*	*1943*	**23**
24	.05	1.09	21.53	35.65	.74	1950	*.97*	*1973*	.13	2.07	23.98	2.07	1.31	1943	*1.57*	*2010*	**24**
25	.06	1.15	21.59	35.71	1.48	1986	*1.07*	*1877*	.12	2.19	24.10	2.19	1.10	1955	*1.79*	*1922*	**25**
26	.07	1.22	21.66	35.78	1.11	1948	*1.14*	*1940*	.12	2.31	24.22	2.31	2.33	1994	*2.10*	*1994*	**26**
27	.06	1.28	21.72	35.84	1.30	1955	*1.45*	*1955*	.13	2.44	24.35	2.44	2.44	1994	*3.20*	*1994*	**27**
28	.06	1.34	21.78	35.90	1.25	2013	*1.75*	*1927*	.13	2.57	24.48	2.57	1.62	1982	*1.58*	*1933*	**28**
29	.07	1.41	21.85	35.97	1.44	2013	*1.52*	*2013*	.14	2.71	24.62	2.71	1.14	1997	*1.41*	*1982*	**29**
30	.06	1.47	21.91	36.03	1.68	2005	*1.35*	*1953*	.15	2.86	24.77	2.86	1.20	1997	*1.16*	*1875*	**30**
									.14	3.00	24.91	3.00	2.44	1994	*2.68*	*1994*	**31**

September	**Airport**		**Downtown**		**October**	**Airport**		**Downtown**	
Normal Precipitation	**1.47”**		**1.54”**		Normal Precipitation	**3.00”**		**3.42”**	
Wettest September	5.62	*2013*	6.85	*2013*	Wettest October	8.41	*1994*	11.63	*1882*
Driest September	T	*1993*[2]	0.00	*1873*	Driest October	0.19	*1988*	T	*1895*
Snowiest September	- -	- -	- -	- -	Snowiest October	T	*1955*	0.6	*1935*

September Airport Records…		**October Airport Records…**	
Greatest Rain in a Day	2.23” on 17th Sept 1969	*Greatest Rain in a Day*	2.44” on 27th & 31st 1994
Greatest Rain in 24 hrs	2.38” on 19-20th Sept 1982	*Greatest Rain in 24 hrs*	4.44” on 26-27th Oct 1994
Greatest Snow in 24 hrs	no snow reported in September	*Greatest Snow in 24 hrs*	Trace on 31st Oct. 1955

[1] *Normals listed for the Airport site (1981-2010 normals). Daily and cumulative averages are based on a daily value that is computed from normalizing the monthly total across the days of a month.*

[2] *Last year of multiple occurrences listed.*

Daily Precipitation Normals and Records

Period of Record: Portland Airport 1940-2014, Portland Downtown 1872-2014

(D= Daily, M= Month to Date, Y= Year to date, W= Water Year to date. Precipitation in units of inches)

DAY	November								December								DAY
	Normals[1] & Cumulative Totals				Record Daily Rainfall				Normal s[1] & Cumulative Totals				Record Daily Rainfall				
	AIRPORT				Airport		Downtown		AIRPORT				Airport		Downtown		
	D	M	Y	W	Amt	Year	Amt	Year	D	M	Y	W	Amt	Year	Amt	Year	
1	.15	.15	25.06	3.15	1.31	1984	*1.35*	*2005*	.21	.21	30.75	8.84	1.69	1987	*1.58*	*1987*	**1**
2	.15	.30	25.21	3.30	1.33	1984	*1.67*	*1902*	.20	.41	30.95	9.04	2.08	1980	*1.87*	*2007*	**2**
3	.16	.46	25.37	3.46	1.88	1983	*2.22*	*1983*	.20	.61	31.15	9.24	1.69	1980	*3.08*	*2007*	**3**
4	.16	.62	25.53	3.62	1.87	1969	*1.95*	*1969*	.20	.81	31.35	9.44	1.56	1966	*2.25*	*1966*	**4**
5	.17	.79	25.70	3.79	1.12	2006	*1.62*	*1877*	.19	1.00	31.54	9.63	1.80	1981	*2.27*	*1933*	**5**
6	.17	.96	25.87	3.96	2.53	2006	*4.84*	*2006*	.19	1.19	31.73	9.82	1.12	1991	*2.43*	*1923*	**6**
7	.18	1.14	26.05	4.14	1.07	2009	*3.10*	*1885*	.19	1.38	31.92	10.01	2.67	2015	*2.81*	*2015*	**7**
8	.18	1.32	26.23	4.32	1.38	1968	*2.05*	*1937*	.18	1.56	32.10	10.19	1.66	2015	*2.12*	*1929*	**8**
9	.18	1.50	26.41	4.50	1.40	1973	*1.80*	*1928*	.18	1.74	32.28	10.37	1.42	2010	*2.25*	*1877*	**9**
10	.19	1.69	26.60	4.69	1.30	1962	*1.52*	*1962*	.18	1.92	32.46	10.55	1.43	1992	*2.00*	*1995*	**10**
11	.19	1.88	26.79	4.88	2.01	1995	*2.01*	*1995*	.17	2.09	32.63	10.72	1.30	2010	*1.71*	*1946*	**11**
12	.18	2.06	26.97	5.06	.94	2008	*1.54*	*2008*	.18	2.27	32.81	10.90	.93	1973	*4.07*	*1882*	**12**
13	.19	2.25	27.16	5.25	1.37	1941	*1.53*	*1990*	.17	2.44	32.98	11.07	1.84	1977	*6.68*	*1882*	**13**
14	.19	2.44	27.35	5.44	1.28	1948	*2.18*	*1876*	.18	2.62	33.16	11.25	1.35	1946	*1.56*	*1946*	**14**
15	.19	2.63	27.54	5.63	2.43	1950	*2.95*	*1950*	.18	2.80	33.34	11.43	1.84	1982	*1.61*	*1982*	**15**
16	.19	2.82	27.73	5.82	1.13	1953	*1.42*	*1950*	.17	2.97	33.51	11.60	1.19	1994	*1.33*	*1997*	**16**
17	.19	3.01	27.92	6.01	1.46	1946	*1.91*	*1875*	.17	3.14	33.68	11.77	1.02	1972	*2.26*	*1885*	**17**
18	.20	3.21	28.12	6.21	1.99	1946	*1.95*	*1946*	.18	3.32	33.86	11.95	1.01	1941	*1.66*	*1932*	**18**
19	.20	3.41	28.32	6.41	2.69	1996	*3.20*	*1996*	.17	3.49	34.03	12.12	1.72	1953	*2.01*	*1895*	**19**
20	.19	3.60	28.51	6.60	1.50	1962	*3.41*	*1921*	.18	3.67	34.21	12.30	1.28	1961	*2.95*	*1925*	**20**
21	.20	3.80	28.71	6.80	1.57	1992	*1.58*	*1992*	.17	3.84	34.38	12.47	1.99	1955	*2.29*	*1955*	**21**
22	.20	4.00	28.91	7.00	2.35	2011	*2.62*	*2011*	.17	4.01	34.55	12.64	1.50	1964	*2.20*	*1936*	**22**
23	.20	4.20	29.11	7.20	1.80	1942	*2.69*	*1874*	.17	4.18	34.72	12.81	1.19	1971	*2.40*	*1872*	**23**
24	.19	4.39	29.30	7.39	2.31	1960	*2.64*	*1960*	.17	4.35	34.89	12.98	1.72	1980	*1.90*	*1980*	**24**
25	.21	4.60	29.51	7.60	2.11	1998	*2.07*	*1998*	.17	4.52	35.06	13.15	1.73	1980	*1.82*	*1980*	**25**
26	.20	4.80	29.71	7.80	2.26	1945	*3.60*	*1883*	.17	4.69	35.23	13.32	1.08	1996	*3.99*	*1937*	**26**
27	.21	5.01	29.92	8.01	1.97	1984	*1.91*	*1984*	.16	4.85	35.39	13.48	2.17	1942	*2.42*	*1965*	**27**
28	.20	5.21	30.12	8.21	1.41	2001	*1.65*	*2001*	.17	5.02	35.56	13.65	.94	2005	*3.16*	*1998*	**28**
29	.21	5.42	30.33	8.42	.67	1942	*3.05*	*1875*	.16	5.18	35.72	13.81	1.66	1983	*2.24*	*1996*	**29**
30	.21	5.63	30.54	8.63	1.63	1994	*1.70*	*1994*	.15	5.33	35.87	13.96	1.50	2002	*1.72*	*2005*	**30**
									.16	5.49	36.03	14.12	1.32	1996	*2.79*	*1875*	**31**

November	Airport		Downtown	
Normal Precipitation	**5.63”**		**6.74”**	
Wettest November	11.92	*2006*	15.77	*1875*
Driest November	0.77	*1976*	0.36	*1936*
Snowiest November	8.2	*1955*	7.0	*1977*

December	Airport		Downtown	
Normal Precipitation	**5.49”**		**6.94”**	
Wettest December	13.35	*1996*	20.14	*1882*
Driest December	1.38	*1976*	0.88	*1876*
Snowiest December	19.0	*2008*	34.1	*1884*

November Airport Records…	
Greatest Rain in a Day	2.69” on 19th Nov. 1996
Greatest Rain in 24 hrs	4.10” on 18-19th Nov. 1996
Greatest Snow in 24 hrs	7.4” on 21-22nd 1977

December Airport Records…	
Greatest Rain in a Day	2.67” on 7th Dec. 2015
Greatest Rain in 24 hrs	3.22” on 6-7th Dec. 2015
Greatest Snow in 24 hrs	8.0 on 19th Dec. 1964

[1] *Normals listed for the Airport site (1981-2010 normals). Daily and cumulative averages are based on a daily value that is computed from normalizing the monthly total across the days of a month.*

[2] *Last year of multiple occurrences listed.*

WETS Table

WETS Station: N WILLAMETTE EXP STN, OR

Requested years: 1971 - 2000

Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	47.0	33.5	40.2	5.94	3.97	7.11	13	0.5
Feb	51.1	34.8	43.0	5.24	3.90	6.13	12	0.3
Mar	56.1	37.2	46.7	4.28	3.30	4.96	12	0.0
Apr	60.5	40.2	50.4	3.27	2.15	3.93	9	0.0
May	67.0	45.1	56.0	2.50	1.64	3.00	7	0.0
Jun	73.1	49.8	61.5	1.80	1.05	2.18	5	0.0
Jul	80.4	53.2	66.8	0.73	0.24	0.85	2	0.0
Aug	80.8	53.0	66.9	0.83	0.22	0.93	2	0.0
Sep	75.8	48.9	62.3	1.79	0.93	2.12	5	0.0
Oct	64.5	41.9	53.2	3.36	1.77	4.10	7	0.0
Nov	52.6	37.7	45.2	6.48	4.50	7.71	14	0.1
Dec	45.8	32.9	39.3	6.44	4.09	7.76	12	0.6
Annual:					38.35	47.19		
Average	62.9	42.4	52.6	-	-	-	-	-
Total	-	-	-	42.65			101	1.4

GROWING SEASON DATES

Years with missing data:	24 deg = 0	28 deg = 1	32 deg = 1
Years with no occurrence:	24 deg = 6	28 deg = 0	32 deg = 0
Data years used:	24 deg = 30	28 deg = 29	32 deg = 29
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	1/27 to 1/3: 341 days	3/1 to 11/22: 266 days	4/14 to 10/29: 198 days
70 percent *	1/14 to 1/17: 368 days	2/20 to 12/1: 284 days	4/7 to 11/5: 212 days

* Percent chance of the growing season occurring between the Beginning and Ending dates.

STATS TABLE - total precipitation (inches)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1963	M1.14	4.02	6.48		4.34	1.62	0.81	0.36	1.11	3.09	5.86	4.45	33.28
1964	11.36	0.83	2.93	1.21	0.94	1.67	0.74	0.58	1.49	1.52	7.21	13.84	44.32
1965	8.51	2.07	1.09	3.23	1.30	0.66	0.23	0.99	0.05	2.79	6.63	6.78	34.33
1966	7.84	1.92	5.96	1.22	0.93	1.18	1.16	0.31	1.41	2.97	5.62	6.57	37.09
1967	6.77	1.53	4.79	2.58	2.12	0.72	0.00	0.00	0.26	5.58	2.04	5.65	32.04
1968	4.68	8.20	3.06	2.04	2.99	2.34	0.98	4.17	2.75	6.88	7.02	M12.46	57.57
1969	7.41	3.03	1.45	2.99	1.76	3.20	0.11	0.08	3.42	4.69	2.94	8.53	39.61
1970	11.72	5.12	2.30	2.36	1.30	0.31	0.07	T	1.38	3.49	6.94	8.92	43.91
1971	7.59	3.49	5.59	3.71	1.77	2.92	0.08	0.43	3.	3.	6.	8.02	47.

									51	69	49		29
1972	6.59	4.78	5.77	3.61	2.65	0.60	0.47	0.65	3.50	0.87	5.07	8.81	43.37
1973	4.45	1.96	M2.67	1.28	1.56	1.47	0.01	0.82	2.58	2.94	13.04	10.02	42.80
1974	8.24	5.48	6.28	2.23	1.98	0.96	2.31	0.02	0.26	1.62	6.56	6.53	42.47
1975	6.84	4.24	2.22	2.46	1.86	1.27	0.65	2.53	0.00	5.61	4.37	6.66	38.71
1976	6.32	6.68	2.82	3.00	1.48	0.57	0.95	2.41	1.18	0.85	1.67	1.48	29.41
1977	1.37	2.80	4.26	0.64	3.82	1.54	0.83	2.69	3.23	2.45	6.61	10.52	40.76
1978	5.35	3.59	1.69	3.50	4.52	1.69	0.90	2.08	2.74	0.37	4.92	3.54	34.89
1979	3.45	7.36	3.22	3.35	2.36	0.47	0.82	0.82	3.25	5.35	3.77	6.75	40.97
1980	9.99	4.68	3.59	4.07	1.23	2.52	0.14	0.49	1.69	1.67	6.87	11.90	48.84
1981	2.01	4.11	3.48	2.29	2.23	4.27	0.19	0.03	2.68	4.14	5.39	10.27	41.09
1982	6.24	6.94	3.12	8.98	M0.89	0.86	0.34	0.99	3.61	3.74	5.04	8.92	49.67
1983	7.18	9.54	7.18	2.67	2.13	2.60	2.68	2.52	0.86	2.25	9.04	6.33	54.98
1984	3.05	4.69	4.46	4.09	4.59	5.35	T	0.03	1.99	5.78	12.90	3.68	50.61
1985	0.45	3.49	4.54	1.42	0.97	2.48	0.45	0.79	1.93	3.17	5.00	2.46	27.15
1986	6.26	7.65	2.95	2.09	2.74	0.38	1.28	0.04	2.93	2.81	6.71	4.13	39.97
1987	6.75	4.94	5.55	2.19	1.66	0.30	2.00	0.10	0.53	0.23	2.40	10.55	37.20
1988	7.88	1.71	3.73	4.63	2.56	2.94	0.21	0.03	1.25	0.20	9.88	3.28	38.30
1989	4.24	3.16	7.02	1.24	2.27	0.91	0.52	1.37	1.34	2.15	3.72	4.15	32.09
1990	8.98	4.97	3.42	2.22	1.71	2.94	0.54	1.09	0.50	6.18	5.00	3.39	40.94
1991	2.83	3.69	4.39	4.62	4.58	2.42	0.16	0.75	0.30	3.70	7.31	5.53	40.28
1992	5.34	5.23	1.46	4.28	0.19	0.63	1.31	0.48	1.88	4.83	5.15	6.71	37.49
1993	2.96	M0.26	5.32	6.30	4.25	2.20	2.44	0.30	0.00	1.35	1.39	6.90	33.67
1994	4.78	6.93	3.58	1.88	1.63	1.57	0.06	0.02	1.12	6.94	8.32	7.70	44.53
1995	7.65	M4.45	4.42	5.14	1.84	2.07	M0.60	1.55	1.52	5.63	10.18	7.66	52.71
1996	9.09	12.04	3.91	6.76	4.63	1.05	0.80	0.14	3.06	5.51	11.39	15.72	74.10
1997	9.55	3.34	8.59	4.59	2.47	2.97	0.80	1.11	3.38	6.25	4.65	3.41	51.11
1998	8.98	5.73	4.91	1.42	5.57	1.27	0.22	0.25	0.90	4.69	10.96	0.54	45.44
1999	7.58	9.08	4.68	1.35	2.53	1.23	0.18	0.47	0.05	2.47	7.68	4.35	41.65
2000	6.21	5.15	3.46	2.15	2.39	1.40	0.01	0.00		3.21	3.04	3.16	30.18
2001	1.55	1.28	3.51	0.69	1.05	1.67	0.73	1.19	0.69	3.80			16.16
2002			5.59	2.44	1.35	1.83	0.07	0.24	1.95		3.22	10.02	26.71
2003	8.73	2.99	7.14	5.64	1.05	0.28	0.00	0.42	0.95	2.45	4.31	9.84	43.80
2004	6.19	4.04	1.09	1.07	1.92	1.63	0.12	2.52	1.74	4.34	2.71	4.46	31.83
2005	1.87	0.58	5.00	2.97	5.02	2.75	0.58	0.00	2.	M2.	6.	10.	40.

								14	63	22	53	29
2006	13.70	2.77	4.30	2.77	2.79	0.99	0.07	0.11	0.84	1.68	13.05	7.43	50.50
2007	4.75	5.26	5.29	2.26	0.90	0.53	0.63	0.66					20.28
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

Appendix C

Site Photographs

P1: Southeastern portion of Killinger Property, looking west

P2: Southeastern portion of Killinger Property, looking north

P3: Northeastern portion of Killinger Property, looking southwest

P4: Northwestern portion of Killinger Property, looking southeast

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Photographs 1 through 4
Overview of Killinger Property

P5: East portion of Wetland B on Kreilkamp property, looking north

P6: East portion of Wetland B on Kreilkamp property, looking southwest

P7: East portion of Wetland B on Kreilkamp property, looking south

P8: Southwest boundary of Wetland B on Kreilkamp property, looking northeast

Photographs 5 through 8
Wetland B on the Kreilkamp Property

P9: Northern portion of Kreilkamp property, looking southeast

P10: Northern portion of Kreilkamp property, looking southwest

P11: Western portion of Kreilkamp property, looking southeast

P12: Western portion of Kreilkamp property, looking west

Photographs 9 through 12

Wetland B and Tree Groves on the Kreilkamp Property

P13: Northeastern portion of Wehler property, looking west

P14: Northeastern portion of Wehler property, looking south

P15: Southwestern portion of Wehler property, looking north

P16: Southwestern portion of Wehler property, looking northeast

Photographs 13 through 16
Overview of Wehler Property

P17: Southwestern portion of pasture on Pike property, looking east

P18: Western portion of pasture on Pike property, looking southwest

P19: Northwestern portion of pasture on Pike property, looking southeast

P20: Northeastern portion of pasture on Pike property, looking east

Photographs 17 through 20
Overview of Pike Property

P21: Northern portion of Willow Creek and Wetland A, looking east

P22: Northern portion of Willow Creek and Wetland A, looking south

P23: Central portion of Willow Creek and Wetland A, looking south

P24: Central portion of Willow Creek and Wetland A, looking north

Photographs 21 through 24

Willow Creek and Wetland A on the Pike Property

P25: Southern portion of Willow Creek and Wetland A, looking north

P26: Southern portion of Willow Creek and Wetland A, looking south

P27: Southern portion of Willow Creek and Wetland A, looking southeast

P28: Southern portion of Willow Creek and Culverts, looking south

Photographs 25 through 28

Willow Creek and Wetland A on the Pike Property

P29: Eastern portion of Wetland A, looking west

P30: Eastern portion of Wetland A, looking northwest

P31: Tree grove in southeastern portion of Pike property, looking east

P32: Southeastern portion of Pike property, looking north

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Photographs 29 through 32

Wetland A and Southeastern Portion of the Pike Property

Wetland Delineation Report

West Hills Land Development: Stafford Meadows Residential Development

Appendix D

Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/6/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-01
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: <1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.318666 Long: -122.748093 Datum: NAD83
Soil Map Unit Name: Concord silt loam NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes **X** No ____
Hydric Soil Present? Yes **X** No ____
Wetland Hydrology Present? Yes **X** No ____

Is the Sampled Area within a Wetland? **Yes** **X** **No** ____

Remarks: Data plot located on northeast side of Unnamed Tributary within pasture of Pike property.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	**0**		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	**0**		
Herb Stratum (Plot size: 5 ft)			
1. *Alopecurus pratensis*	70	Yes	FAC
2. *Various grass hay species* [1]	25	Yes	FAC
3. *Daucus carota*	5	No	FACU
4. *Trifolium repens*	5	No	FAC
5.			
6.			
7.			
8.			
9.			
50%= 52.5 20%= 21 Total Cover:	**105**		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	**0**		
% Bare Ground in Herb Stratum **0** % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**100**	x3 =	**300**	
FACU species	**5**	x4 =	**20**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**105**	(A)	**320**	(B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** **X** **No** ____

Remarks: 1. Various grass hay species include fescues, bentgrasses and bluegrasses and are assumed to have hydrophytic vegetation indicator status of facultative.

SOIL

Sampling Point: DP-01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					SiL	
3-8	10YR 3/2	80	7.5YR 5/8	15	C	M	SiL	
			7.5YR 5/8	5	C	PL		Oxidized rhizospheres
8-12	10YR 4/2	78	7.5YR 5/8	20	C	M	SiL	
			7.5YR 5/8	2	C	PL		
12-16	10YR 4/1	90	10YR 6/8	10	C	M	SiCL	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes ___ No X Depth (inches): ___
Saturation Present? Yes ___ No X Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/6/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-02
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: <1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.318666 Long: -122.748073 Datum: NAD83
Soil Map Unit Name: Concord silt loam NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Data plot located just upslope from DP-01.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Various grass hay species* [1]	70	Yes	FAC
2. *Alopecurus pratensis*	10	No	FAC
3. *Hypochaeris radicata*	10	No	FACU
4. *Geranium lucidum*	5	No	NOL
5. *Trifolium repens*	2	No	FAC
6. *unknown forbs*	4	No	-
7.			
8.			
9.			
50%= 50.5 20%= 20.2 Total Cover:	101		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**82**	x3 =	**246**	
FACU species	**10**	x4 =	**40**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**92**	(A)	**286**	(B)

Prevalence Index = B/A = **3.1**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 1. Various grass hay species include fescues, bentgrasses and bluegrasses and are assumed to have hydrophytic vegetation indicator status of facultative. NOL = not on wetland plant indicator list

SOIL

Sampling Point: DP-02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	100					SiL	
3-5	10YR 3/2	95	7.5YR 5/8	4	C	M	SiL	
			7.5YR 5/8	1	C	PL		Trace oxidized rhizospheres
5-12	10YR 3/2	90	7.5YR 5/8	5	C	M	SiL	
			10YR 6/8	5	C	M		
12-16	10YR 4/1	75	7.5YR 5/8	15	C	M	SiL	
			10YR 6/8	5	C	M		
			10UR 5/1	5	D	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/6/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-03
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: <1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.317633 Long: -122.748134 Datum: NAD83
Soil Map Unit Name: Concord silt loam NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? **Yes X No ___**

Remarks: Data plot located on southwest side of Unnamed Tributary within pasture of Pike property.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Alopecurus pratensis*	45	Yes	FAC
2. *Various grass hay species* [1]	25	Yes	FAC
3. *Trifolium repens*	20	No	FAC
4. *Ranunculus repens*	5	No	FAC
5. *Plantago lanceolata*	5	No	FACU
6. *Hypochaeris radicata*	2	No	FACU
7. *Unknown forb*	2	No	-
8. *Prunella vulgaris*	1	No	FACU
9.			
50%= 52.5 20%= 21 Total Cover:	105		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**95**	x3 =	**285**
FACU species	**8**	x4 =	**32**
UPL species	**0**	x5 =	**0**
Column Totals:	**103**	(A)	**317** (B)

Prevalence Index = B/A = **3.1**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ___**

Remarks: 1. Various grass hay species include fescues, bentgrasses and bluegrasses and are assumed to have hydrophytic vegetation indicator status of facultative.

SOIL

Sampling Point: DP-03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/2	98	7.5YR 5/8	2	C	M	SiL	
3-10	10YR 4/2	75	7.5YR 5/8	5	C	M	SiL	
			2.5YR 4/6	10	C	PL		Oxidized rhizospheres
			2.5YR 4/6	10	C	M		
10-16	10YR 4/2	95	7.5YR 6/8	5	C	M	SiL	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______
Water table Present? Yes ___ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/6/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-04
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: <1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.317636 Long: -122.748154 Datum: NAD83
Soil Map Unit Name: Concord silt loam NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: Data plot located just upslope from DP-03.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Alopecurus pratensis*	40	Yes	FAC
2. *Various grass hay species* [1]	30	Yes	FAC
3. *Trifolium repens*	15	No	FAC
4. *Ranunculus repens*	5	No	FAC
5. *Plantago lanceolata*	5	No	FACU
6. *Hypochaeris radicata*	5	No	FACU
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**0**	x2 = **0**
FAC species	**90**	x3 = **270**
FACU species	**10**	x4 = **40**
UPL species	**0**	x5 = **0**
Column Totals:	**100** (A)	**310** (B)

Prevalence Index = B/A = **3.1**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 1. Various grass hay species include fescues, bentgrasses and bluegrasses and are assumed to have hydrophytic vegetation indicator status of facultative.

SOIL

Sampling Point: DP-04

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	98	7.5YR 5/8	5	C	M	SiL	
6-12	10YR 4/2	95	7.5YR 5/8	5	C	M	SiL	
12-16	10YR 4/1	85	7.5YR 5/8	15	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
_X_ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No _X_ Depth (inches): ____
Water table Present? Yes ___ No _X_ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ___ No _X_ Depth (inches): ____

Wetland Hydrology Present? **Yes** ___ **No** _X_

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-05
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 2-3%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319535 Long: -122.746224 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Data plot located in narrow, localized swale area in pasture of Kreilkamp property.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust		____	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**1**	(A)
Total Number of Dominant Species Across All Strata:	**1**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**100**	x3 =	**300**	
FACU species	**0**	x4 =	**0**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**100**	(A)	**300**	(B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is >50%
X	3 - Prevalence Index is ≤3.0[1]
	4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
	5 - Wetland Non-Vascular Plants[1]
	Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: DP-05

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					SiL	
5-10	10YR 4/2	84	2.5YR 3/4	15	C	M	SiL	
			2.5YR 3/4	1	C	PL		Trace oxidized rhizospheres
10-16	10YR 4/1	80	2.5YR 3/6	20	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** X **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes		No X	Depth (inches):	
Water table Present?	Yes	X	No	Depth (inches):	11
Saturation Present? (includes capillary fringe)	Yes	X	No	Depth (inches):	10

Wetland Hydrology Present? **Yes** X **No**

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-06
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 2-3%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319543 Long: -122.74626 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes ___ No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks: Data plot located just upslope from DP-05.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**100**	x3 =	**300**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**100** (A)		**300** (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-06

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 4/2	100					SiL	
7-14	10YR 4/2	84	2.5YR 3/4	15	C	M	SiL	
			2.5YR 3/4	1	C	PL		
14-16	10YR 4/1	85	2.5YR 3/6	15	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes X No ___ Depth (inches): 15
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 14

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-07
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 2-3%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319592 Long: -122.745897 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Data plot located in narrow, localized swale area in pasture of Kreilkamp property.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**100**	x3 =	**300**	
FACU species	**0**	x4 =	**0**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**100**	(A)	**300**	(B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: DP-07

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					SiL	
5-10	10YR 4/2	80	2.5YR 3/6	5	C	PL	SiL	Oxidized rhizospheres
			2.5YR 3/4	5	C	M		
			2.5YR 3/6	10	C	M		
10-16	10YR 4/1	90	2.5YR 3/4	10	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Muck Mineral (S1)
- ___ Sandy gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches):	
Water table Present?	Yes	X	No		Depth (inches):	12
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	11

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-08
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 2-3%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319604 Long: -122.745916 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? **Yes ____ No X**

Remarks: Data plot located just upslope from DP-07.

VEGETATION

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status?
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**100**	x3 =	**300**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**100** (A)		**300** (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

SOIL

Sampling Point: DP-08

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					SiL	
5-12	10YR 4/2	84	2.5YR 3/4	15	C	M	SiL	
			2.5YR 3/4	1	C	PL		
12-16	10YR 4/1	90	2.5YR 3/4	10	C	M	SiL	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes X No ___ Depth (inches): 14
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 13

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017

Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-09

Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 2-3%

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319571 Long: -122.745706 Datum: NAD83

Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soil Present?	Yes	X	No	
Wetland Hydrology Present?	Yes	X	No	

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks: Data plot located along gradual slope in pasture of Kreilkamp property near eastern fence line.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1.			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **1** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**100**	x3 =	**300**	
FACU species	**0**	x4 =	**0**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**100**	(A)	**300**	(B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is >50%
X	3 - Prevalence Index is ≤3.0[1]
	4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
	5 - Wetland Non-Vascular Plants[1]
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-09

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					SiL	
5-10	10YR 4/2	85	2.5YR 3/6	5	C	PL	SiL	Oxidized rhizospheres
			2.5YR 3/4	5	C	M		
			2.5YR 3/6	5	C	M		
10-16	10YR 4/1	90	2.5YR 3/4	10	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** X **No** ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? **Yes** X **No** ______

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-10
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: ______
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319545 Long: -122.745719 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ______ (If no, explain in Remarks)
Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ______
Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?**	**Yes** ______ **No** X
Hydric Soil Present?	Yes X	No		
Wetland Hydrology Present?	Yes	No X		

Remarks: Data plot located just upslope from DP-09.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ______			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**100**	x3 =	**300**	
FACU species	**0**	x4 =	**0**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**100**	(A)	**300**	(B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

	1 - Rapid Test for Hydrophytic Vegetation
X	2 - Dominance Test is >50%
X	3 - Prevalence Index is ≤3.0[1]
	4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
	5 - Wetland Non-Vascular Plants[1]
	Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ______

Remarks:

SOIL

Sampling Point: DP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					SiL	
5-12	10YR 4/2	89	2.5YR 3/4	10	C	M	SiL	
			2.5YR 3/4	1	C	PL		
12-16	10YR 4/1	95	2.5YR 3/4	5	C	M	SiL	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes X No ___ Depth (inches): 16
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 15

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-11
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319848 Long: -122.746033 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? **Yes X No ____**

Remarks: Data plot located along northern property boundary of Kreilkamp property under planted red pine trees.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. *Pinus resinosa*	60	Yes	NI
2.			
3.			
4.			
5.			
50%= 30 20%= 12 Total Cover:	60		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Crataegus monogyna*	2	Yes	FAC
2.			
3.			
4.			
5.			
50%= 1 20%= 0.4 Total Cover:	2		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**102**	x3 =	**306**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**102** (A)		**306** (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: Pinus resinosa exhibiting stunted growth (i.e., multi-stem rather than single stem in wetland.

SOIL

Sampling Point: DP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	98	2.5YR 3/4	2	C	M	SiL	
5-12	10YR 4/2	83	2.5YR 3/4	15	C	M	SiL	
			7.5YR 5/8	2	C	M		
12-16	10YR 4/1	90	7.5YR 5/8	5	C	M	SiL	
			2.5YR 3/4	5	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
X Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes X No ___ Depth (inches): 10
Saturation Present? Yes X No ___ Depth (inches): 9
(includes capillary fringe)

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017

Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-12

Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W

Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 1%

Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319847 Long: -122.746082 Datum: NAD83

Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes ____ No X		

Remarks: Data plot located just upslope from DP-11.

VEGETATION

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status?
1. *Pinus resinosa*	60	Yes	NI
2.			
3.			
4.			
5.			
50%= 30 20%= 12 Total Cover:	60		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Crataegus monogyna*	2	Yes	FAC
2.			
3.			
4.			
5.			
50%= 1 20%= 0.4 Total Cover:	2		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		
% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**2**	(A)
Total Number of Dominant Species Across All Strata:	**2**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**102**	x3 =	**306**	
FACU species	**0**	x4 =	**0**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**102**	(A)	**306**	(B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: DP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					SiL	
6-14	10YR 4/2	89	2.5YR 3/6	1	C	PL	SiL	Trace oxidized rhizospheres
			2.5YR 3/4	10	C	M		
14-16	10YR 4/1	80	7.5YR 5/8	15	C	M	SiL	
			2.5YR 3/4	5	C	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes X No ___ Depth (inches): 14
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 13

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-13
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319686 Long: -122.745898 Datum: NAD83
Soil Map Unit Name: Concord silt loam NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks: Data plot located in narrow, localized swale area in pasture of Kreilkamp property.

VEGETATION

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status?
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Rubus armeniacus*	5	Yes	FAC
2.			
3.			
4.			
5.			
50%= 2.5 20%= 1 Total Cover:	5		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x1 = **0**
FACW species	**0**	x2 = **0**
FAC species	**105**	x3 = **315**
FACU species	**0**	x4 = **0**
UPL species	**0**	x5 = **0**
Column Totals:	**105** (A)	**315** (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: DP-13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type^1	Loc^2	Texture	Remarks
0-3	10YR 3/2	98	7.5YR 5/8	2	C	M	SiL	
3-10	10YR 4/2	75	7.5YR 5/8	5	C	M	SiL	
			2.5YR 4/6	10	C	PL		Oxidized rhizospheres
			2.5YR 4/6	10	C	M		
10-16	10YR 4/2	95	7.5YR 6/8	5	C	M	SiL	

^{1}Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ^{2}Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils^3:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

^{3}Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes X No ___ Depth (inches): 10
Saturation Present? Yes X No ___ Depth (inches): 9
(includes capillary fringe)

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-14
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: 1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.319702 Long: -122.745968 Datum: NAD83
Soil Map Unit Name: Concord silt loam NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? **Yes ____ No X**

Remarks: Data plot located just upslope from DP-14.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. *Rubus armeniacus*	5	Yes	FAC
2.			
3.			
4.			
5.			
50%= 2.5 20%= 1 Total Cover:	5		
Herb Stratum (Plot size: 5 ft)			
1. *Festuca rubra*	100	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
50%= 50 20%= 20 Total Cover:	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 0 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:
OBL species	**0**	x1 =	**0**
FACW species	**0**	x2 =	**0**
FAC species	**105**	x3 =	**315**
FACU species	**0**	x4 =	**0**
UPL species	**0**	x5 =	**0**
Column Totals:	**105** (A)		**315** (B)

Prevalence Index = B/A = **3.0**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

SOIL

Sampling Point: DP-14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					SiL	
5-12	10YR 4/2	84	2.5YR 3/4	15	C	M	SiL	
			2.5YR 3/4	1	C	PL		
12-16	10YR 4/1	90	2.5YR 3/4	10	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-15
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: <1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.317626 Long: -122.747823 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present? Yes X No ____

Is the Sampled Area within a Wetland? **Yes X No ____**

Remarks: Data plot located on southeast side of Unnamed Tributary within pasture of Pike property.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status?
Tree Stratum (Plot size: 30 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Various grass hay species* [1]	85	Yes	FAC
2. *Taraxacum officinale*	5	No	FACU
3. *Rubus ursinus*	2	No	FACU
4. *Brassica* spp.	5	No	-
5.			
6.			
7.			
8.			
9.			
50%= 48.5 20%= 19.4 Total Cover:	97		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 3 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100%**	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	**0**	x1 =	**0**	
FACW species	**0**	x2 =	**0**	
FAC species	**85**	x3 =	**255**	
FACU species	**7**	x4 =	**28**	
UPL species	**0**	x5 =	**0**	
Column Totals:	**92**	(A)	**283**	(B)

Prevalence Index = B/A = **3.1**

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: 1. Various grass hay species include fescues, bentgrasses and bluegrasses and are assumed to have hydrophytic vegetation indicator status of facultative.

SOIL

Sampling Point: DP-15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					SiL	
4-8	10YR 3/2	83	10YR 6/8	5	C	M	SiL	
			7.5YR 6/8	5	C	M		
			2.5YR 3/4	2	C	PL		Oxidized rhizospheres
			2.5YR 3/4	5	C	M		
8-16	10YR 5/1	80	7.5YR 6/8	10	C	M	SiL	
			5YR 6/8	10	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______
Water table Present? Yes ___ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Stafford Meadows Residential Development City/County: Wilsonville/Clackamas County Sampling Date: 12/14/2017
Applicant/Owner: West Hills Land Development State: OR Sampling Point: DP-16
Investigator(s): Julie Fox, Joe Pursley Section, Township, Range: Section 12, T3S, R1W
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): none Slope: <1%
Subregion (LRR): Northwest Forests and Coast (LRR A) Lat: 45.317625 Long: -122.747785 Datum: NAD83
Soil Map Unit Name: Aloha silt loam, 0 to 3% slopes NWI Classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" Present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Data plot located just upslope from DP-16.

VEGETATION

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status?
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Sapling/Shrub Stratum (Plot size: 15 ft)			
1. None			
2.			
3.			
4.			
5.			
50%= 0 20%= 0 Total Cover:	0		
Herb Stratum (Plot size: 5 ft)			
1. *Various grass hay species*[1]	85	Yes	FAC
2. *Taraxacum officinale*	5	No	FACU
3. *Rubus ursinus*	2	No	FACU
4. *Brassica spp.*	5	No	-
5.			
6.			
7.			
8.			
9.			
50%= 48.5 20%= 19.4 Total Cover:	97		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
Total Cover:	0		

% Bare Ground in Herb Stratum 3 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100%	(A/B)

Prevalence Index Worksheet:

Total % Cover of:			Multiply by:	
OBL species	0	x1 =	0	
FACW species	0	x2 =	0	
FAC species	85	x3 =	255	
FACU species	7	x4 =	28	
UPL species	0	x5 =	0	
Column Totals:	92	(A)	283	(B)

Prevalence Index = B/A = 3.1

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ 4 - Morphological Adaptation[1] (Provide supporting data in Remarks or on a separate sheet)
____ 5 - Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: 1. Various grass hay species include fescues, bentgrasses and bluegrasses and are assumed to have hydrophytic vegetation indicator status of facultative.

SOIL

Sampling Point: DP-16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					SiL	
10-14	10YR 3/2	95	7.5YR 5/8	4	C	M	SiL	
			7.5YR 5/8	1	C	PL		Trace oxidized rhizospheres
14-16	10YR 4/2	85	7.5YR 5/8	8	C	M	SiL	
			10YR 6/8	10	C	M		

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Muck Mineral (S1)
___ Sandy gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR B**)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water table Present? Yes ___ No X Depth (inches): ___
Saturation Present? Yes ___ No X Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (Unnamed Tributary gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix E

Pipe Property Drain Tile Map

NEEDY TILE CO

CUSTOMER MIKE PIKE

ADDRESS

WILSONVILLE, ORE 97070

DATE 5-18-89

INVOICE NO.

LATERAL SPACING 40 FT

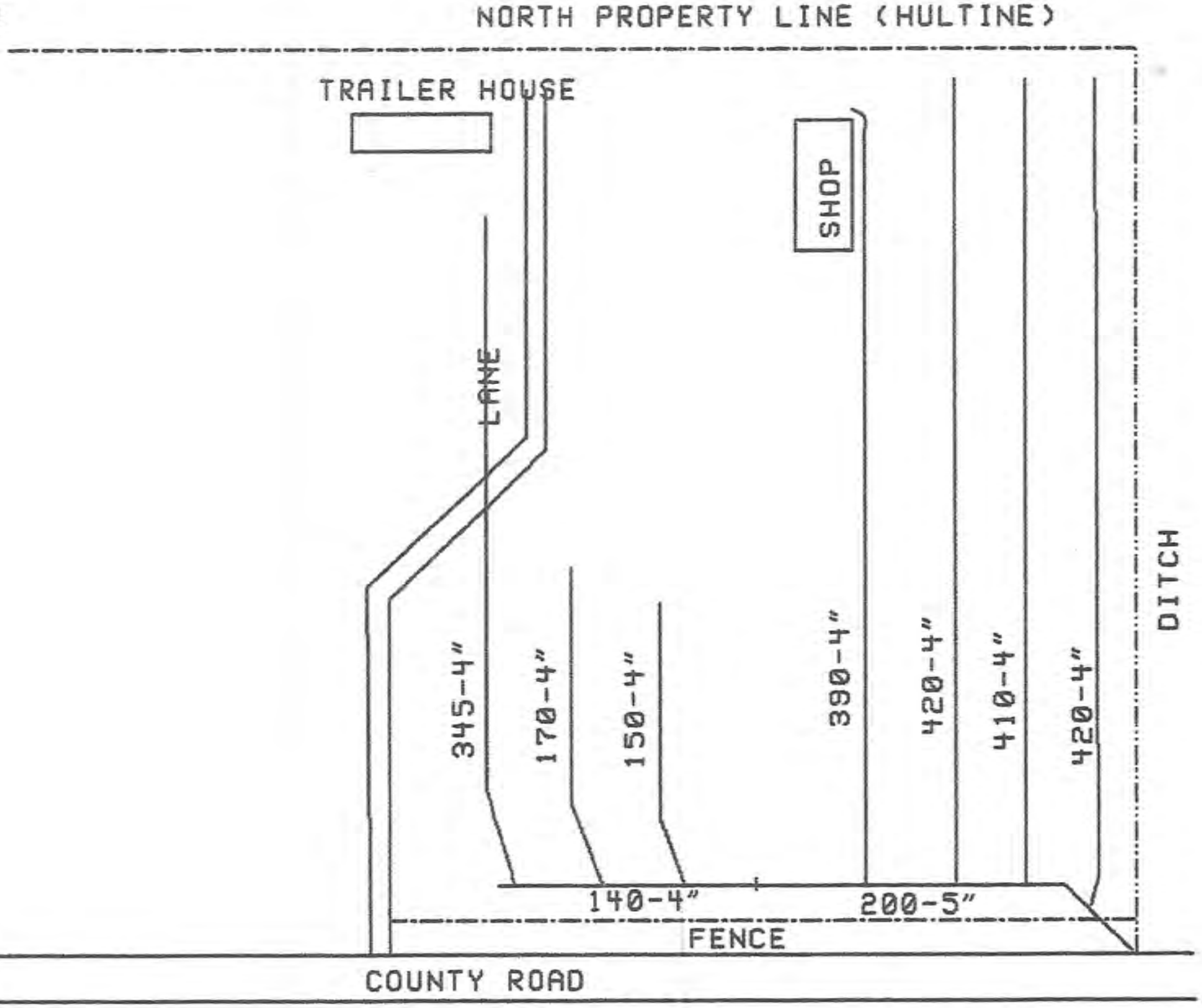
5" TILE 200 FT

4" TILE 2445 FT

CONNECTIONS 7

OUTLET 6"CMP X 10 FT

INSTALLED BY GALE + LES



Appendix E

January 2018
West Hills Land Development: Stafford Meadows Residential Development

ANCHOR QEA

Significant Resource Impact Report and Significant Resource Overlay Zone Map Refinement Request

Prepared for West Hills Land Development

January 2018
West Hills Land Development: Stafford Meadows Residential Development

Significant Resource Impact Report and Significant Resource Overlay Zone Map Refinement Request

Prepared for
West Hills Land Development
3330 NW Yeon Avenue
Portland, OR 97210

Prepared by
Anchor QEA, LLC
6720 SW Macadam Avenue, Suite 125
Portland, Oregon 97219

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ABBREVIATIONS

City	City of Wilsonville
Cowardin classification system	*Classification of Wetlands and Deepwater Habitats of the United States*
DSL	Oregon Department of State Lands
ESA	Endangered Species Act
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
HGM	hydrogeomorphic
LIDA	Low Impact Development Approaches
LWI	Local Wetlands Inventory
Master Plan	*Frog Pond West Master Plan*
NGVD	National Geodetic Vertical Datum
NI	no indicator status
NOL	not on list
NWI	National Wetlands Inventory
OBL	obligate
OFWAM	Oregon Freshwater Wetland Assessment Methodology
Oregon HGM classification system	*Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles*
PEM	palustrine emergent
PEM1C	palustrine emergent, persistent, seasonally flooded
PFO	palustrine forested
PSS	palustrine scrub-shrub
PHS	Pacific Habitat Services, Inc.
R4SBC	riverine, intermittent, stream bed, seasonally flooded
R5UBH	perennial riverine unconsolidated bottom, permanently flooded
R7	Residential, medium lot single family
R10	Residential, large lot single family
SRIR	Significant Resource Impact Report
SROZ	Significant Resource Overlay Zone
UGB	urban growth boundary
UPL	upland
USACE	U.S. Army Corps of Engineers

1 Introduction

Anchor QEA, LLC, was retained by West Hills Land Development to prepare a Significant Resource Impact Report (SRIR) and Significant Resource Overlay Zone (SROZ) Map Refinement Request consistent with Section 4.139.00 of the City of Wilsonville's (City's) SROZ Ordinance for the proposed Stafford Meadows residential development in Wilsonville, Clackamas County, Oregon (Figures 1 and 2). The proposed project site for that development consists of four properties—the Killinger, Wehler, Kreilkamp, and Pike properties—located just outside the City limits but inside the Metro urban growth boundary (UGB) in the 181-acre Frog Pond West Neighborhood planning area (Figure 3). The Frog Pond West Neighborhood is part of the larger Frog Pond Area, a 500-acre planning area that includes future development areas that are both within the UGB and outside of the UGB in the urban reserve.

Specific location information for the project site is as follows:

City/County/State:	Wilsonville, Clackamas County, Oregon
General Location:	Northwest of the intersection of SW Boeckman Road and SW Wilsonville/SW Stafford Road
Tax Lots:	31W12D002001 (Killinger) 31W12D002100 (Wehler) 31W12D002201 (Kreilkamp) 31W12D002202 (Pike)
Latitude/Longitude[1]:	45.318473° North/-122.747021° West
Public Land Survey System:	SE 1/4 of Section 12, Township 3 South, Range 1 West, Willamette Meridian
Street Address:	6651 SW Boeckman Road (Killinger) 6855 SW Boeckman Road (Wehler) 6875 SW Boeckman Road (Kreilkamp) 7025 SW Boeckman Road (Pike)
Approximate Area:	2.0 acres (Killinger) 3.7 acres (Wehler) 5.12 acres (Kreilkamp) 5.33 acres (Pike) Total Area: 16.15 acres
Zoning:	Residential, medium lot single family (R7) and residential, large lot single family (R10) (proposed)
Waterways:	Unnamed tributary to the Willow Creek, a tributary to the Willamette River

Note:

1. Latitude and longitude shown are for the approximate centroid of the study area.

This report is prepared in accordance with the requirements of Section 4.139.06, Significant Resource Impact Report and Review Criteria, of the City's SROZ Ordinance and addresses the requirements of a Standard SRIR per Section 4.139.06(.02) and those required for SROZ map refinement per Section 4.139.10(.01)D. Specifically, it includes the following:

- A description of the project site location and an overview of the existing site conditions
- A physical analysis that describes and maps the physical features present on the project site including its soils, geology, hydrology, wetland and waterbodies, topography, existing structures and other features, and the locations of any SROZs or other mapped resource boundaries (e.g., Metro Urban Growth Management Functional Plan (UGMFP) Title 3 Water Quality Resource Area boundaries)
- An ecological analysis that describes the type and characteristics of the vegetation communities, wetlands, riparian corridors, and wildlife habitat resources present on the project site
- A discussion of the riparian corridor type present on the project site as it compares to the SROZ currently mapped by the City and a request to refine the existing mapping
- A description of the proposed project and any proposed encroachments into SROZs or their associated Impact Areas
- A list of recommended measures for minimizing adverse impact of the proposed development on the natural resources of the project site
- The proposed significant resource mitigation and enhancement plan
- A summary of the project's compliance with the SRIR Review Criteria
- The names and qualifications of the report preparers

Please note that this report documents the investigation, best professional judgment, and conclusions of Anchor QEA and should be used for planning purposes only until verified in writing by the City.

2 Project Site Location and Existing Conditions

The 16.15-acre project site is located north of SW Boeckman Road and west of SW Stafford Road on tax lots 31W12D 02001, 31W12D 02100, 31W12D 02201, and 31W12D 02202 in Wilsonville, Clackamas County, Oregon (Figures 1 through 3). It is in the northwestern portion of the Frog Pond Area in an area known as the Frog Pond West Neighborhood. The future conceptual development of the larger Frog Pond Area is addressed in the City's *Frog Pond Area Plan* (City of Wilsonville 2015). The specific development strategy for the Frog Pond West Neighborhood is addressed in the recently adopted *Frog Pond West Master Plan* (Master Plan; City of Wilsonville 2017).

2.1 Landscape Setting

The project site is situated in the Prairie Terraces subregion of the Willamette Valley ecoregion near the boundaries of the Valley Foothills subregion (Thorson et al. 2003). This subregion is characterized by level to undulating topography drained by low-gradient, meandering streams and rivers; poorly drained soils derived from fluvial geologic deposits from the Missoula floods; and a mild climate with cool, wet winters, warm, dry summers, and a mean annual precipitation of 40 to 50 inches (Watershed Professionals Network 1999). Hydrologically, the project site is in the Coffee Lake Creek-Willamette River subwatershed (hydrologic unit code 170900070402) of the Willamette River basin (USGS 2015).

2.2 Current Site Description

The current conditions of the study area are depicted in the 2017 aerial photograph provided in Figure 4. The predominant land use and existing structures for each property are briefly described as follows:

- **Killinger Property** – Property includes a rural residence, pole barn, and associated landscaping with a fallow agricultural field or pasture in the eastern and northern portions.
- **Wheler Property** – Property includes a rural residence and associated landscaping surrounded by a former tree/shrub nursery in the eastern and western portions.
- **Kreilkamp Property** – Property consists of a flag lot that contains a rural residence and associated landscaping, fallow pasture in the central and northwestern portions, and forested areas in the southern, western, and northern portions.
- **Pike Property** – Property includes a rural residence, a parking canopy, a garage, and a horse barn in the northwestern portion surrounded by predominantly pasture with a horse corral in the central-northern portion, a small orchard in the southwest portion, small forested areas in the southeast and northeast portions, a narrow band of trees along the northern property boundary, and a linear section of Willow Creek and an associated herbaceous riparian corridor that extends from north to south across the property.

Access to each of these properties is currently provided by four private driveways off SW Boeckman Road.

3 Physical Analysis

As required by Section 4.139.06(.02)2 of the City’s SROZ Ordinance, the following sections provide a description of the physical features of the project site.

3.1 Soil Types

The Natural Resources Conservation Service online Web Soil Survey (NRCS 2017) maps three soil types within the study area (Figure 5): Aloha silt loam, 0% to 3% slopes; Aloha silt loam, 3% to 6% slopes; and Concord silt loam. Table 1 summarizes the soil mapping information for the study area. Of these soil types, Concord silt loam is classified as a hydric soil. The remaining soil types on the study area are considered non-hydric but are known to contain potential inclusions of hydric soils in low areas and swales.

Table 1
Soils Mapped on the Project Site by Natural Resources Conservation Service Web Soil Survey

Map Unit	Soil Type Name	Drainage Class	Hydrologic Soil Group[1]	Hydric Rating	Hydric Inclusions[2]	Acres
1A	Aloha silt loam, 0 to 3% slopes	Somewhat poorly drained	C/D	5	Yes	13.30
1B	Aloha silt loam, 3 to 6% slopes	Somewhat poorly drained	C/D	5	Yes	0.52
21	Concord silt loam	Poorly drained	C/D	93	Yes	2.35

Notes:

1. Hydrologic soil groups are based on runoff potential according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.
   i. Group C soils have slow infiltration rates when thoroughly wet, caused by either an underlying layer that impedes the downward movement of water or soils of moderately fine or fine texture.
   ii. Group D soils have a very slow infiltration rate (high runoff potential) when thoroughly wet and include soils consisting of clays with high shrink-swell potential, soils that have a high water table, soils that have a clay or claypan layer at or near the surface, and soils that are shallow over nearly impervious material.
2. Non-hydric soils may have inclusions of hydric soil (Huberly and Dayton) in the lower positions on the landform.

3.2 Geology

According to the Oregon Department of Geology and Mineral Industries' online interactive Geologic Map of Oregon, the project site is underlain by Quaternary Age sediments that are classified in the Quaternary Surficial Deposits terrane group (DOGAMI 2017). These materials typically consist of deposits of fine-grained, unconsolidated sediment deposits derived from alluvium, colluvium, river and coastal terraces, landslides, glacial, eolian, beach, lacustrine, playa and pluvial lake deposits, and outburst flood deposits left by the Missoula and Bonneville floods.

3.3 Topography and Slope

Topography on the site is generally flat, except for the Kreilkamp property, which slopes gently from northeast to southwest toward Willow Creek (Figure 6). According to the U.S. Geological Survey's 7.5-minute' series (topographic) quadrangle map for Canby, Oregon, general elevations on the project site range from approximately 220 feet National Geodetic Vertical Datum (NGVD) near

Willow Creek on the Pike Property to 230 feet NGVD in the northeastern and northwestern portions of the project site (Figure 4; USGS 2017). Surrounding topography is also generally flat with elevations gradually sloping from northeast to southwest. A more detailed topographic survey with a 1-foot contour was conducted by Otak, Inc., and is provided in Figure 11. That survey shows the lowest elevation as being around 212 feet NGVD at the southern end of Willow Creek near the SW Boeckman Road culvert inlet. This highest elevation on the site is 235 feet NGVD along the eastern boundary and northern edge of the Kreilkamp and Killinger properties, respectively.

As required by Section 4.139.06(.02)(D)(1)(i) of the SROZ Ordinance, three slope cross-section measurements were completed perpendicular to Willow Creek at not more than 100-foot increments. These measurements, which are included in Appendix A, indicate that the slopes within the stream channel range from 0.7% to 26.0%. across all cross sections, with the steeper sections occurring within the drainage channel in isolated areas of channel incision. Slopes outside the stream banks are typically no more that 5%.

3.4 Hydrology

The majority of the study area drains to a linear section of Willow Creek that flows from north to south across the Pike property (Figure 7). Flow entering this stream includes both overland flows and subsurface flows routed through existing drainage tiles. A shallow ditch that flows east to west into Willow Creek is also present just inside the southern fence line of the Pike property. No other drainages or ponds exist on the other properties of the project site. Sources of hydrology for the on-site wetlands (Section 3.4) include direct precipitation and a seasonally high water table.

At the southern boundary of the Pike property, Willow Creek continues under SW Boeckman Road through a pair of 18-inch-diameter concrete culverts that are located within the road right-of-way of the road (Figure 7). Off site, Willow Creek[1] continues to the south and southeast, eventually draining into the Willamette River, approximately 1.15 miles to the south of the project site. The drainage basin of Willow Creek at SW Boeckman Road is estimated to be 55 acres.

3.5 Wetlands and Other Waters

The presence of wetland and other waters on the project site was evaluated using existing resource maps and inventories and during a series of wetland determinations and a formal wetland delineation that were performed on the project site and adjacent properties by Anchor QEA.

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[1] Some maps (e.g., Fishman Environmental Services' 1999 City of Wilsonville Local Wetland and Riparian Corridor Inventory North map) identify the section of the stream to the south of SW Boeckman Road as Meridian Creek.

3.5.1 National Wetlands Inventory

The U.S. Fish and Wildlife Service National Wetland Inventory (NWI) online Wetlands Mapper indicates that there is one mapped NWI wetland in the study area: an unknown perennial riverine unconsolidated bottom, permanently flooded water regime (R5UBH) wetland (USFWS 2018; Figure 8). The location of the R5UBH wetland coincides with the location of Willow Creek on the Pike property.

3.5.2 Local Wetlands Inventory

The project site was not included in the survey area for the 1999 Local Wetlands Inventory (LWI) that was prepared for the City by Fishman Environmental Services (FES 1999); however, the off-site portion of Willow Creek to the south of the project site is shown on the LWI but is identified as a tributary to Meridian Creek (Figure 9). The stream segment that receives water from the project site is identified as "R2.15" and is described in the LWI as a relatively narrow and shallow intermittent stream that is bordered by upland vegetation.

3.5.3 Frog Pond Area Wetland Inventory

Potential wetlands and other waters were inventoried in the Frog Pond Area by Pacific Habitat Services, Inc. (PHS) in April 2014 as part of a natural resources inventory for the Frog Pond and Advance Road Urban Growth Areas (PHS 2014). The PHS study was based on a combination of off- and on-site wetland determination methods and did not involve formal wetland delineation of any properties in the study area (i.e., no wetland boundaries were established and no formal wetland delineation data was collected in the field). On-site determinations were only conducted on sites where property access permission had been granted and where property owner contact information had been provided.[2] Wetland mapping was completed by drawing the approximated wetland boundaries on an aerial photograph of the study area using GIS.

Wetland and other waters mapped on the project site by PHS include a stream in the location of Willow Creek on the Pike property, a narrow strip of wetland along Willow Creek, and another wetland in the northeastern corner of the Kreilkamp property (Figure 10). These features are all shown as connecting to a much larger, mostly agricultural wetland that extends to the north of the project site across tax lots 31W12D001500, 31W12D001700, 31W12D001800, and 31W12D002200. Collectively, these areas and the off-site wetland are identified as Wetland 5, which is estimated to be approximately 13.22 acres in size.

Although the study did not include a quality assessment or local significance determination using the Oregon Freshwater Wetland Assessment Methodology (OFWAM), PHS did provide a qualitative assessment of whether or not the identified wetlands that are larger than 0.5 acre would meet the

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[2] In their report, PHS does not specify which sites were visited in the field and which were inventoried using only off-site methods.

City's significance criteria of Section 4.139.09.02 of the SROZ Ordinance. Based on this assessment, no potentially significant wetlands were identified on the project site or any of the adjacent properties.

3.5.4 Wetland Determinations and Delineation

Anchor QEA wetland scientists performed a series of wetland determinations on the properties of the project site and many of the adjacent parcels between May 2016 and December 2017, culminating in the formal delineation of the project site in December 2017. During that delineation, the three following potential waters of the United States and State of Oregon were identified (Figure 11):

- **Wetland A** – Located in the riparian area adjacent to Willow Creek and estimated to be 3,265 square feet (0.07 acre) in size. Wetland A continues off site to the north but ends at the southern boundary of the project site.
- **Wetland B** – Occurs in the northeast corner of the Kreilkamp property and continues off site to the north into an agricultural field. The on-site area of Wetland B was estimated to be 11,149 square feet (0.26 acre).
- **Intermittent Stream** – Occurs in the location of Willow Creek on the Pike property and was estimated to be 3,535 square feet (0.08 acre) in size. As discussed in Section 2.1.2, this section of Willow Creek enters the Pike property on the northern end, flows across the property, and exits on the southern end, eventually connecting to Willamette River.

Additional information on the methods used for the wetland delineation and a more detailed description of the identified wetlands and other waters including their classification, typical vegetation, soils, and hydrologic sources is provided in Section 4.2. A copy of the wetland delineation report is provided in the Site Development Permit Application package submitted for the proposed project. Site photographs of wetland are provided in Appendix B.

In addition to the project site, Anchor QEA wetland scientists have also walked tax lots 31W12D001500, 31W12D001800, and 31W12D002200 on numerous occasions over the years. Although potential wetlands were identified along the Willow Creek channel and in small, isolated areas of the northern agricultural field, these areas were not nearly as extensive as those mapped by PHS in their 2014 wetland inventory.

3.6 Tree Survey

A total of 571 trees with a diameter at breast height greater than 6 inches are present on the project site (Figure 11). Most of these trees occur in the northern, western, and southern portions of the Kreilkamp property. There are no trees with a diameter at breast height greater than 6 inches located within the riparian corridor of Willow Creek or within 50 feet of the Willow Creek stream channel on the Pike property.

3.7 Existing Structures and Other Features

Figure 11 shows the existing structure and other features currently present on the project site. As described in Section 2.1.2, structures currently present primarily include rural residential and agricultural buildings (e.g., garages, barns, and sheds), gravel and asphalt driveways and access roads, culverts, and various types of fences (including electric fences). Except for sanitary sewer service, most of the utilities (e.g., electricity, phone, and natural gas) servicing the properties of the project site are located underground and extend north from SW Boeckman Road. Sanitary sewer service appears to be provided on individual septic systems. Agricultural drainage tile is also known to occur in various locations on the project site, including in the field to the west of Willow Creek on the Pike property, the central portion of the Wehler property, and in the northern and central portions of the Kreilkamp property.

3.8 Mapped Resource Areas

The following sections describe the natural resources mapped on the project site by regional and local entities including Metro and the City. These areas are shown on Figure 11.

3.8.1 Metro Title 3 Water Quality Resource Areas

No Metro Title 3 Water Quality Resource Areas occur on the project site (Figure 11). Although the off-site portion of Willow Creek to the south of the site is mapped as a Title 3 Water Quality Resource Area, this mapping ends at SW Boeckman Road and does not extend onto the project site.

3.8.2 City of Wilsonville Significant Resource Zone Overlay Mapping

The City's April 29, 2009 Significant Resource Overlay Zone map (City of Wilsonville 2009) does not show any mapped SROZs on the project site. However, in the 2017 Master Plan for Frog Pond West, the City identifies a potential SROZ along Willow Creek north of SW Boeckman Road (Figure 11). This SROZ extends approximately 822 feet to the north of SW Boeckman Road, crossing both the Pike property and the adjacent tax lot to the north (tax lot 31W12D002200). Although no specific width is assigned to this SROZ in the Master Plan, information provided by the City indicates that it is assumed to extend 50 feet on either side of the Willow Creek channel.

3.8.3 Goal 5 Safe Harbor Boundary

Criteria for establishing the Goal 5 Safe Harbor Boundary around riparian corridors is found in Oregon Administrative Rule 660-023-0090(5), subsections (a) through (d). Because the segment of Willow Creek on the project site does not carry annual average stream flow of greater than 1,000 cubic feet per second, is not fish-bearing, and does not include a significant wetland, it is presumed that a Goal 5 Safe Harbor Boundary is not required for the on-site riparian corridor.

4 Ecological Analysis

As required by Section 4.139.06(.02)3 of the City's SROZ Ordinance, the following sections provide an ecological analysis of the vegetation, wetlands and other waters, and wildlife habitat currently present on the project site.

4.1 Vegetation Communities

The study area contains a mix of forested, scrub-shrub, and herbaceous vegetation including a variety of native, introduced, and invasive species. Most of the project site properties are dominated by herbaceous vegetation in the form of fallow agricultural fields, pastures, or maintained lawns; a few forested areas are also present. Table 2 summarizes the typical plant species observed in the study area at the time of the site visit, including their individual wetland indicator status according to the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016). Native status was determined using the U.S. Department of Agriculture online PLANTS database (USDA 2018), with invasive status determined using the Clackamas County Weed List from Clackamas Soil and Water Conservation District (Clackamas SWCD 2018). The following sections provide a brief description of the typical vegetation communities present on each of the project site properties.

Table 2
Typical Plant Species Observed on the Stafford Meadows Project Site

Common Name	Scientific Name	Wetland Indicator Status[1]	Native Status[2]
Alaska brome	*Bromus sitchensis*	NOL	Native
Alfalfa	*Medicago sativa*	UPL	Introduced
American water plantain	*Alisma plantago-aquatica*	OBL	Native
Beaked hazelnut	*Corylus cornuta*	FACU	Native
Bentgrass species	*Agrostis* spp.	UPL to FACW	Introduced
Bing cherry	*Prunus avens*	NOL	Introduced
Bitter cherry	*Prunus emarginatus*	FACU	Native
Bluegrass species	*Poa* spp.	FACU to OBL	Native/Introduced
Canada thistle	*Cirsium arvense*	FAC	Invasive
Cascara false buckthorn	*Frangula purshiana*	FAC	Native
Colonial bentgrass	*Agrostis capillaris*	FAC	Introduced
Common dandelion	*Taraxacum officinale*	FACU	Introduced
Common duckweed	*Lemna minor*	OBL	Native
Common hawthorn	*Crataegus monogyna*	FAC	Invasive
Common plantain	*Plantago major*	FAC	Introduced
Common selfheal	*Prunella vulgaris*	FAC	Native
Common velvetgrass	*Holcus lanatus*	FAC	Introduced

Common Name	**Scientific Name**	**Wetland Indicator Status[1]**	**Native Status[2]**
Creeping buttercup	*Ranunculus repens*	FAC	Introduced
Creeping yellowcress	*Rorippa sylvestris*	OBL	Introduced
Cultivated apple tree	*Malus sp.*	NOL	Introduced
Dense sedge	*Carex densa*	OBL	Native
Douglas fir	*Pseudotsuga menziesii*	FACU	Native
Dwarf Oregon-grape	*Mahonia nervosa*	FACU	Native
English holly	*Ilex aquifolium*	FACU	Introduced
English plantain	*Plantago lanceolata*	FACU	Introduced
European centaury	*Centaurium erythraea*	FAC	Introduced
Fescue species	*Festuca* spp.	UPL to FAC	Native/Introduced
Field bindweed	*Convolvulus arvensis*	NOL	Invasive
Fringed willowherb	*Epilobium ciliates*	FACW	Native
Giant sequoia	*Sequoiadendron giganteum*	NOL	Introduced
Hairy cat's ear	*Hypochaeris radicata*	FACU	Invasive
Himalayan blackberry	*Rubus armeniacus*	FAC	Invasive
Indian plum	*Oemleria cerasiformis*	FACU	Native
Lupine species	*Lupinus* spp.	FACU to FAC	Native
Mannagrass	*Glyceria striata*	OBL	Native
Meadow foxtail	*Alopecurus pratensis*	FAC	Introduced
Mustard species	Various genera	--	Introduced
Norway spruce	*Picea abies*	NOL	Introduced
Norway spruce	*Picea abies*	NOL	Introduced
Ox-eye daisy	*Leucanthemum vulgare*	FACU	Introduced
Paper birch	*Betula papyrifera*	FAC	Introduced
Ponderosa pine	*Pinus ponderosa*	FACU	Native
Queen Anne's lace	*Daucus carota*	FACU	Invasive
Red fescue	*Festuca rubra*	FAC	Native
Red pine	*Pinus resinosa*	NI	Introduced
Reed canarygrass	*Phalaris arundinacea*	FACW	Invasive
Scouler's willow	*Salix scouleriana*	FAC	Native
Shiny geranium	*Geranium lucidum*	NOL	Invasive
Soft rush	*Juncus effusus*	FACW	Native
Tall fescue	*Schedonorus arundinaceus*	FAC	Introduced
Tansy ragwort	*Jacobaea vulgaris*	FACU	Invasive
Various fir species	*Abies* spp.	FACU	Native and Introduced
Various pine species	*Pinus* spp.	NOL	Introduced
Water parsley	*Oenanthe sarmentosa*	OBL	Native

Common Name	Scientific Name	Wetland Indicator Status[1]	Native Status[2]
Western dock	*Rumex occidentalis*	FACW	Native
Western red cedar	*Thuja plicata*	FAC	Native
Western swordfern	*Polystichum munitum*	FACU	Native
White clover	*Trifolium repens*	FAC	Introduced
Wild rose	*Rosa* spp.	UPL to FAC	Native and Introduced
Willow hybrid	*Salix* spp. (hybrid ornamental)	FAC to OBL	Native

Notes:

1. Wetland indicator status based on the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016).
   --: not applicable
   FAC: facultative
   FACU: facultative upland
   FACW: facultative wetland
   NI: no indicator status
   NOL: not on list (species is not listed on the 2016 National Wetland Plant List)
   OBL: obligate
   UPL: upland
2. Native/introduced status determined using U.S. Department of Agriculture PLANTS database (USDA 2018); invasive status determined using Clackamas County Weed List from Clackamas Soil and Water Conservation District (Clackamas SWCD 2018)

4.1.1 Typical Vegetation on the Killinger Property

Typical vegetation surrounding the residential home on the Killinger property includes red pine, Douglas fir, and American elm trees, along with several patches of Himalayan blackberry. The agricultural field in the eastern portion is dominated by various grass hay species, including various species of fescue, bentgrass, and bluegrass, along with lesser amounts of shiny geranium, western buttercup, common plantain, hairy cat's ear, and tansy ragwort. Several giant sequoias are present along the length of the driveway, and various native and non-native trees and shrubs surround the house.

4.1.2 Typical Vegetation on the Wheler Property

In the actively managed Christmas tree farm portions of the Wheler Property, various true fir and pine trees species are currently planted, along with a few Douglas fir trees. These areas include a mix of regularly mown pasture grasses and weedy forbs in the open areas between the trees. The existing home is surrounded by a mix of native and non-native deciduous and conifer trees and a maintained lawn.

4.1.3 Typical Vegetation on the Kreilkamp Property

In the western portion of the Kreilkamp property, typical tree species along the driveway and near the house include Norway spruce, ponderosa pine, Douglas fir, and willow, with an understory of Cascara false buckthorn and common hawthorn saplings, Himalayan blackberry, and Western swordfern. A few western red cedar trees are also adjacent to the house. Red pine trees are present along the northern property boundary with a thin understory of Cascara false buckthorn saplings and Himalayan blackberry. A few common hawthorn trees and saplings are present along the eastern fence line and in the fallow pasture, which also includes one large ponderosa pine tree surrounded by a few Cascara false buckthorn saplings and Himalayan blackberry patches. The forested patch in the southern portion or the Kreilkamp property is predominantly red pine with some Douglas fir trees and a sparse understory of Cascara false buckthorn saplings and Indian plum. The fallow pasture is dominated by red fescue with lesser amounts of field bindweed, common velvetgrass, and colonial bentgrass, along with a very small percentage of alfalfa, Canada thistle, and western dock.

4.1.4 Typical Vegetation on the Pike Property

Douglas fir trees are present along the northwestern boundary of the Pike property. Vegetation observed in the northeastern and southeastern portions includes Douglas fir, ponderosa pine, and paper birch trees, as well as bitter cherry saplings, wild rose, and Himalayan blackberry. A small orchard of domestic fruit trees is present in the southwestern portion. The pasture contains predominantly grass hay species, including various species of fescue, bentgrass, and bluegrass, along with lesser amounts of Queen Anne's lace, white clover, hairy cat's ear, shiny geranium, English plantain, common selfheal, lupine, ox-eye daisy, common dandelion, and trailing blackberry. Typical vegetation present in and around the section of Willow Creek that flows from north to south through the property includes American water plantain, water foxtail, water parsley, mannagrass, common duckweed, dense sedge, fringed willowherb, western dock, creeping buttercup, and meadow foxtail, along with a few wild rose shrubs growing in portions of the channel.

4.2 Wetlands

Anchor QEA wetland scientists performed wetland delineation field work on December 6 and 14, 2017, and wetland determination field work on May 3, 2016, October 21, 2016, and January 17, 2017. Field work was conducted according to methods presented in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010), and Oregon Administrative Rules 141-090-0005 to 141-090-0055. Plant indicator status was determined using the National Wetland Plant List: 2016 Wetland Ratings (Lichvar et al. 2016).

As stated in Section 3.5.4, two wetlands (Wetlands A and B) and one other water (Willow Creek) were identified on the project site during the delineation (Figure 11). The description, classification, and on-site area of these features are summarized in Table 3 with site photos provided in Appendix B. Each area is also briefly described in the following sections. Table 4 provides an assessment of whether the identified wetland would meet the City's criteria for adding wetlands to their SROZ inventory per Section 4.139.10(.02) of the SROZ Ordinance.[3]

Table 3
Potential Wetlands and Other Waters Delineated on the Stafford Meadows Project Site

		Classification		On-Site Area	
Wetlands	**Description**	**Cowardin[1]**	**Oregon Hydrogeomorphic[2]**	**Square Feet**	**Acres**
Wetland A	Herbaceous riparian wetland	PEM1C	Slope	3,265	0.07
Wetland B	Forested/scrub-shrub/ herbaceous wetland	PFO/PSS/PEM1C	Slope	11,149	0.26
Willow Creek	Intermittent stream	R4SBC	N/A	3,535	0.08
Total Area of Wetlands and Non-Wetland Other Waters				**17,949**	**0.41**

Notes:

1. *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin classification system; Cowardin et al. 1979) wetland codes:
   PEM1C: palustrine emergent, persistent, seasonally flooded
   PFO: palustrine forested
   PSS: palustrine scrub-shrub
   R4SBC: riverine, intermittent, stream bed, seasonally flooded
2. *Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles* (Oregon HGM classification system; Adamus 2001)

N/A: not applicable

4.2.1 Wetland A

Wetland A is a 0.07-acre wetland located along the length of Willow Creek on the Pike property (Figure 11). It includes a short section of shallow ditch that runs along the southern property boundary, just inside the Pike property fence line. Wetland A continues off site to the north along the stream channel and appears to widen slightly as it extends through tax lots 31W12D002200 and 31W12D001500. Wetland A is classified as a palustrine emergent (PEM) wetland under the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin classification system; Cowardin et al. 1979) and as a slope wetland under the *Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles* (Oregon HGM classification system; Adamus 2001).

Wetland A is dominated by colonial bentgrass (facultative [FAC]), meadow foxtail (FAC) and red fescue (FAC) in the herbaceous layer, with white clover (FAC), creeping buttercup (FAC), English plantain (facultative upland [FACU]), and Queen Anne's lace (FACU) also present to a lesser extent. A small amount of wild rose (upland [UPL] to FAC) occurs in Wetland A, but there are no trees

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[3] The criteria contained in Section 4.139.10(.02) of the City's SROZ Ordinance are identical to those from Section 3.07.340(E)(3) of Title 3 of Metro's UGMFP.

present. The water regime of Wetland A was determined to be seasonally saturated with overland flow, seasonal high water table, direct precipitation, and overbank flows from Willow Creek during storm events being the primary hydrologic sources.

Wetland A is not mapped in the City's 1999 LWI (Figure 9) but is shown on the 2014 wetland inventory conducted by PHS (Figure 10). As indicated in Table 4, Wetland A does not meet the City's criteria for adding wetlands to the SROZ.

4.2.2 Wetland B

Wetland B is a 0.26-acre isolated wetland located in the northeastern portion of the study area on the Kreilkamp property (Figure 11). It continues off site to the north into the adjacent agricultural field. The off-site portion of the wetland is clearly visible on the 2017 Google Earth aerial photograph (Figure 4) and appears to have developed as the result of failing drainage tile. Based on the apparent boundary visible on the aerial photograph and field observations, the total size of Wetland B is estimated be approximately 0.4 acre. Wetland B is classified as a palustrine forested (PFO)/palustrine scrub-shrub (PSS)/PEM wetland under the Cowardin classification system (Cowardin et al. 1979) and as a slope wetland under the Oregon HGM classification system (Adamus 2001).

Dominant vegetation in the forested portion of Wetland B includes red pine (not on list [NOL]) with a sparse understory of common hawthorn (FAC) saplings and Himalayan blackberry (FAC) in the shrub layer. In the herbaceous layer, red fescue (FAC) is dominant with some reed canarygrass (facultative wetland [FACW]) also present. The water regime of Wetland B was determined to be seasonally saturated with overland flow, seasonal high water table, and direct precipitation being the primary hydrologic sources.

Wetland B was not mapped in the City's 1999 LWI (Figure 9) but is shown on the 2014 wetland inventory conducted by PHS (Figure 10). As indicated in Table 4, Wetland A does not meet the City's criteria for adding wetlands to the SROZ.

Table 4
Assessment of the Wetlands on the Project Site in Meeting the Adding Wetlands Criteria of Section 4.139.10(.02) of the City of Wilsonville's Significant Resource Overlay Zone Ordinance

Criterion	Wetland A	Wetland B
A. The wetland is fed by surface flows, sheet flows or precipitation, and has evidence of flooding during the growing season, and has 60 percent or greater vegetated cover, and is over 0.5 acre in size; or the wetland qualifies as having intact water quality function under the 1996 OFWAM.	No – Wetland A is fed by surface flow, sheet flow, and precipitation and has evidence of some limited flooding during the growing season. It has over 60% vegetated cover but is not greater than 0.5 acre in size, nor is it likely to qualify as having intact water quality function under OFWAM.	No – Wetland B is fed by surface flow, sheet flow, and precipitation; it does not receive water from overbank flooding. It has over 60% vegetated cover but is not greater than 0.5 acre in size, nor is it likely to qualify as having intact water quality function under OFWAM.
B. The wetland is in the Metro Title 3 Flood Management Area as corrected by the most current FEMA Flood Insurance Rate Maps, and has evidence of flooding during the growing season, and is five acres or more in size, and has a restricted outlet or no outlet; or the wetland qualifies as having intact hydrologic control function under the 1996 OFWAM.	No – Wetland A is not in a Metro Title 3 Flood Management Area. It has evidence of some limited flooding during the growing season but is less than 5 acres in size. It has a restricted outlet and is not likely to qualify as having intact hydrologic control function under OFWAM.	No – Wetland B is not in a Metro Title 3 Flood Management Area. It does not have evidence of flooding during the growing season and is less than 5 acres in size. It has a restricted outlet and is not likely to qualify as having intact hydrologic control function under OFWAM.
C. The wetland or a portion of the wetland is within a horizontal distance of less than one - fourth mile from a water body which meets the Department of Environmental Quality definition of water quality limited water body in OAR Chapter 340, Division 41 (1996).	No – Wetland A is greater than 0.25 mile from the Willamette River, the closest water-quality limited water body.	No – Wetland B is greater than 0.25 mile from the Willamette River, the closest water-quality limited water body.
D. Created or restored wetlands that meet the requirements of Section 4.139.10(.02) shall be added to the Significant Resource Overlay Zone. [added by Ord. No. 674 November 16, 2009].	No – Wetland A is not a created or restored wetland.	No – Wetland B is not a created or restored wetland.

4.2.3 Willow Creek

The section of Willow Creek that occurs on the project site consists of a 0.08-acre linear, intermittent stream channel, with an average width of 4 to 6 feet wide, that flows from north to south across the Pike property (Figure 11). The channel originates off site to the north and receives surface water from the surrounding pastures and agricultural fields. Within the study area, the stream channel is contained within the boundaries of Wetland A. It exits the study area through twin 18-inch concrete culverts under SW Boeckman Road and continues southward through a narrow forested/scrub-shrub riparian corridor surrounded by residential development, eventually entering a heavily forested riparian corridor before draining into the Willamette River. The stream channel substrate consists predominantly of fine silts with some medium to coarse sand.

The stream channel on the study area is surrounded by pasture and dominated by herbaceous vegetation both adjacent to and within the channel, along with patches of wild rose growing in portions of the channel. Dominant vegetation within the channel includes American water plantain, water parsley, common duckweed, mannagrass, creeping yellowcress, and dense sedge. Immediately adjacent to the channel, meadow foxtail dominates, along with red fescue, fringed willowherb, and western dock.

Figure 11 shows the ordinary high water mark for Willow Creek, which was identified in the field by Anchor QEA and professionally surveyed by Otak. The maximum ordinary high water mark width of the stream on the study area is approximately 12 feet and occurs in the vicinity of the large rose bush in the southcentral portion of the channel.

4.3 Wildlife Habitat

The potential for the project site to provide habitat for wildlife site was evaluated during the December 6 and 14, 2017 site visit. Table 5 provides a list of the wildlife species observed during those site visits and species that are likely to use the project site given the habitat currently present.

Table 5
Wildlife Observed or Likely to Occur on the Stafford Meadows Project Site

Wildlife Class	Common Name	Scientific Name	Observation Notes
Birds	Bewick's wren	*Thryomanes bewickii*	Observed or heard
	American bushtit	*Psaltriparus minimus*	Observed or heard
	Ruby-crowned kinglets	*Regulus calendula*	Observed or heard
	Golden-crowned kinglets	*Regulus satrapa*	Observed or heard
	Sapsuckers	*Sphyrapicus* spp.	Visible horizontal holes on red pine
	American robin	*Turdus migratorius*	Observed or heard
	American crow	*Corvus brachyrhynchos*	Observed or heard
	Northern flicker	*Colaptes auratus*	Observed or heard
	Turkey vulture	*Cathartes aura*	Likely to occur
	California quail	*Callipepla californica*	Likely to occur
	Ring-necked pheasant	*Phasianus colchicus*	Likely to occur
	Red-tailed hawk	*Buteo jamaicensis*	Likely to occur
	Cooper's hawk	*Accipiter cooperii*	Likely to occur

Wildlife Class	Common Name	Scientific Name	Observation Notes
Birds (cont.)	Barred owl	*Strix varia*	Likely to occur
	Great-horned owl	*Bubo virginianus*	Likely to occur
	Barn owl	*Tyto alba*	Likely to occur
	Hairy woodpecker	*Leuconotopicus villosus*	Likely to occur
	Downy woodpecker	*Picoides pubescens*	Likely to occur
	Spotted towhee	*Pipilo maculatus*	Likely to occur
	Black-capped chickadee	*Poecile atricapillus*	Likely to occur
	Other passerine birds		Likely to occur
Mammals	Black-tailed deer	*Odocoileus hemionus*	Droppings, tracks, browse, and trails
	Douglas squirrel	*Tamiasciurus douglasii*	Observed
	Coyote	*Canis latrans*	Droppings
	Townsend's mole	*Scapanus townsendii*	Molehills
	Raccoon	*Procyon lotor*	Likely to occur
	Virginia opossum	*Didelphis virginiana*	Likely to occur
	Red fox	*Vulpes vulpes*	Likely to occur
	Brush rabbit	*Sylvilagus bachmani*	Likely to occur
	Striped skunk	*Mephitis mephitis*	Likely to occur
	Deer mouse	*Peromyscus maniculatus*	Likely to occur
	Long-tailed vole	*Microtus longicaudus*	Likely to occur
Amphibians	Western toad	*Anaxyrus boreas*	Likely to occur
	Pacific tree frog	*Pseudacris regilla*	Likely to occur
Reptiles	Common garter snake	*Thamnophis sirtalis*	Likely to occur

4.3.1 Wildlife Habitat Assessment

The following sections provide an assessment of the current wildlife habitat present on the project site in terms of wildlife habitat diversity, water quality protection, ecological integrity, connectivity, and uniqueness. This assessment was based on the best professional judgement and experience of an Anchor QEA wildlife biologist.

4.3.1.1 Wildlife Habitat Diversity

The study area primarily consists of maintained pasture/agriculture fields bisected by a dense band of forest with a shrub understory. The forested band is large enough to provide foraging, shelter, and breeding habitat for both small and large avian and mammal species. Willow Creek and the associated wetland habitat also flank the forested and pasture habitats, increasing habitat suitability for some species by providing seasonal hydrology and availability for amphibian breeding. The pasture and agriculture habitats provide some foraging area for wildlife, but seasonal grazing, mowing, and other regularly occurring maintenance activities likely limit wildlife use. Overall, the project site contains a mosaic of mixed habitat types with lots of edge effects and a lack of large contiguous areas that provide corridors for species movements and species diversity.

4.3.1.2 Water Quality Protection

Most of the project site is vegetated, with some impervious surfaces and exposed soils primarily associated with residential homes, driveways, and horse hoof shear within the pasture on the Pike property. The vegetated areas allow for natural infiltration of seasonal precipitation and minimize overland flow and erosion. The on-site section of Willow Creek may have reduced water quality protection due to the minimal types and extent of riparian vegetation and the open grazing of horses in and adjacent to the stream. Water quality habitat for amphibians and other aquatic species is also limited by the reduced riparian area.

4.3.1.3 Ecological Integrity

The project site has limited ecological integrity for wildlife habitat due to the presence of rural residential development, persistent levels of mixed pastoral, agricultural, and silvicultural practices, as well as the location of dense residential development to the south. Although pastoral, agricultural, and silvicultural land uses do provide some habitat for various wildlife species, such areas typically offer only short-term ecological benefits and habitat due to the routine and seasonal disturbance of vegetation.

4.3.1.4 Connectivity

Existing wildlife habitat on the project site has limited connectivity to similar habitat types because of the multiple small parcels and individual land holdings in this area and the long history of mixed pastoral, agricultural, and silvicultural uses on these parcels. The closest areas of good quality and well-connected forested habitats include the Boeckman Creek riparian corridor, which lies approximately 0.25 mile to the west, and a downstream portion of Willow Creek, which lies approximately 0.25 mile to the southeast of the site on the other side of SW Wilsonville Road. Although the pasture areas within the study area may provide some connected habitat for smaller mammal species (e.g., mice, voles) and some amphibians, the quality and extent of that habitat connectivity is reduced by the presence of gravel and asphalt driveway, other impervious areas, and seasonal land use practices (e.g., mowing).

4.3.1.5 Uniqueness

The project site does not provide any unique habitats or land features. The habitat types on site are patchy and similar to habitat types present in the surrounding areas and wider region. The nearest unique habitat type and land feature is the Willamette River, which is 1.2 miles to the south of the project site.

4.4 Riparian Corridor

The on-site riparian corridor along Willow Creek is dominated by herbaceous vegetation and PEM wetlands, with one large clump of shrubs growing in one section of the channel. There are no trees present in the corridor and the shrubs that do occur include invasive species. Topography within 200 feet of the stream channel is relatively flat, with most slopes being less than 5%. Based on the descriptions of the generalized riparian corridor types in the Definitions section of the City's SROZ Ordinance, the on-site Willow Creek riparian corridor most closely resembles Riparian Corridor Type NR-4, which is characterized by a PEM or PSS wetland in the corridor and a lack of adjacent steep slopes within 200 feet.

The following sections provide a brief assessment of the quality and condition of the on-site riparian corridor along Willow Creek in regard to the presence of large woody debris, degree of stream shading, potential for erosion and sedimentation control, potential for water quality protection, presence of a functional floodplain, use of the floodplain by species listed under the Endangered Species Act (ESA), and connectivity with upstream or downstream significant wildlife habitat.

4.4.1 Presence and Abundance of Large Woody Debris in and Adjacent to the Stream

No large woody debris was observed within the Willow Creek riparian corridor on the project site. There are no trees adjacent to the on-site portion of the stream and only limited woody shrub cover, so the potential for large woody debris recruitment is very low. Small snags and some downed branches were observed upstream and off site of the study area to the north. Given the limited flows carried by the stream, the movement of woody debris into the on-site riparian corridor of Willow Creek is unlikely.

4.4.2 Degree of Tree/Shrub Canopy Shading Adjacent to the Stream

There are no trees and only four shrub patches within the on-site riparian corridor along Willow Creek that provide shading for the intermittent stream. The shrub patches are confined to a 5- to 15-foot wide area spanning the stream centerline and likely provide shading for less than 25% of the on-site stream length.

4.4.3 Degree to Which Riparian Vegetation Controls Erosion and Sedimentation

The existing vegetation in the on-site riparian area along Willow Creek provides moderate to good erosion control due to the low gradient of the stream channel and the relatively flat topography of the adjacent areas. Large storm events may lead to sedimentation in the northwest region of the stream due to a concentration of horse-related soil disturbances in the corral area and the areas adjacent to the existing horse barn.

4.4.4 Degree to Which Riparian Vegetation Provides Water Quality Protection

The existing vegetation in the on-site riparian area along Willow Creek is primarily herbaceous with very little dense woody stem or broadleaf cover. The lack of rigid stems and leaf cover may increase sediment mobilization and runoff to the stream, especially in areas where the vegetation has been disturbed by horses. The existing vegetation provides poor water quality protection from pasture nutrients or sediment, and the presence of horse usage in and adjacent to the stream provides a constant source of water quality degradation both through soil disturbance and the presence of horse manure.

4.4.5 Presence of a Functional Floodplain (Inundated Annually)

Based on historic aerial photography and observations made during the site visits, the on-site riparian corridor along Willow Creek appears to provide only a limited functioning floodplain outside of the PEM wetland that is directly adjacent to the stream channel. During a wet year, a large storm event may cause the adjacent pasture to function as floodplain, but it is unlikely to be an annual occurrence.

4.4.6 Type and Condition of Functional Floodplain Vegetation

The existing vegetation present in the portion of the on-site Willow Creek riparian corridor that could function as a functional floodplain consists of approximately 90% pasture grasses and 10% shrubs. Vegetation condition is degraded due to horse grazing and other on-going maintenance activities (e.g., mowing).

4.4.7 Use of Floodplain by Endangered Species Act-Listed Species

Based on historic aerial photography and observations made during the site visits, the investigators found no evidence to suggest that the functional floodplain portions of the on-site riparian corridor along Willow Creek, or any adjacent area, are used by ESA-listed species.

4.4.8 Role of Riparian Corridor in Connecting Significant Wildlife Habitat Areas

Although the on-site Willow Creek riparian corridor does provide a seasonal hydrology habitat connection between upstream and downstream wetland and stream habitats, it does not provide a connection between significant wildlife habitat areas.

5 Proposed Significant Resource Overlay Zone Map Refinement

As stated in Section 3.8.2, although the City's 2009 SROZ map (City of Wilsonville 2009) does not show any mapped SROZs on the project site, the 2017 Master Plan for Frog Pond West identifies a potential SROZ along the Willow Creek riparian corridor on the Pike property (Figure 11). That SROZ extends approximately between SW Boeckman Road and the northern extent of off-site tax lot 31W12D002200. At the time this SROZ was identified, the City assigned it a preliminary vegetated corridor width of 50 feet extending from either side of the Willow Creek channel centerline.

Based on field data collected by Anchor QEA wetland scientists during the 2017 wetland delineation and an assessment of the existing wildlife habitat and riparian corridor conditions present on the project site, the project applicant (West Hills Land Development) is requesting a refinement to the City's preliminary SROZ mapping along Willow Creek. Specifically, the applicant is requesting that the vegetated corridor width of the proposed SROZ along Willow Creek be reduced from 50 to 15 feet on either side of the channel. This requested refinement is based on the following observations of Willow Creek and its associated riparian corridor:

- Willow Creek is a non-fish bearing, intermittent stream draining less than 100 acres.
- Adjacent slopes within 200 feet of Willow Creek are less than 25%.
- Wetlands adjacent to Willow Creek are limited to emergent and scrub-shrub wetlands, are less than 0.5 acre in size, and are not considered to be locally significant.
- Neither Willow Creek nor its associated riparian corridor are mapped as a Title 3 Water Quality Resource Area under Metro's Urban Growth Functional Management Plan.
- Willow Creek and its associated riparian corridor do not warrant a Goal 5 safe harbor boundary.

According to Table NR-1 of the City's SROZ Ordinance, the flow duration (i.e., intermittent) and drainage area (i.e., between 50 to 100 acres) identified for Willow Creek meet the definition of a Secondary Protected Water Feature. Secondary Protected Water Features that have adjacent slopes of less than 25% are assigned a vegetated corridor width of 15 feet. Because the adjacent wetland and riparian corridor are not considered significant resources or Title 3 Water Quality Resource Areas, the starting point for measuring the vegetated corridor width is the edge of the bankfull stage or 2-year storm level in Willow Creek.

Figure 11 shows the proposed SROZ and its associated 25-foot-wide impact area based on the listed refinements.

6 Proposed Project

The project site is the proposed location of the Stafford Meadows residential development project, a 46-lot single-family home residential development that will also include a future development tract for an additional six single-family lots (Figure 12). The proposed development will include residential building lots, streets, utilities, landscaping, open space, and water quality facilities. The project has been designed to be consistent with the recently adopted Master Plan for Frog Pond West, with development occurring in 2 of the 13 land use subdistricts identified in that plan:

- **Subdistrict 2** – Designated for medium lot, single-family development with an average lot size of 7,000 net square feet (zoning code R7); minimum of 26 dwelling units/maximum of 32 dwelling units
- **Subdistrict 3** – Designated for large lot, single-family development with an average lot size of 10,000 net square feet (zoning code R10); minimum of 20 dwelling units/maximum of 25 dwelling units

As shown in Figure 12, access to the project is proposed to occur off SW Boeckman Road via a new north-south Collector-Gateway street (Street A) that will parallel the existing drainage (Willow Creek) on the Pike property, as specified in the transportation framework of the Master Plan. In accordance with the Master Plan, the proposed Collector-Gateway will consist of a 76-foot-wide right-of-way that contains two 12-foot-wide travel lanes separated by an 8-foot-wide median or stormwater planter. Adjacent to the outside edge of each travel lane there will be an 8-foot-wide buffered bike lane bordered by an 8-foot-wide planter or stormwater feature. A 6-foot-wide paved sidewalk will also be constructed between the planter/stormwater feature and the outer edge of the right-of-way. Eight-foot-wide public utility easements will be border the outside edges of the proposed right-of way.

To provide access to the proposed development areas and future development projects on adjacent sites, a series of local streets (streets B, C, D, E, and F) will extend off the new collector road, including one east-west street (Street C) that will extend across Willow Creek and its riparian corridor (Figure 12). According to the Master Plan, the local street cross section consists of a 52-foot-wide right-of-way that contains a 28-foot-wide paved surface including two travel lanes with parking on either side, two 7-foot-wide planter/stormwater features, and two 5-foot-wide paved sidewalks. The local street right-of-way will also be bordered by a 6-foot-wide public utility easement on either side.

Stormwater treatment and conveyance for the proposed project will be handled by a series of linked private Low Impact Development Approaches (LIDA) stormwater basins on individual lots and public LIDA stormwater swales along the development's proposed roadways (Figure 12). Stormwater collected from LIDA basins and swales on the portion of the development to the east of Street A will be routed to a stormwater detention basin located in the southcentral portion of the project site in

Tract B. This basin will discharge to the Willow Creek riparian corridor via a piped outfall that will discharge onto a small riprap pad. Stormwater from LIDA basins and planters on the portion of the development to the west of Street A will discharge directly to the Willow Creek riparian corridor via a piped outfall that will discharge onto a small riprap pad.

In addition to the on-site work described in the preceding paragraphs, the proposed project would also include improvements to the section of SW Boeckman Road that fronts the project site. According to the current *Wilsonville Transportation Systems Plan* (City of Wilsonville 2016), SW Boeckman Road is shown as a minor arterial in this location. This road type is intended to have a 73- to 81-foot-wide right-of-way that includes two 11- to 12-foot-wide travel lanes and a 12- to 14-foot-wide center turn lane or median with adjacent planter strips and sidewalks along both sides of the road. Currently, only the section of road between the western boundary of the Pike property and the existing Willow Creek crossing has been upgraded to these standards; the remaining portion between Willow Creek and SW Stafford Road is only a two-lane road. In accordance with the Master Plan, the section of SW Boeckman Road within the Frog Pond West neighborhood will be upgraded and widened to meet the minor arterial standards, with additional features including a brick wall along the bordering property lines, foundation landscaping, additional pedestrian connections, and a landscape buffer tract incorporated into the roadway design (City of Wilsonville 2017).

6.1 Proposed Significant Resource Overlay Zone and Significant Resource Overlay Zone Impact Area Encroachments

To accommodate the construction of the proposed Stafford Meadows project in accordance with the Master Plan, encroachment into the SROZ and SROZ Impact Areas will be required. Proposed encroachments will result from construction of Street A, the Street C road crossing over Willow Creek, the proposed stormwater outfalls, and the improvement work along SW Boeckman Road. These activities will result in impacts to the Willow Creek channel, its adjacent wetlands, and upland portions of its riparian corridor. The SROZ Impact Area would also be affected. A brief description of each of these proposed impacts is provide in the following sections. Table 6 provides a summary of the proposed project impacts on SROZ resources and the SROZ Impact Area.

6.1.1 Street A

Construction of Street A will require some minor grading encroachment into the SROZ Impact Area for the construction of curbs and sidewalks consistent with the proposed cross section of the Collector-Gateway street type (Table 6; Figure 12). Encroachments are required to accommodate a section of Street A that curves back toward the east to intersect with proposed Street C. The road alignment is designed to be consistent with the transportation framework plans included in both the City's current *Transportation System Plan* (City of Wilsonville 2016) and the Master Plan. As such, these encroachments are exempt from the regulations of the SROZ ordinance per either of the following: 1) Section 4.139.04(.08), which pertains to the construction of new roads or pedestrian/bike paths in the SROZ where the purpose of the crossing is to provide access to or across a sensitive area and where the location of the crossing is consistent with the intent of the *City of Wilsonville Comprehensive Plan* (City of Wilsonville 2013); or 2) Section 4.139.04(.20), which allows the installation of public streets and utilities specifically mapped with a municipal utility master plan, the Transportation System Plan, or a capital improvement plan. Encroachment of Street A into the SROZ Impact Area has been minimized to the extent practicable based on the City's roadway design standards.

Table 6
Proposed Project Impacts on the Significant Resource Overlay Zone and Significant Resource Overlay Zone Impact Area

	SROZ Impacts									
	Other Water (Stream)		Wetland		Upland Riparian Corridor		SROZ Impact Area Impacts		Total	
Proposed Activity	**Square Feet**	**Acre**	**Square Feet**	**Acre**	**Square Feet**	**Acre**	**Square Feet**	**Acre**	**Square Feet**	**Acre**
Street A Construction	0	0	0	0	0	0	306	0.007	**306**	**0.007**
Street C Crossing of Willow Creek	361	0.008	371	0.009	1,190	0.027	2,603	0.060	**4,525**	**0.104**
Stormwater Outfalls	0	0	0	0	44	0.001	798	0.018	**842**	**0.019**
SW Boeckman Road Improvements	40	0.001	236	0.005	369	0.008	484	0.011	**1,129**	**0.025**
Total	**401**	**0.009**	**607**	**0.014**	**1,603**	**0.036**	**4,191**	**0.096**	**6,802**	**0.155**

6.1.2 Street C Road Crossing

In order to provide access to the western portion of the proposed development and emergency vehicle ingress and egress as required, Street C will need to be extended across Willow Creek and its associated SROZ, resulting in encroachments into the SROZ Impact Area, the upland riparian corridor and wetlands adjacent to the stream channel, and the stream channel itself (Table 6; Figure 12). The proposed crossing will be accomplished using a concrete box culvert with a retaining wall on the downstream side. Construction of these features will require the excavation of native soil from and the placement of fill material (e.g., drain rock, bedding aggregate, native soil, concrete, or asphalt) into the aforementioned resources of the SROZ. Because these activities would affect potential wetlands and other waters of the United States and State of Oregon, the applicant intends to obtain a Clean Water Act Section 404 Permit from the U.S. Army Corps of Engineers (USACE) and an Oregon Removal-Fill Permit from the Oregon Department of State lands (DSL) prior to completing any of this work.

Proposed SROZ impacts from the Street C crossing have been minimized by reducing the width of the proposed local street that would cross this resource from the 52 feet specified for local streets in the Master Plan to 31 feet. This is accomplished by removing the roadside parking and planter/stormwater features from the proposed road cross section and using a retaining wall on the downstream side, thereby reducing the width of SROZ encroachment area needed to install the proposed crossing. Furthermore, the applicant has elected to use a concrete box culvert to maintain stream conveyance rather than a pipe culvert, reducing the amount of excavation and fill material needed for culvert installation.

The proposed Street C crossing is considered and exempt activity under Section 4.139.04(.08) of the City's SROZ ordinance because it is intended to provide vehicular, bike, and pedestrian connectivity between the eastern and western portions of the proposed development and because it is shown on both the transportation framework and bicycle and pedestrian framework plans of the Master Plan.

6.1.3 Stormwater Outfalls

The stormwater conveyance plan for the proposed development requires outfalls to a surface water on both the eastern and western portions of the project site. In order to access Willow Creek, the only surface water on the site, these outfalls will need to extend through the SROZ Impact Area and portions of the upland riparian corridor at the southern end of the SROZ (Figure 12). Because the stormwater conveyance system is dependent on gravity, these outfalls need to be in the lowest portion of the site to function correctly. As such, there are no other practicable locations for these features.

Construction of the proposed stormwater outfalls will require trenching through the SROZ Impact Area and a portion of the SROZ to allow the installation of piping (Table 6). Once the pipes have been installed, the trenches will be backfilled and topped with native soil that will be graded to match the contours of the surrounding area. Riprap pads will be installed at the end of each outfall to dissipate flow and prevent erosion. Aside from the riprap pads, most of the proposed encroachment will be temporary.

Proposed project encroachments into the SROZ and SROZ Impact Area for installation of the stormwater piping and outfalls are an exempt activity per Section 4.139.04(.18) of the

SROZ Ordinance, which allows for private or public-sector service connection laterals and service utility extensions.

6.1.4 SW Boeckman Road Improvements

Construction of the required improvements to SW Boeckman Road along the frontage of the project site will require impacts to SROZ resources (i.e., stream channel, wetlands, and upland riparian corridor) and the SROZ Impact Area (Figure 12). Due to the width constraints of the road improvement corridor and the location of Willow Creek and its associated resources, these impacts are considered unavoidable; it is not possible to accommodate the width required for a road cross section and avoid SROZ resources.

Proposed improvement work will require the excavation of material from and placement of material into a portion of Willow Creek; its associated wetlands, including the shallow ditch that extends to the east; portions of the upland riparian corridor; and portions of the SROZ Impact Area (Table 6). This work is needed to facilitate extension of the existing culverts under the road and the construction of the landscaped buffer and brick wall along the edge of the expanded right-of-way, as specified in the Master Plan. Because these activities would affect potential wetlands and other waters of the United States and the State of Oregon, the applicant intends to obtain permits from USACE and DSL prior to completing any work.

The proposed SROZ and SROZ Impact Area encroachments for the SW Boeckman Road frontage work are associated with a public street improvement that is specifically mapped in the City's Transportation System Plan (City of Wilsonville 2016) and the Master Plan. As such, they are considered exempt activities under Section 4.139.04(.20) of the SROZ Ordinance.

6.2 Resource Effects

Direct project effects on SROZ resources include temporary disturbance of aquatic habitat in Willow Creek and temporary and permanent disturbance of degraded herbaceous wetland and upland habitats in the riparian corridor. Overall, impacts on these resources are expected to be minor given their degraded condition. Willow Creek is non-fish bearing and intermittent and offers relatively limited habitat for other aquatic organisms (e.g., amphibians). Installation of the box culvert for the Street C road crossing and extension of the existing culverts under SW Boeckman Road would not result in the loss of significant aquatic habitat nor would they change the flow characteristics of Willow Creek. Project impacts on wetland and upland riparian areas and habitat would primarily result in the removal of degraded herbaceous areas and potentially a few shrubs; no trees are located in the SROZ, so there would be no impacts related to tree removal. Project impacts would not adversely affect the limited level of function and value currently provided by these resources. Once the project has been constructed, the increased levels of noise and human presence associated with residential development could temporarily displace wildlife from nearby habitats. However, because rural and urban development disturbance currently occurs on and around the project site, some level of habituation by wildlife to noise and human activity has occurred. Consequently, indirect impacts to wildlife from disturbance and displacement are expected to be minor.

7 Proposed Significant Resource Overlay Zone Mitigation and Enhancement

Proposed permanent project impacts on Willow Creek and its associated wetlands will be compensated for by purchasing stream and wetland mitigation credits from an approved wetland mitigation bank serving the project site (e.g., Mud Slough Mitigation Bank). This mitigation will be coordinated through the USACE and DSL permitting processes.

Temporary impacts on upland portions of the SROZ and the SROZ Impact Area from installation of the stormwater outfalls will be mitigated by restoring those locations to pre-project grades and planting all disturbed soils with a native seed mix (Figure 13).

Proposed permanent project impacts on the upland portions of the SROZ will be mitigated by enhancing the remaining areas of upland riparian corridor within the SROZ boundaries through the planting of native trees and shrubs. Plant species selection, density, and spacing will be in accordance with the planting requirements specified in Section 4.139.07(.02)(E) of the City's SROZ Ordinance, which requires the planting of 5 trees and 25 shrubs for every 500 feet of disturbance area at a spacing of between 8 to 12 feet on center for trees and 4 to 5 feet on center for shrubs. Proposed plant species and numbers are shown in Table 7.

Once the enhancement plantings have been installed, the applicant will monitor the mitigation area for a period of five years to maintain plant survivorship and control invasive species. Per the plant survival standards of Section 4.139.07(.02)(E)(7) of the SROZ Ordinance, trees and shrubs that die will be replaced in kind to the extent necessary to maintain a minimum of 80% of the total number of plants installed, or approximately 66 trees (80% of 82 trees planted) and 326 shrubs (80% of 407 shrubs planted), by the fifth anniversary of the date that the mitigation plantings were installed.

Table 7
Proposed Planting Treatment for Area of Remaining Upland Riparian Corridor in the SROZ

Scientific Name	Common Name	On Center Spacing (feet)	Plant Numbers
Trees (Based on City SROZ Mitigation Standards of 0.01 Tree/Square Foot)[1,2]			
Alnus rubra	Red alder	8 to 12	14
Acer macrophyllum	Bigleaf maple	8 to 12	14
Pseudotsuga menziesii	Douglas fir	8 to 12	14
Prunus emarginata	Bitter cherry	8 to 12	14

Scientific Name	**Common Name**	**On Center Spacing (feet)**	**Plant Numbers**
Rhamnus purshiana	Cascara buckthorn	8 to 12	13
Thuja plicata	Western red cedar	8 to 12	13
Tree Subtotal			**82**
Shrubs (Based on City SROZ Mitigation Standards of 0.05 Shrub/Square Foot)^{1,2}			
Amelanchier alnifolia	Pacific serviceberry	4 to 5	41
Holodiscus discolor	Oceanspray	4 to 5	41
Mahonia nervosa	Cascade Oregon-grape	4 to 5	41
Sambucus racemosa	Red elderberry	4 to 5	40
Lonicera involucrata	Twinberry honeysuckle	4 to 5	40
Oemleria cerasiformiscruciform	Indian plum	4 to 5	40
Symphoricarpos albusalbas	Snowberry	4 to 5	41
Ribes sanguineum	Red-flowering currant	4 to 5	41
Rosa nutkana	Nootka rose	4 to 5	41
Rosa pisocarpa	Cluster rose	4 to 5	41
Shrub Subtotal			**407**
Total Plants			**489**

Notes:

1. Planting area based on 8,146 square feet (0.19 acre) of remaining upland riparian corridor in the SROZ.
2. Plants (especially shrubs) should be clumped to mimic natural conditions with not more than four species to a clump.

Final species quantities are dependent upon availability.

8 Compliance with Significant Resource Impact Report Review Criteria

The following sections document the proposed project's required compliance with the SRIR review criteria of Section 4.139.06.03 of the City's SROZ Ordinance.

A. **Except as specifically authorized by this code, development shall be permitted only within the Area of Limited Conflicting Use found within the SROZ.**

Proposed project encroachments into the refined Willow Creek SROZ and its associated SROZ Impact Area would result from the construction of Street A, the Street C road crossing over Willow Creek, the proposed stormwater outfalls, and the improvement work along SW Boeckman Road. These activities will require impacts on the Willow Creek stream channel, adjacent wetland, and associated riparian corridor, and the installation of stormwater piping and two outfalls in the riparian corridor.

The proposed road related impacts are exempt from the regulations of the SROZ Ordinance per either Section 4.139.04(.08), which pertains to the construction of new roads or pedestrian/bike paths in the SROZ where the purpose of the crossing is to provide access to or across a sensitive area and where the location of the crossing is consistent with the intent of the *City of Wilsonville Comprehensive Plan* (City of Wilsonville 2013), or Section 4.139.04(.20), which allows the installation of public streets and utilities specifically mapped with a municipal utility master plan, the Transportation System Plan, or a capital improvement plan. The intent of the proposed road work is to provide vehicular, bike, and pedestrian connectivity within the Stafford Meadows development, and all of these roads are public roads identified in both the City's current Transportation System Plan and the Frog Pond West Master Plan. As such, the proposed crossing meets the criteria required for these exemptions.

Project encroachments into the SROZ from the proposed stormwater piping and outfalls are also an exempt activity per Section 4.139.04(.18) of the SROZ Ordinance, which allows for private or public-sector service connection laterals and service utility extensions.

B. **Except as specifically authorized by this code, no development is permitted within Metro's Urban Growth Management Functional Plan Title 3 Water Quality Resource Area boundary.**

No development activities are proposed to occur within areas mapped as Metro UGMFP Title 3 Water Quality Resource Areas. Although the downstream (off-site) portion of Willow Creek is mapped as a Title 3 Water Quality Resource Area, this mapping ends at SW Boeckman Road and does not extend onto the project site. As such, it would not be impacted by the proposed project.

C. **No more than five (5) percent of the Area of Limited Conflicting Use located on a property may be impacted by a development proposal. On properties that are large enough to include Areas of Limited Conflicting Use on both sides of a waterway, no more than five (5) percent of the Area of Limited Conflicting Use on each side of the riparian corridor may be impacted by a development proposal. This condition is cumulative to any successive development proposals on the subject property such that the total impact on the property shall not exceed five (5) percent.**

The SROZ riparian corridor type present on the project site (Riparian Corridor Type NR-4) does not include an Area of Limiting Conflicting Use. As such, this criterion is not applicable to the Stafford Meadows project.

D. **Mitigation of the area to be impacted shall be consistent with Section 4.139.06 of this code and shall occur in accordance with the provisions of this Section.**

The mitigation standards contained in Section 4.139.07 of the City's SROZ Ordinance are applicable to project encroachments into the Area of Conflicting Uses of significant wildlife habitat resources areas. Mitigation for project activities that would affect wetlands and other waters regulated by USACE and DSL or riparian corridors, such as those proposed for the Stafford Meadows project, are to be mitigation in accordance with state and federal mitigation requirements.

As described under Criteria J, the applicant intends obtain a Clean Water Act Section 404 Permit from USACE and an Oregon Removal-Fill Permit from DSL to excavate material from and place fill material into Willow Creek and Wetlands A and B to facilitate construction of the proposed project. Mitigation for these wetland and other water impacts will be achieved by purchasing wetland mitigation credits from an approved wetland mitigation bank serving the project site (e.g., Mud Slough Mitigation Bank). Mitigation for permanent project impacts on the upland portions of the SROZ will be achieved by enhancing the remaining areas of upland riparian corridor within the SROZ boundaries through the planting of native trees and shrubs.

E. **The impact on the Significant Resource is minimized by limiting the degree or magnitude of the action, by using appropriate technology or by taking affirmative steps to avoid, reduce or mitigate impacts.**

Project impacts on the SROZ around Willow Creek have been minimized by reducing the width of the proposed local street that would cross this resource from the 52 feet specified in the Frog Pond West Master Plan for Local Streets to 31 feet. This is accomplished by removing the roadside parking and planter/stormwater features from the proposed road cross section and using a downstream retaining wall to reduce the width of the crossing corridor. Furthermore, the applicant has elected to use a concrete box culvert to maintain stream conveyance rather than a pipe culvert, reducing the amount of excavation and fill material need for culvert installation.

Project impacts on the SROZ from the installation of stormwater piping and two outfalls will primarily be temporary impacts, with all disturbed areas return to pre-construction grades once installation is complete. Minor permanent impact will be required in the form of small riprap pads.

F. **The impacts to the Significant Resources will be rectified by restoring, rehabilitating, or creating enhanced resource values within the "replacement area" (see definitions) on the site or, where mitigation is not practical on site, mitigation may occur in another location approved by the City.**

Permitted impacts to the upland riparian corridor resources within the Willow Creek SROZ will be mitigated by enhancing the remaining portions of the upland riparian corridor within the SROZ by planting native trees and shrubs in accordance with the plant spacing and diversity standards contained in Section 4.139.07(.02)(E)(3) and (4) of the City's SROZ Ordinance.

G. **Non-structural fill used within the SROZ area shall primarily consist of natural materials similar to the soil types found on the site.**

Most of the fill that will be placed in the SROZ and SROZ Impact Areas for the construction of the proposed Street C road crossing and the installation of the stormwater lines and outfalls will be structural fill. Final grading around the road crossing and the upper portions of backfill in the stormwater line installation trenches will be accomplished using native soil. Small areas of riprap will be required at each end of the box culvert and below each stormwater outfall to serve as energy dissipation pads.

H. **The amount of fill used shall be the minimum required to practically achieve the project purpose.**

The amount of fill material proposed for the construction of the concrete box culvert road crossing and stormwater lines has been minimized to the extent practicable to allow construction of these features to City development standards.

I. **Other than measures taken to minimize turbidity during construction, stream turbidity shall not be significantly increased by any proposed development or alteration of the site.**

Stream turbidity will not be significantly increased by the proposed project or any other alterations of the project site. Aside from the erosion and sedimentation control measures that would be implemented during construction, long-term measures to protect the water quality of the stream include enhancing the upland riparian portion of the SROZ along Willow Creek with native trees and shrubs planted in accordance with the plant spacing and diversity standards contained in Section 4.139.07(.02)(E)(3) and (4) of the City's SROZ Ordinance. In addition, stormwater from the proposed development would be treated using stormwater planters adjacent to the future roadways and in a stormwater detention basin prior to be discharged to the SROZ through a controlled outlet.

J. **Appropriate federal and state permits shall be obtained prior to the initiation of any activities regulated by the U.S. Army Corps of Engineers and the Oregon Division of State Lands in any jurisdictional wetlands or water of the United States or State of Oregon, respectively.**

The applicant intends to obtain a Clean Water Act Section 404 Permit from USACE and an Oregon Removal-Fill Permit from DSL for the construction of the culverted road crossing across Willow Creek and Wetland A and for the placement of fill material into Wetland B for the construction of residential lots and streets. Compensatory mitigation for these impacts will be achieved through the purchase of wetland mitigation credits from an approved wetland mitigation bank serving the project site (e.g., Mud Slough Mitigation Bank).

9 Qualifications of Preparers

9.1 Julie Fox

Julie Fox has nine years of experience as a biologist and natural resource scientist specializing in environmental surveying and sampling, including vegetation inventory and habitat assessments, water quality monitoring, and soil and sediment sampling. Ms. Fox is certified in wetland delineations and experienced in ordinary high water mark mapping, wetland functions and values assessments, compensatory wetland and vegetated corridor mitigation planning, mitigation compliance monitoring, and compliance with Section 404 of the Clean Water Act, the ESA, and state and local requirements and regulations. Ms. Fox is skilled in Trimble GPS field data collection and processing; ArcGIS suite for spatial analysis and mapping; preparing reports; writing purpose and needs statements; preparing alternatives analyses; assessing project impacts; coordinating with local, state, and federal regulatory agencies; and preparing Joint Section 404/Removal-Fill Permit Applications.

9.2 Matt Kuziensky

Matt Kuziensky is a certified Professional Wetland Scientist with more than 24 years of experience in wetland delineation, permitting, functions and values assessment, natural resource assessment, compensatory mitigation planning, mitigation compliance monitoring, and National Environmental Policy Act and Washington State Environmental Policy Act technical analysis. He has managed wetland- and vegetation-related natural resource work for a variety of activities, including residential, commercial, and industrial developments; landfills; mining operations; utility installations; highway and railway projects; and marine terminal facilities. He is experienced in using multiple wetland functions and values assessment methods, including the Oregon HGM classification system (Adamus 2001), Oregon Rapid Wetland Assessment Protocol, OFWAM, and the Washington State Wetland Ratings System for both western and eastern Washington. He also has experience in using the preliminary version of the Stream Function Assessment Method being developed by DSL, USACE Portland District, Region 10 of the U.S. Environmental Protection Agency, and the Willamette Partnership to assess project impacts on a stream.

9.3 Joseph Pursley

Joseph Pursley is a natural resource scientist, certified arborist, and environmental permitting specialist with 18 years of experience in wetland science, habitat mapping, wildlife biology, avian ecology, stream ecology, ecological restoration, botanical surveys, and environmental monitoring. Mr. Pursley has worked in all phases of project planning, field monitoring, mitigation, and construction and has project experience in initial site assessment, resource delineation, design review, best management practice installation and review, water quality sampling, and environmental compliance coordination and communication. Mr. Pursley specializes in wildlife ecology, wildlife habitat mapping, and assessment of avian species. He has organized, managed, and led several multi-week large scale field efforts for wildlife surveys, wetland delineations, ordinary high water mark mapping, and jurisdictional resource determinations.

9.4 Greg Summers

Greg Summers is a National Environmental Policy Act/regulatory specialist and professional wetland scientist. He oversees the preparation of Environmental Impact Statements, Environmental Assessments, Biological Assessments, Biological Evaluations, wetland projects of all varieties, and threatened and endangered species compliance. Mr. Summers has more than 24 years of experience working in the Pacific Northwest and extensive experience working in a variety of ecosystems including restoration, assessment, construction oversight, and monitoring.

He manages projects in support of land-use planning, Section 404 permit applications, and state and local wetland enforcement activities, including the Land Conservation and Development Commission. Mr. Summers has provided expert testimony at public land-use hearings for wetland law. His responsibilities also include marketing, project budgeting, scheduling, quality assurance, and quality control. He has worked in the United Sates in Oregon, Washington, Montana, Alaska, Idaho, Wyoming, Utah, California, Wisconsin, North Dakota, Illinois, Virginia, Kentucky, Tennessee, Georgia, Mississippi, and in the Canadian Provinces of British Columbia, Alberta, Northwest Territories, and Ontario.

10 References

Adamus, P.R., 2001. *Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles*. Oregon Division of State Lands. February 2001.

City of Wilsonville, 2009. *Significant Resource Overlay Zone* (map). Available from: https://www.ci.wilsonville.or.us/DocumentCenter/Home/View/636. Accessed: January 3, 2018.

City of Wilsonville, 2013. *City of Wilsonville Comprehensive Plan*. Available from: http://www.ci.wilsonville.or.us/DocumentCenter/View/553. Accessed: December 27, 2017.

City of Wilsonville, 2015. *Frog Pond Area Plan: A Concept Plan for Three Neighborhoods in East Wilsonville*. Approved by City Council November 16, 2015. Available from: http://www.ci.wilsonville.or.us/DocumentCenter/Home/View/11299. Accessed: January 3, 2018.

City of Wilsonville, 2016. *Wilsonville Transportation System Plan*. Available from: http://www.ci.wilsonville.or.us/DocumentCenter/View/10954. Accessed: January 10, 2018.

City of Wilsonville, 2017. *Frog Pond West Master Plan*. Adopted by City Council July 17, 2017. Available from: http://www.ci.wilsonville.or.us/DocumentCenter/View/12098. Accessed: January 3, 2018.

Clackamas SWCD (Clackamas Soil and Water Conservation District), 2018. *Clackamas County Weed List*. Available from: https://weedwise.conservationdistrict.org/weeds. Accessed: January 10, 2018.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Washington, D.C.: Government Printing Office. December 1979.

DOGAMI (Oregon Department of Geology and Mineral Industries), 2017. *Geologic Map of Oregon*. Available from: http://www.oregongeology.org/sub/ogdc/index.htm. Accessed: January 3, 2018.

Environmental Laboratory, 1987. *Corps of Engineers Wetland Delineation Manual.* Technical Report Y-87-1. U.S. Army Waterways Experiment Station. January 1987.

FES (Fishman Environmental Services), 1999. *City of Wilsonville Local Wetlands and Riparian Corridor Inventory*. Prepared for the City of Wilsonville. January 1999. Available from: http://docs.dsl.state.or.us/PublicReview/0/doc/863262/Electronic.aspx. Accessed: January 9, 2018.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin, 2016. The National Wetland Plant List: 2016 Wetland Ratings. *Phytoneuron*. 2016(30):1-17.

NRCS (Natural Resources Conservation Service), 2018. Web Soil Survey. Soil Survey Staff, Natural Resources Conservation Service, U.S. Department of Agriculture. Available from: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed: January 5, 2018.

PHS (Pacific Habitat Services, Inc.), 2014. *Memorandum: Wetland Inventory Results – Natural Resources Inventory for Frog Pond and Advance Road Urban Growth Areas in Wilsonville*. Prepared for the City of Wilsonville. April 8, 2014. Available from: http://www.ci.wilsonville.or.us/DocumentCenter/View/6280. Accessed: January 9, 2018.

Thorson, T.D., S.A. Bryce, D.A. Lammers, A.J. Woods, J.H. Omernik, J. Kagan, D.E. Pater, J.A. Comstock, 2003. *Ecoregions of Oregon* (color poster with map, descriptive text, summary tables and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

USACE (U.S. Army Corps of Engineers), 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0), edited by

J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-10-3. Final Report. U.S. Army Engineer Research and Development Center. May 2010.

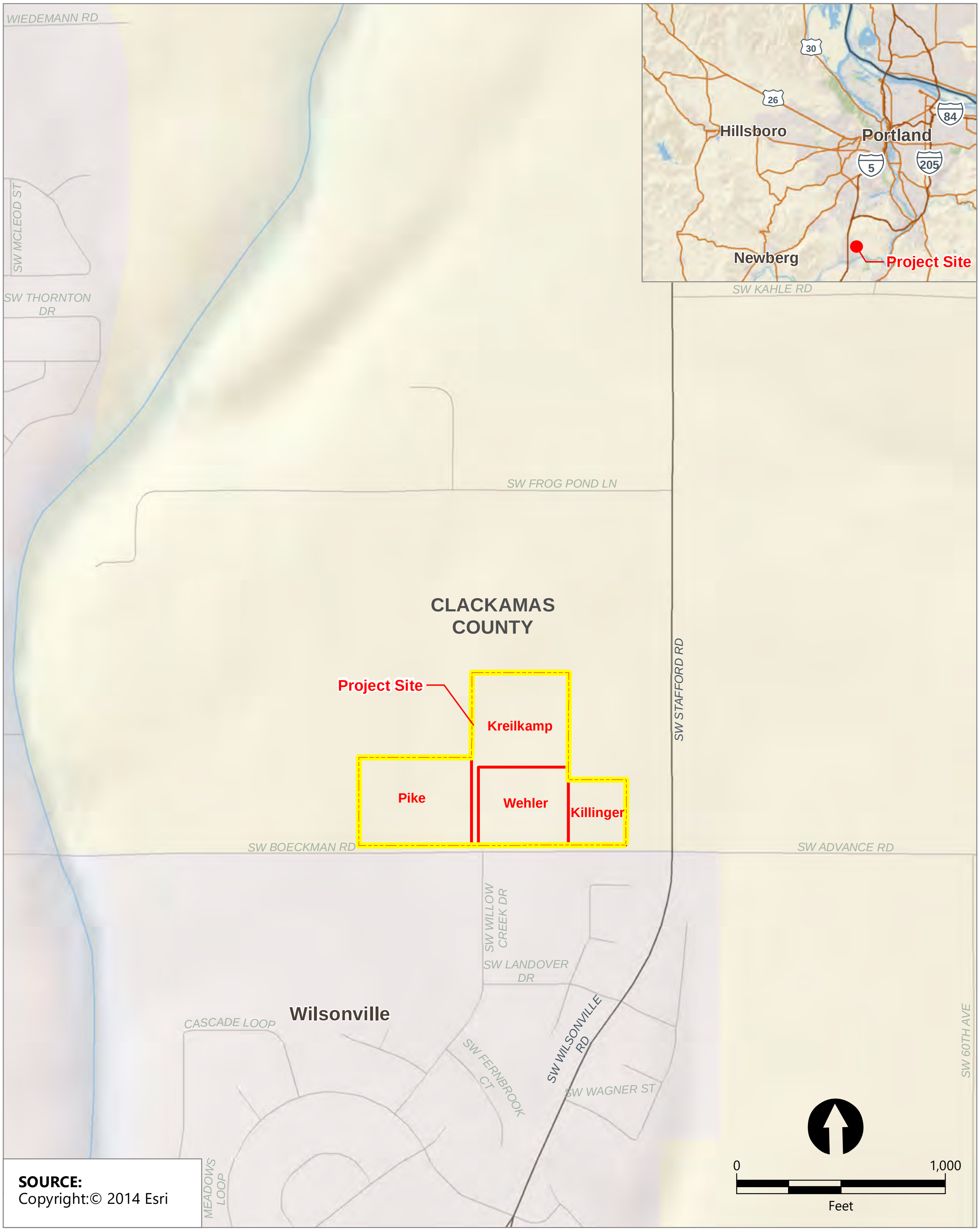
USDA (U.S. Department of Agriculture), 2018. PLANTS Database. Available from: https://plants.usda.gov/java/. Accessed: January 10, 2018.

USFWS (U.S. Fish and Wildlife Service), 2018. National Wetlands Inventory Wetlands Mapper. Updated: March 20, 2017. Available from: http://www.fws.gov/wetlands/Data/Mapper.html. Accessed: January 5, 2018.

USGS (U.S. Geological Survey), 2015. *The National Hydrography Dataset* (NHD). Updated: October 27, 2015. Available from: http://nhd.usgs.gov/data.html. Accessed: January 5, 2018.

USGS, 2017. *U.S. Topo 7.5-minute Map for Canby, OR 2014*. Oregon, Washington County. 7.5 Minute Series.

Figures



SOURCE:
Copyright:© 2014 Esri

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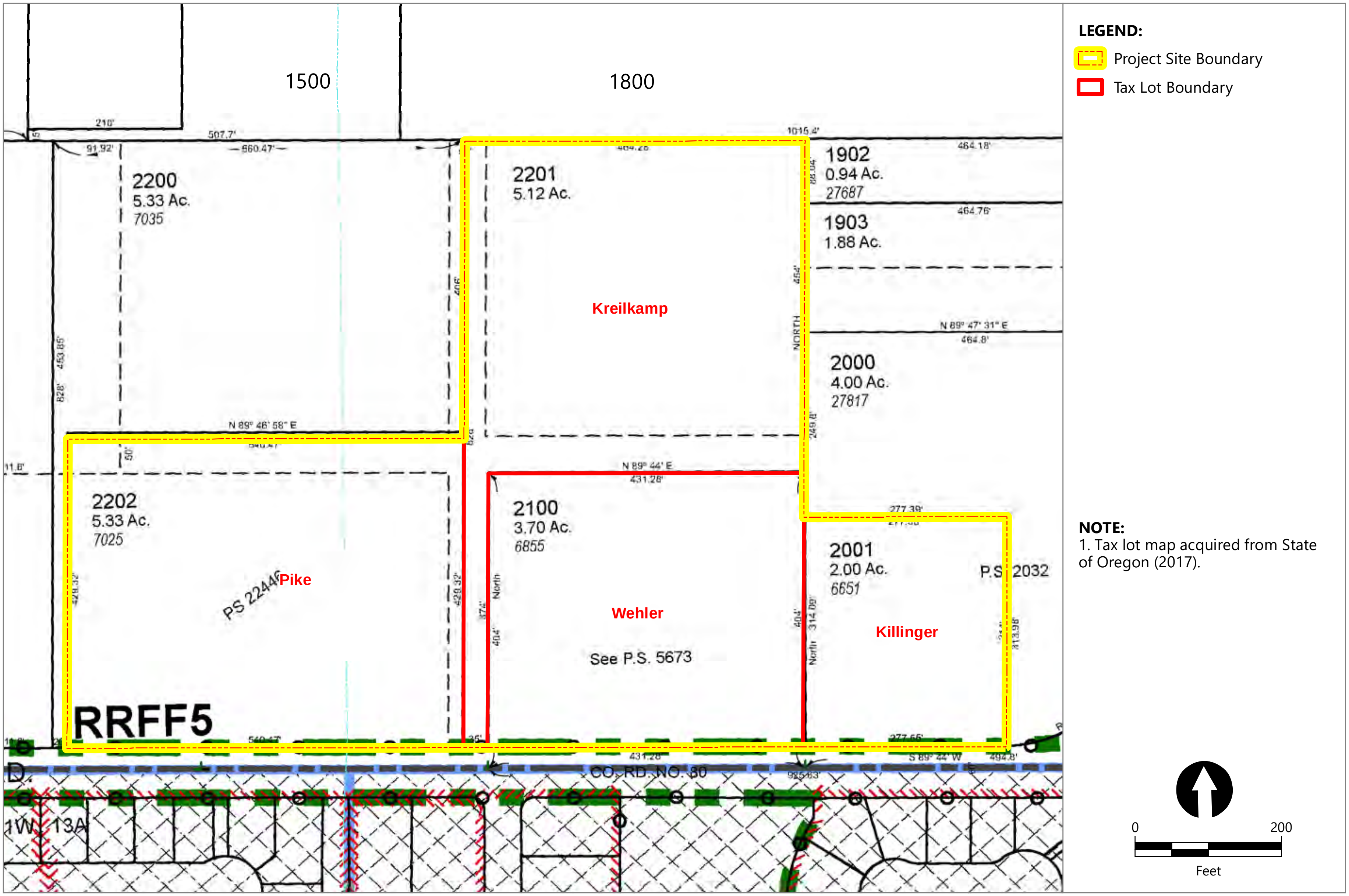
ANCHOR QEA

Figure 1
Site Location Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



NOTE:
1. Tax lot map acquired from State of Oregon (2017).

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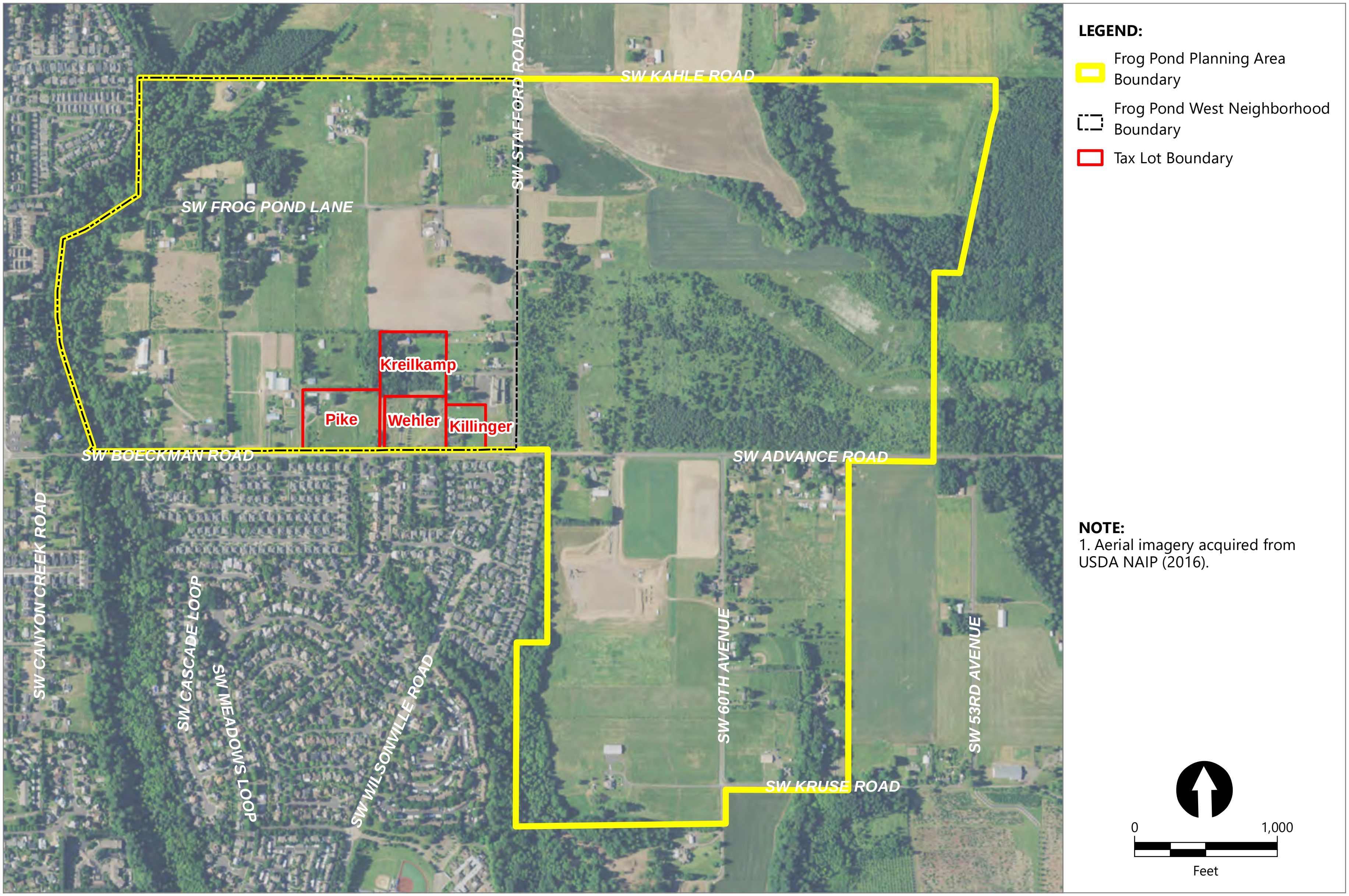
Figure 2
Tax Lot Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



NOTE:
1. Aerial imagery acquired from USDA NAIP (2016).

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ANCHOR QEA

Figure 3

Frog Pond Area and Frog Pond West Neighborhood Planning Area Map

Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development

NOTE:
1. Aerial imagery acquired from Google Earth (2017).

Publish Date: 2018/01/10, 8:21 AM | User: lhudson
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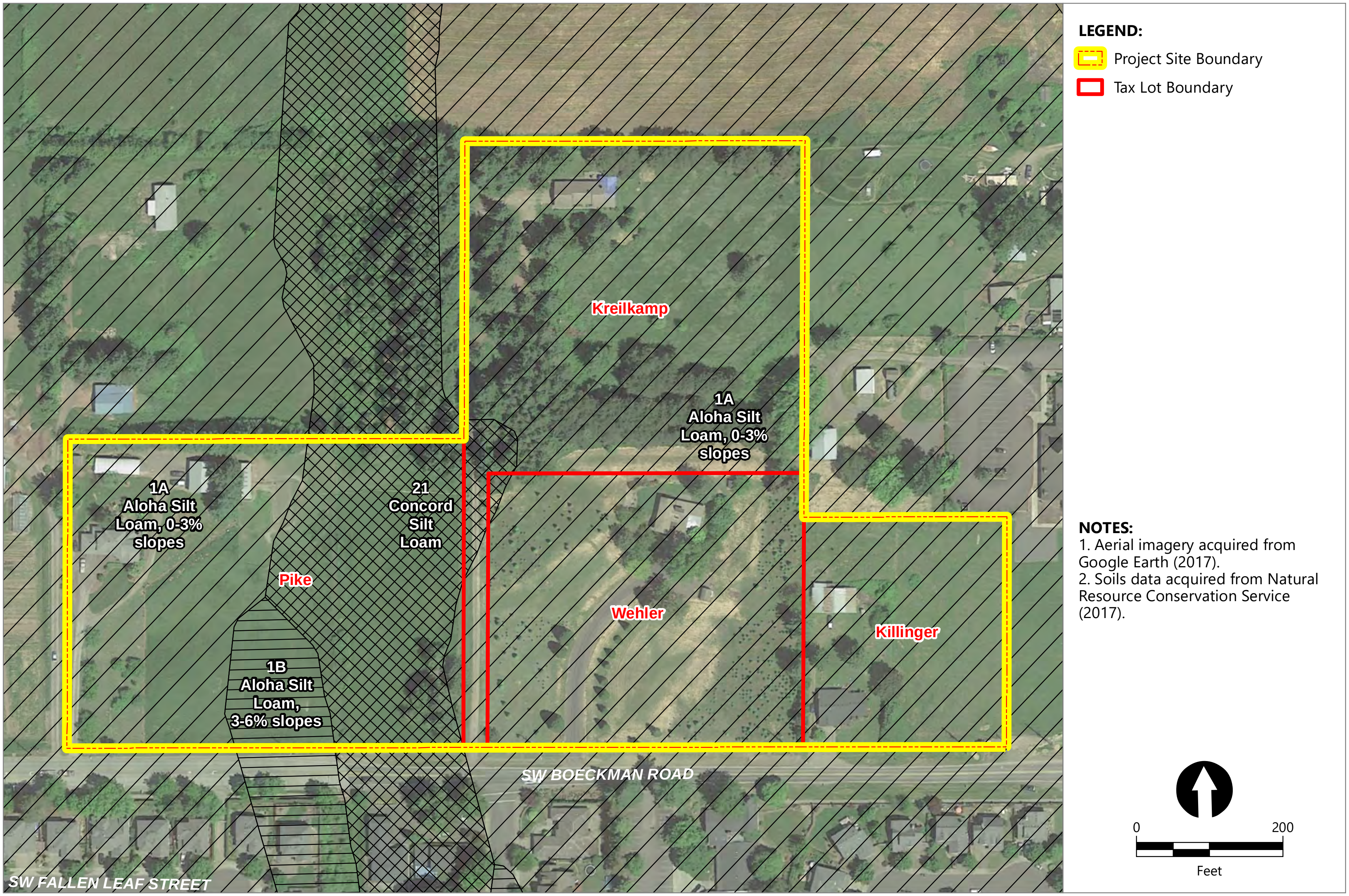
Figure 4
2017 Aerial Overview Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



NOTES:
1. Aerial imagery acquired from Google Earth (2017).
2. Soils data acquired from Natural Resource Conservation Service (2017).

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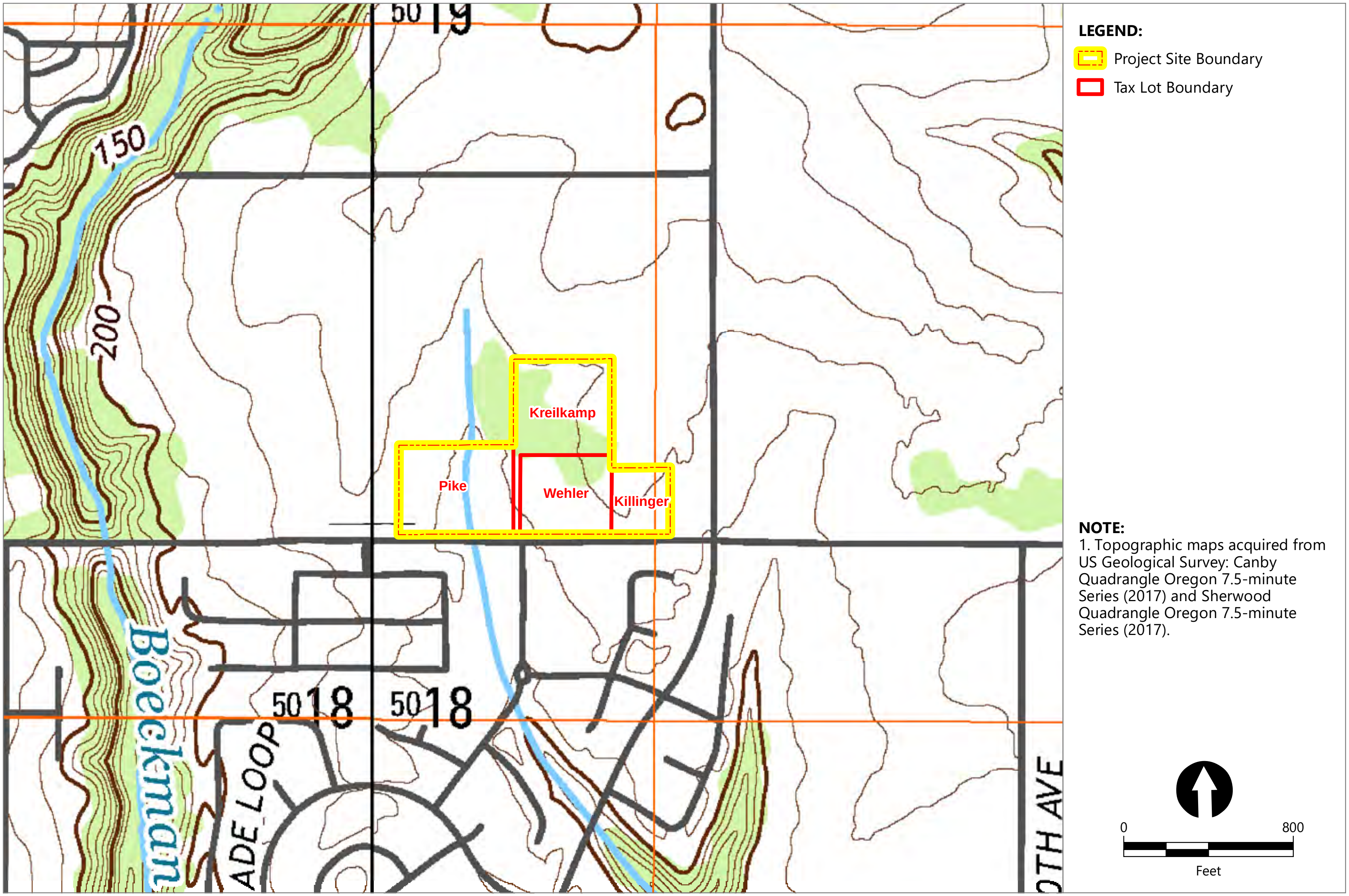
ANCHOR QEA

Figure 5
Soils Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

🟨 Project Site Boundary

🟥 Tax Lot Boundary

NOTE:

1. Topographic maps acquired from US Geological Survey: Canby Quadrangle Oregon 7.5-minute Series (2017) and Sherwood Quadrangle Oregon 7.5-minute Series (2017).

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QEA

Figure 6
U.S. Geological Survey Topographic Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development

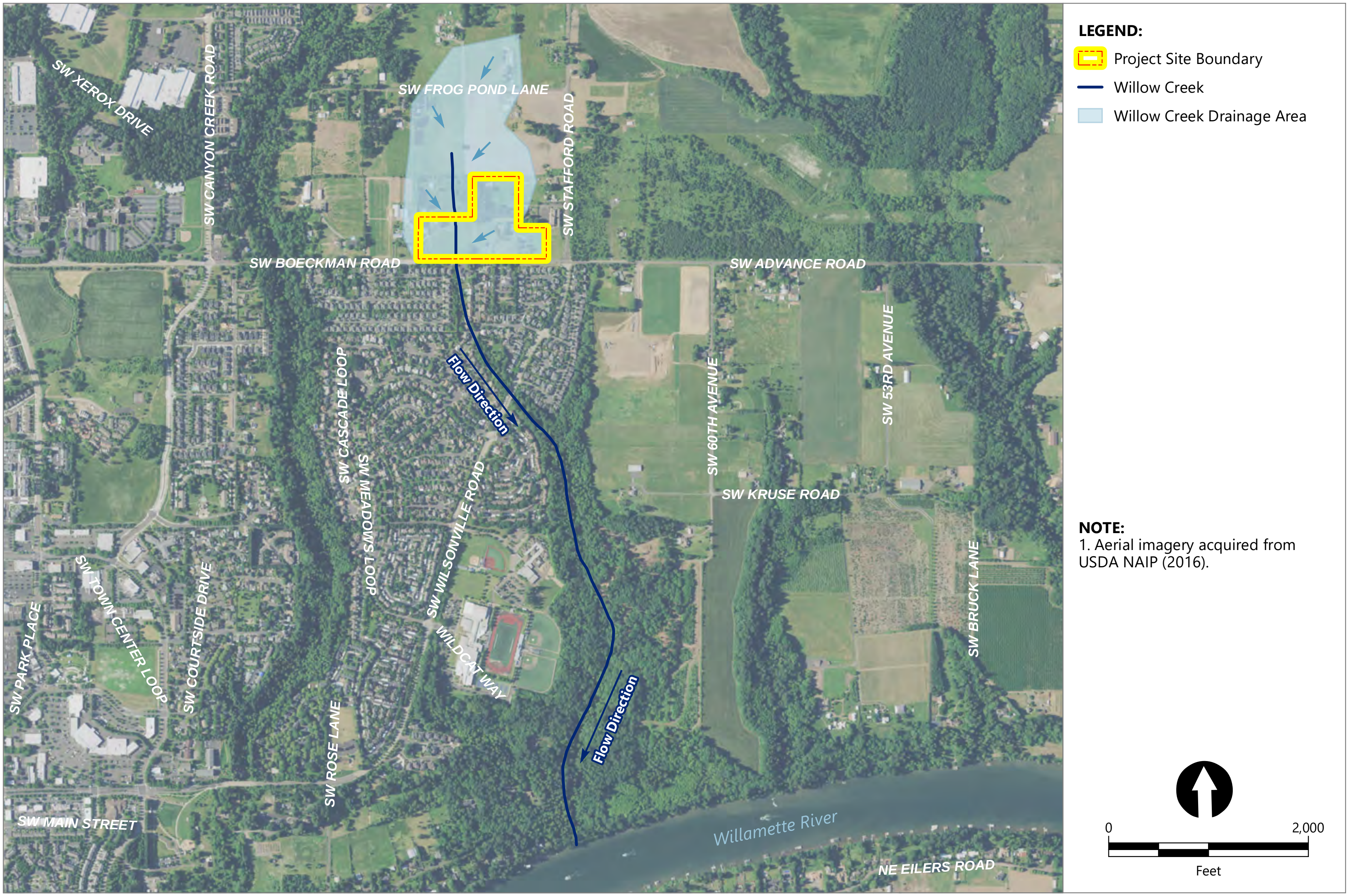

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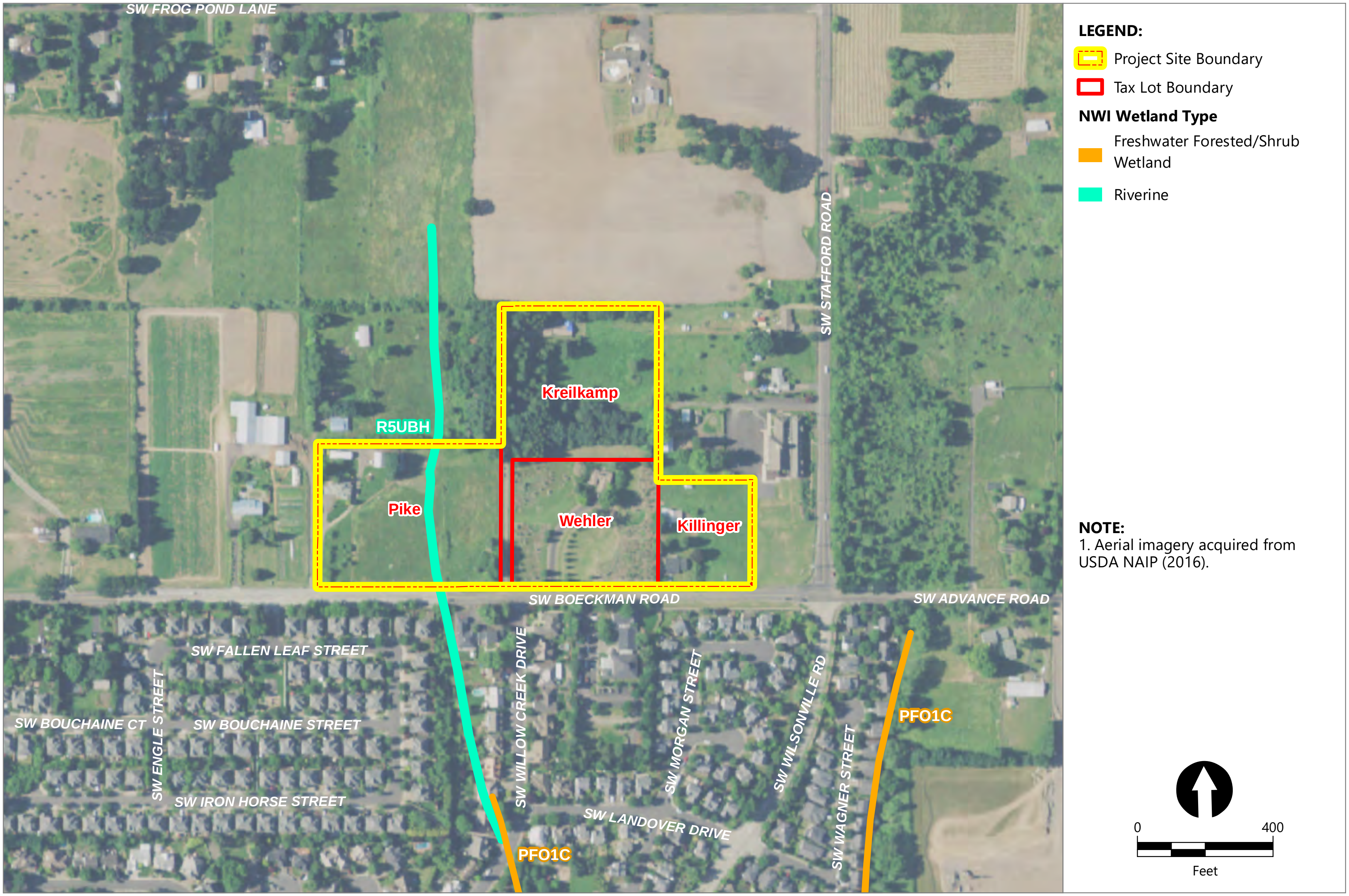
Figure 7
Willow Creek Drainage Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



NOTE:
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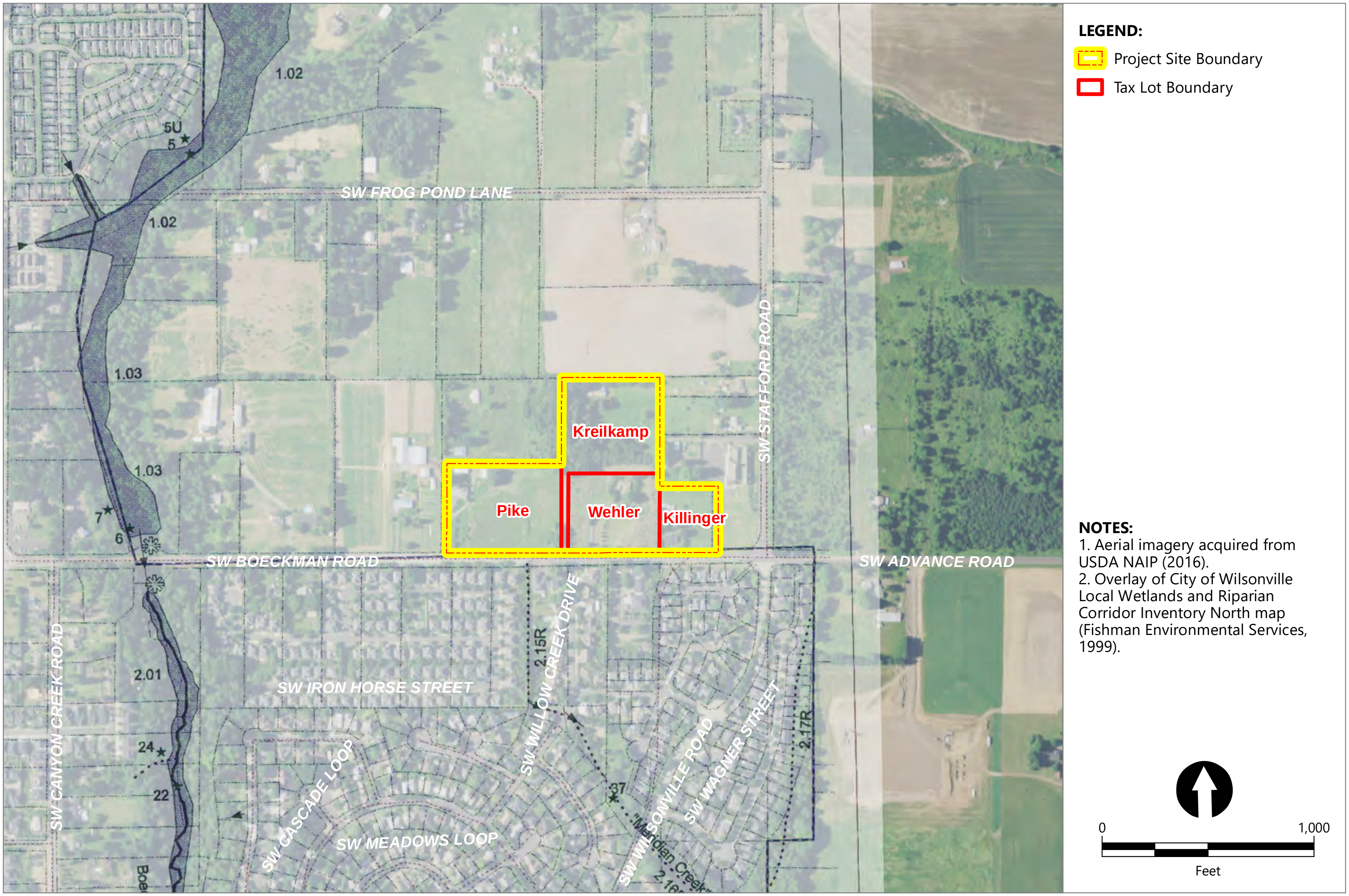
Figure 8
National Wetlands Inventory Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



NOTES:

1. Aerial imagery acquired from USDA NAIP (2016).
2. Overlay of City of Wilsonville Local Wetlands and Riparian Corridor Inventory North map (Fishman Environmental Services, 1999).

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Figure 9
Local Wetlands Inventory Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development

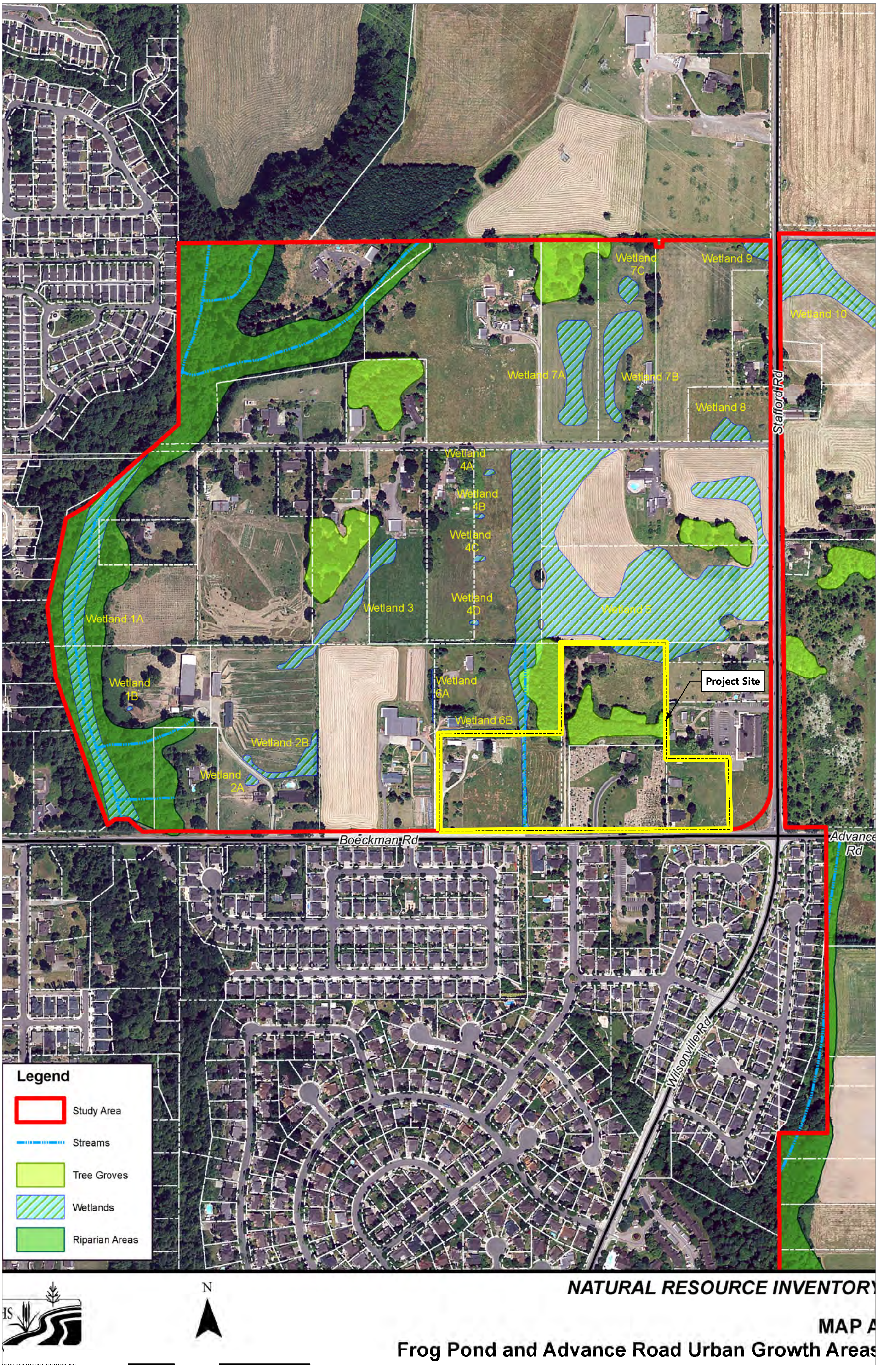

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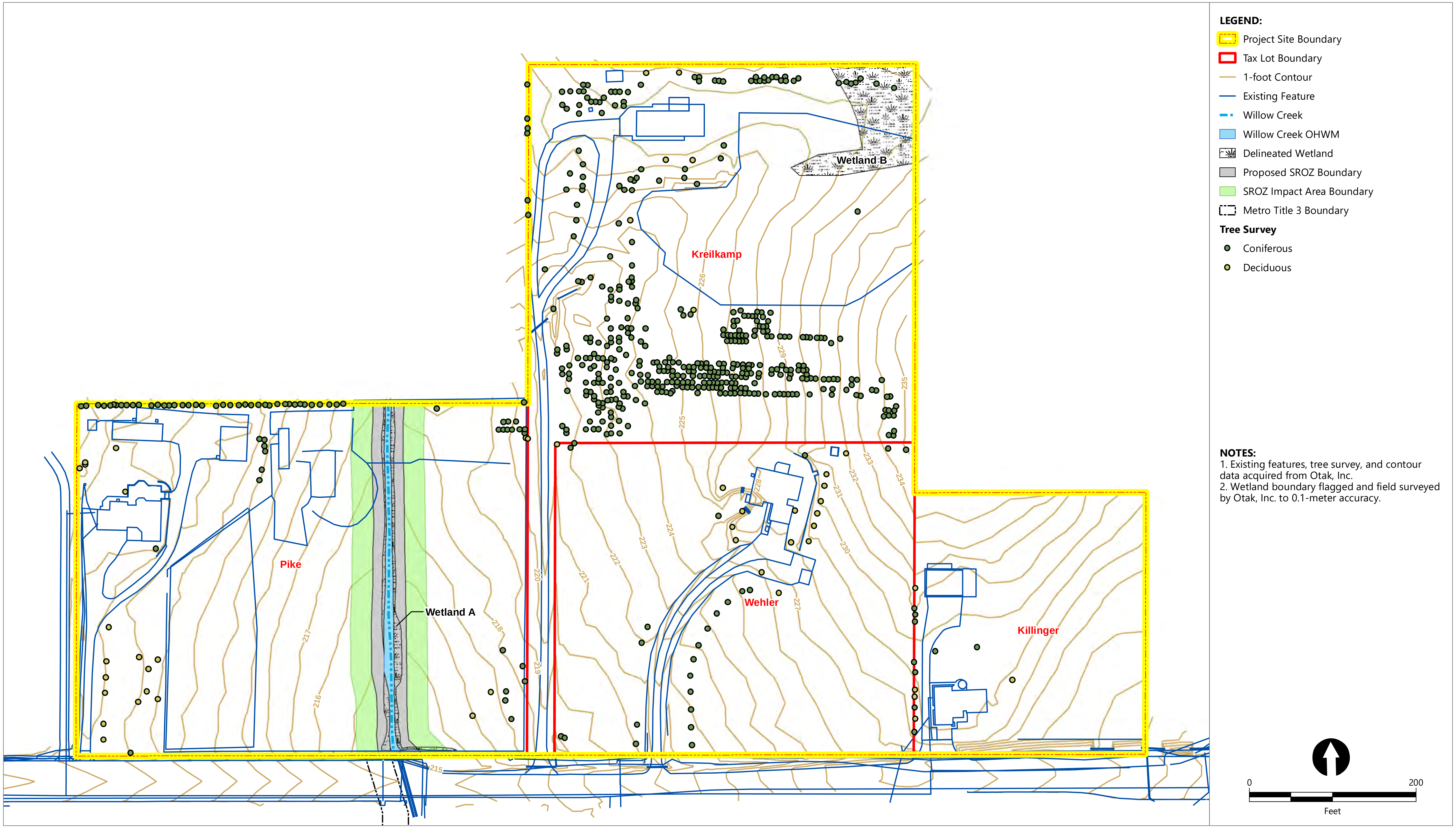
Figure 10
2014 Pacific Habitat Services, Inc., Wetland Inventory Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

- ▭ Project Site Boundary
- 🟥 Tax Lot Boundary
- — 1-foot Contour
- — Existing Feature
- - · Willow Creek
- ▭ Willow Creek OHWM
- ▨ Delineated Wetland
- ▭ Proposed SROZ Boundary
- 🟩 SROZ Impact Area Boundary
- ⬚ Metro Title 3 Boundary

Tree Survey

- ● Coniferous
- ● Deciduous

NOTES:
1. Existing features, tree survey, and contour data acquired from Otak, Inc.
2. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.

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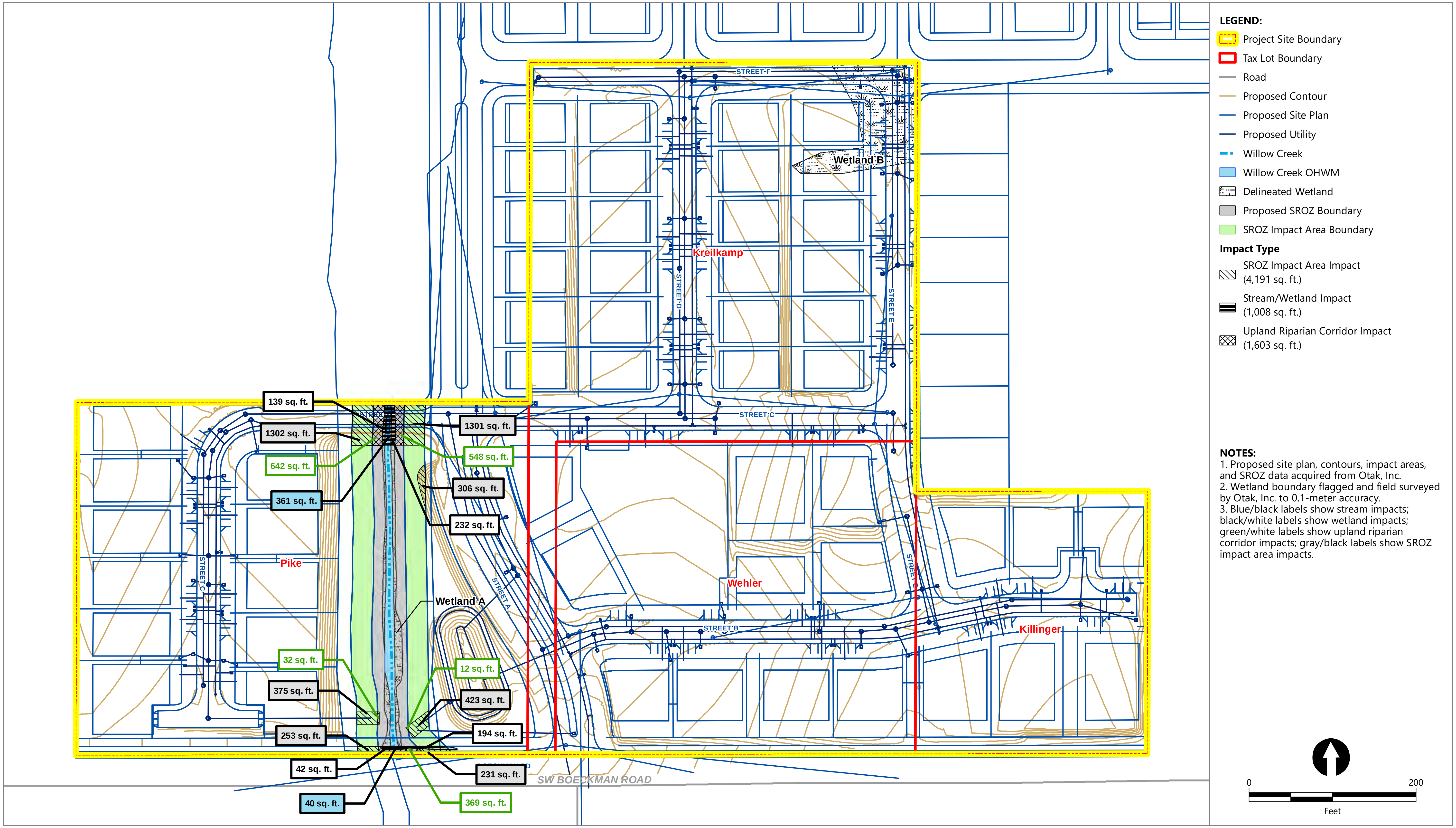
ANCHOR QEA

Figure 11
Existing Conditions Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



LEGEND:

- Project Site Boundary
- Tax Lot Boundary
- Road
- Proposed Contour
- Proposed Site Plan
- Proposed Utility
- Willow Creek
- Willow Creek OHWM
- Delineated Wetland
- Proposed SROZ Boundary
- SROZ Impact Area Boundary

Impact Type

- SROZ Impact Area Impact (4,191 sq. ft.)
- Stream/Wetland Impact (1,008 sq. ft.)
- Upland Riparian Corridor Impact (1,603 sq. ft.)

NOTES:

1. Proposed site plan, contours, impact areas, and SROZ data acquired from Otak, Inc.
2. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.
3. Blue/black labels show stream impacts; black/white labels show wetland impacts; green/white labels show upland riparian corridor impacts; gray/black labels show SROZ impact area impacts.

Publish Date: 2018/01/12, 1:27 PM | User: lhudson
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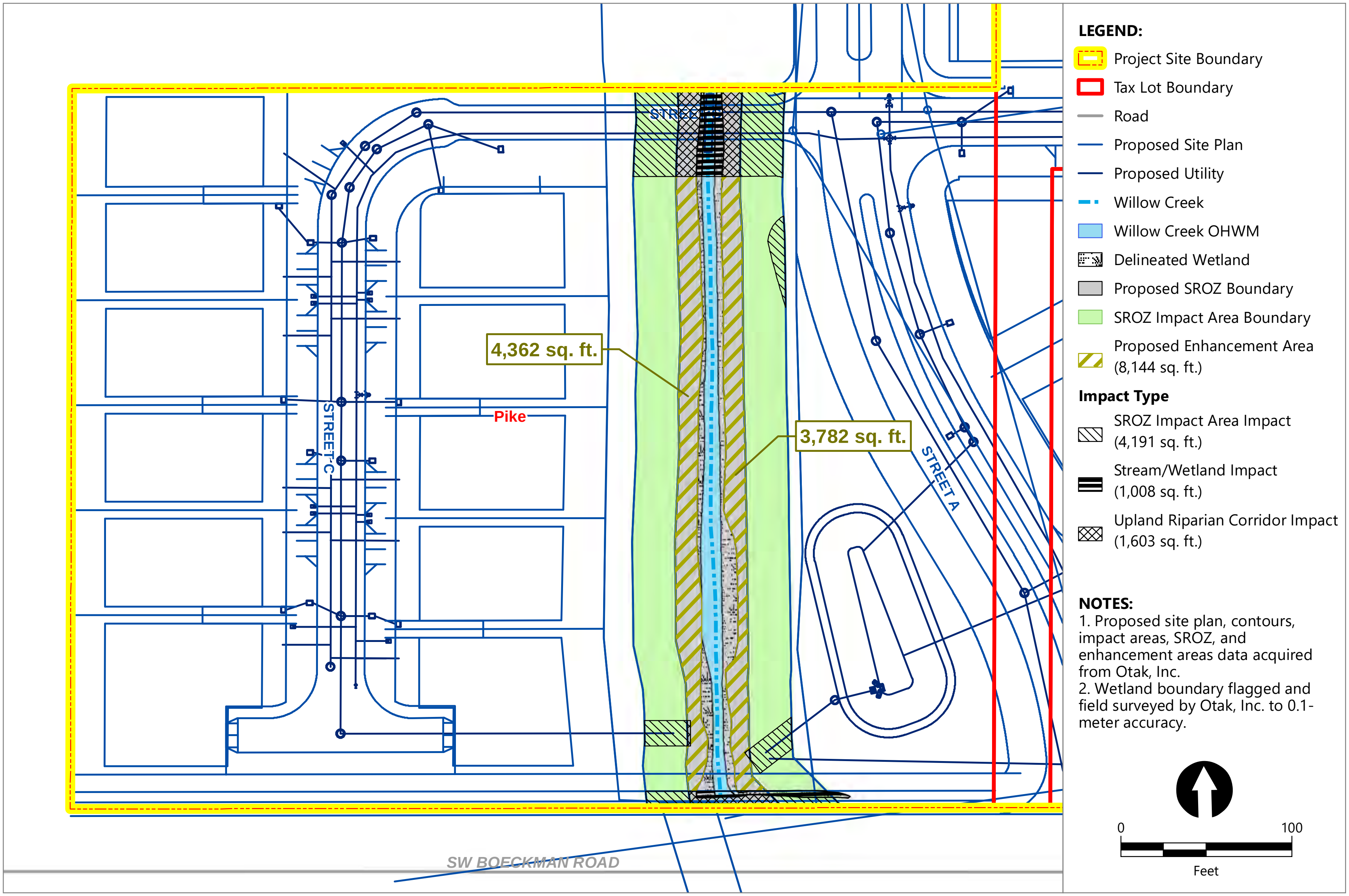
Figure 12
Proposed Development Map
Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development



NOTES:

1. Proposed site plan, contours, impact areas, SROZ, and enhancement areas data acquired from Otak, Inc.
2. Wetland boundary flagged and field surveyed by Otak, Inc. to 0.1-meter accuracy.

Publish Date: 2018/01/12, 10:52 AM | User: lhudson
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ANCHOR QEA

Figure 13

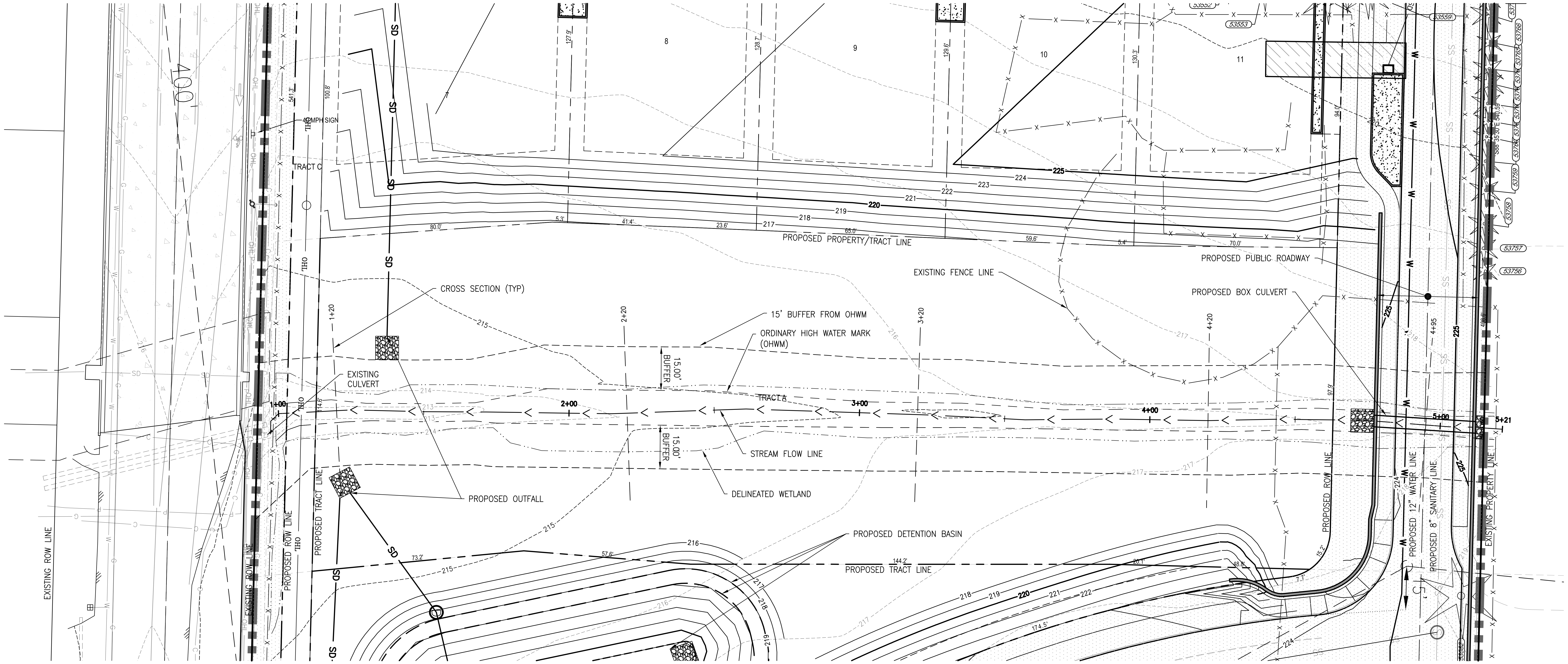
Proposed Restoration Plan Map

Significant Resource Impact Report
West Hills Land Development: Stafford Meadows Residential Development

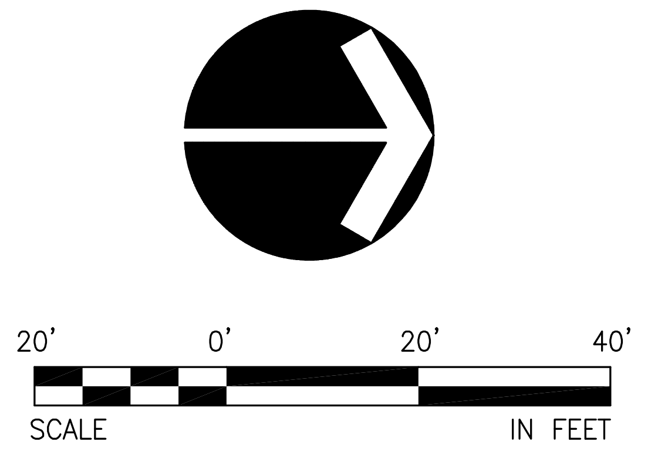
Appendix A

Stream Slope Cross Sections

Otak
Otak, Inc.
808 SW Third Avenue, Ste. 300
Portland, OR 97204
503. 287. 6825
www.otak.com



STAFFORD MEADOWS STREAM PLAN VIEW



STAMP

WEST HILLS
LAND DEVELOPMENT

CONSULTANT

STAFFORD MEADOWS

LAND USE
WILSONVILLE, OREGON

STAFFORD MEADOWS STREAM PLAN VIEW

TITLE

#	DATE	DESCRIPTION

REVISIONS

MRK
DRAWN BY

MAP
CHECKED BY

LAND USE SUBMITTAL
STATUS

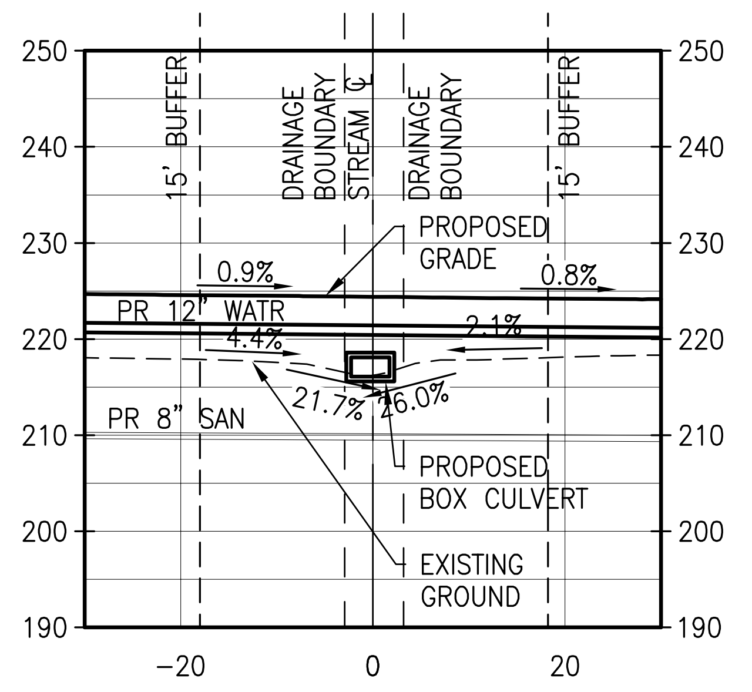
JANUARY 15, 2018
DATE

P17868
PROJECT NUMBER

X-SEC 1

Plotted: Jan 09, 2018 - 5:46pm L:\Project\17800\17868\CADD\ACAD\Dwg\Exhibits\Frog Pond - Preliminary slope cross sections_2018-01-09.dwg Layout Name: X-SEC 1

Stafford Meadows Stream Alignment4+95.00



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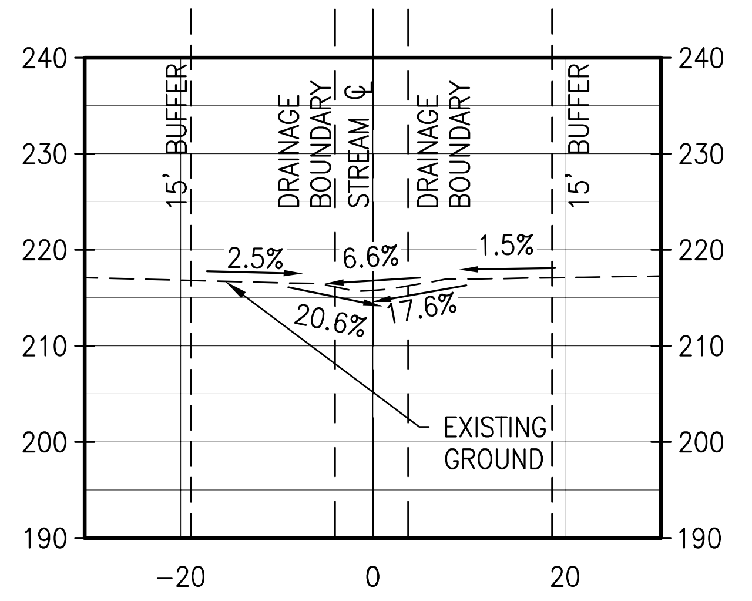
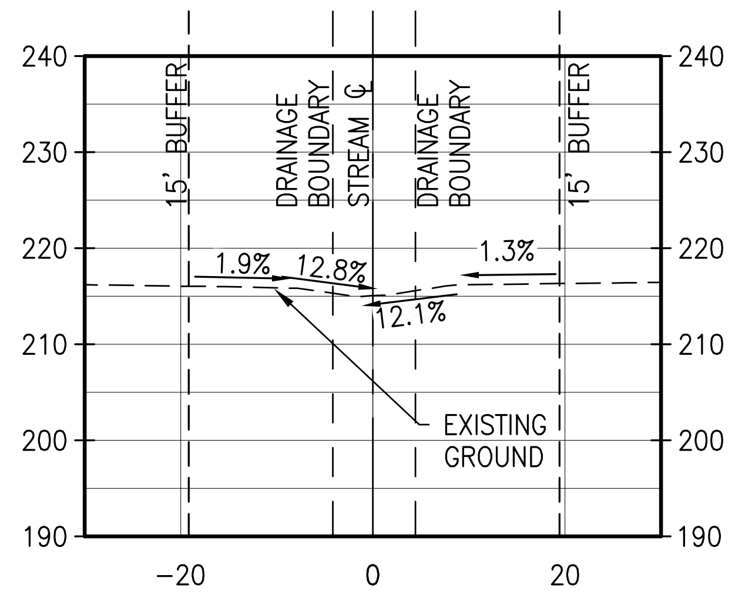
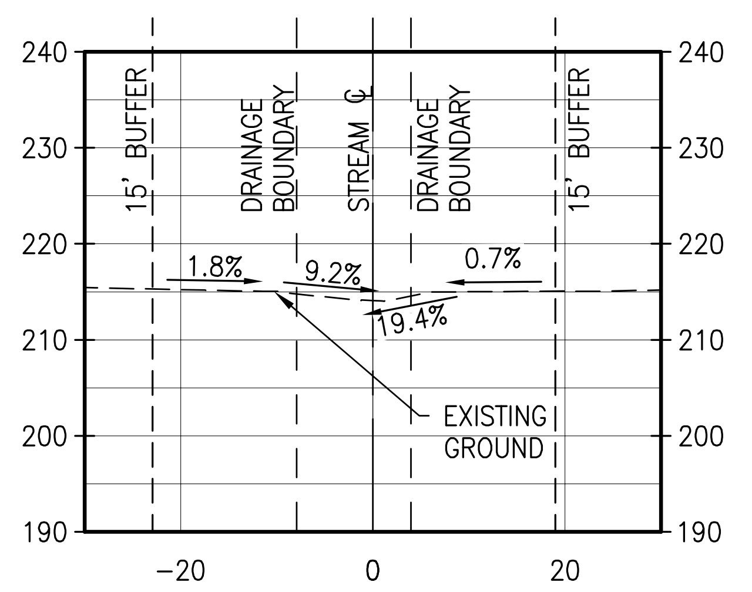


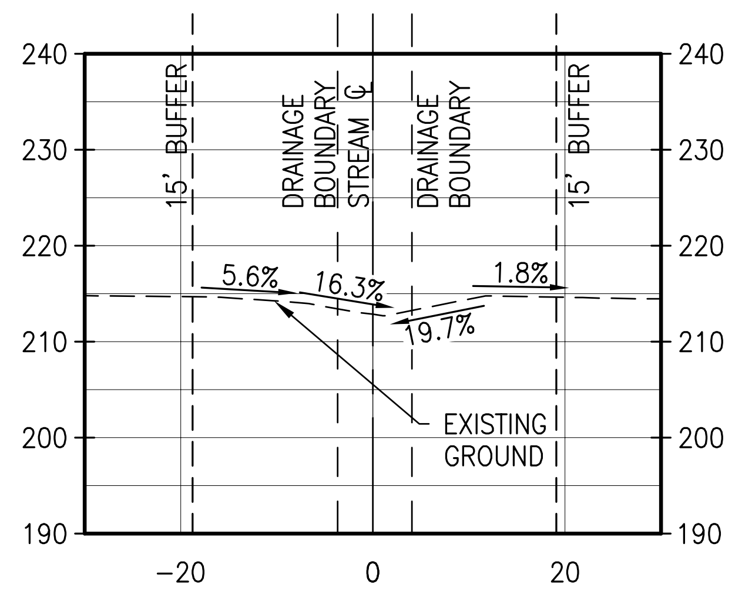
Stafford Meadows Stream Alignment3+20.00

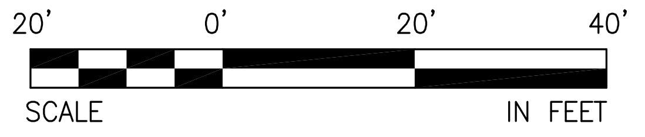


Stafford Meadows Stream Alignment2+20.00



Stafford Meadows Stream Alignment1+20.00





STAFFORD MEADOWS STREAM CROSS SECTIONS

SCALE
HORIZ: 1"=20'
VERT: 1"=20'

Plotted: Jan 09, 2018 - 5:34pm L:\Project\17800\17868\CADD\ACAD\Dwg\Exhibits\Frog Pond - Preliminary slope cross sections_2018-01-09.dwg Layout Name: X-SEC 2

Otak

Otak, Inc.
808 SW Third Avenue, Ste. 300
Portland, OR 97204
503. 287. 6825
www.otak.com

STAMP

WEST HILLS
LAND DEVELOPMENT

CONSULTANT

STAFFORD MEADOWS
LAND USE
WILSONVILLE, OREGON
STAFFORD MEADOWS STREAM CROSS SECTIONS

TITLE

#	DATE	DESCRIPTION

REVISIONS

MRK	MAP
DRAWN BY	CHECKED BY

LAND USE SUBMITTAL
STATUS

JANUARY 15, 2018
DATE

P17868
PROJECT NUMBER

X-SEC 2

Appendix B

Project Site Photographs

P1: Southeastern portion of Killinger Property, looking west

P2: Southeastern portion of Killinger Property, looking north

P3: Northeastern portion of Killinger Property, looking southwest

P4: Northwestern portion of Killinger Property, looking southeast

Photographs 1 through 4
Overview of Killinger Property

P5: East portion of Wetland B on Kreilkamp property, looking north

P6: East portion of Wetland B on Kreilkamp property, looking southwest

P7: East portion of Wetland B on Kreilkamp property, looking south

P8: Southwest boundary of Wetland B on Kreilkamp property, looking northeast

Photographs 5 through 8
Wetland B on the Kreilkamp Property

P9: Northern portion of Kreilkamp property, looking southeast

P10: Northern portion of Kreilkamp property, looking southwest

P11: Western portion of Kreilkamp property, looking southeast

P12: Western portion of Kreilkamp property, looking west

Photographs 9 through 12

Wetland B and Tree Groves on the Kreilkamp Property

P13: Northeastern portion of Wehler property, looking west

P14: Northeastern portion of Wehler property, looking south

P15: Southwestern portion of Wehler property, looking north

P16: Southwestern portion of Wehler property, looking northeast

Photographs 13 through 16
Overview of Wehler Property

P17: Southwestern portion of pasture on Pike property, looking east

P18: Western portion of pasture on Pike property, looking southwest

P19: Northwestern portion of pasture on Pike property, looking southeast

P20: Northeastern portion of pasture on Pike property, looking east

Photographs 17 through 20
Overview of Pike Property

P21: Northern portion of Willow Creek and Wetland A, looking east

P22: Northern portion of Willow Creek and Wetland A, looking south

P23: Central portion of Willow Creek and Wetland A, looking south

P24: Central portion of Willow Creek and Wetland A, looking north

Photographs 21 through 24

Willow Creek and Wetland A on the Pike Property

P25: Southern portion of Willow Creek and Wetland A, looking north

P26: Southern portion of Willow Creek and Wetland A, looking south

P27: Southern portion of Willow Creek and Wetland A, looking southeast

P28: Southern portion of Willow Creek and Culverts, looking south

Photographs 25 through 28

Willow Creek and Wetland A on the Pike Property

P29: Eastern portion of Wetland A, looking west

P30: Eastern portion of Wetland A, looking northwest

P31: Tree grove in southeastern portion of Pike property, looking east

P32: Southeastern portion of Pike property, looking north

Photographs 29 through 32

Wetland A and Southeastern Portion of the Pike Property

Appendix F

Stafford Meadows Tree Plan

This Tree Plan is required by Section 4.610.40. Type C Permit as part of the site development application for the Stafford Meadows subdivision in Wilsonville, Oregon. Trees were measured by a licensed surveyor and inventoried by an ISA Certified Arborist. The attached Tree Table includes all trees that are 6 inches in diameter and larger. There are 570 trees and the Tree Table delineates those to be protected and those to be removed. Root protection zones (RPZs) for protected trees will be the dripline of the tree (crown diameter) plus a minimum of 5 ft. All protected trees have been tagged with metal tags that must remain in place throughout the development. Tag numbers are keyed to the tree survey map and the attached Tree Table.

The property includes an abandoned tree plantation comprised of Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*). These trees were planted in tilled soil approximately three feet deep on top of a layer of dense clay soil. This resulted in the trees having shallow and narrow root systems, which will make them prone to windthrow if the stand is opened. These trees are labeled “plantation” in the Remarks column of the tree inventory.

There is a hedgerow consisting of two rows of young Douglas firs (*Pseudotsuga menziesii*) on the northwest property line. The southern row of trees is on-property and the northern row is off-property. These trees may be cut but may not be uprooted when they are removed to avoid damaging the off-property trees. The trees to be cut are numbered 53756 through 53795 on the survey map. Grinding the stumps with a portable stump grinder is permissible.

The eleven trees being preserved during development will be cordoned off with fencing built at the edge of root protection zones before construction activity begins. Fencing will consist of 6-foot high metal chain link secured with 8-foot metal posts. Without authorization, none of the following is allowed within a root protection zone:

1. New buildings;
2. Grade change or cut and fill, during or after construction;
3. New impervious surfaces;
4. Utility or drainage field placement;
5. Staging or storage of materials and equipment during construction;
6. Vehicle maneuvering during construction.

Section 4.620.00. requires that each removed tree be replaced with a 2-inch caliper tree within one year of removal. Replacement trees shall be chosen for the site from an approved tree species list supplied by the City, and shall be state Department of Agriculture Nursery Grade No. 1 or better. The trees must be staked, fertilized and mulched, and shall be guaranteed by the permit grantee for two years after the planting date. The species and locations will be determined by the landscape designer. It is apparent that there is insufficient space at the site to plant all of the 559 required trees, so the owner is invoking Section 4.629.00.(06.) and will pay into the City Tree Fund the value of the replacement trees that cannot be planted at the site.

Portland Tree Consulting

The goal of this Tree Plan is to meet the requirements of the tree preservation code and to observe all laws, rules, and regulations. All trees to be removed should be verified and marked and all tree protection measures should be inspected and approved before any clearing or grading work begins. It is the owner's responsibility to implement this tree plan and to monitor the construction process to its conclusion. Deviations can result in tree damage, liability, and violations of the City Code.

Assumptions and Limiting Conditions

Portland Tree Consulting PO Box 19042 Portland, OR 97280
(503) 452-8160 peter@pdxtreeconsulting.com

1. Client warrants any legal description provided to the Consultant is correct and titles and ownerships to property are good and marketable. Consultant shall not be responsible for incorrect information provided by Client. Client agrees to defend, indemnify, and hold Consultant, its officers, directors, employees, and agents harmless from any claims or damages, including attorney fees, arising out of acts or omissions of Client in connection with work performed pursuant to this Agreement.
2. All data will be verified insofar as feasible; however, the Consultant can neither guarantee nor be responsible for the accuracy of information provided by others.
3. The Consultant shall not be required to give testimony or attend court or hearings by reason of this report unless subsequent contractual arrangements are made, including additional fees.
4. The report and any values expressed therein represent the opinion of the Consultant, and the Consultant's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
5. Sketches, drawings and photographs in the report are intended as visual aids and may not be to scale. The reproduction of information generated by others will be for coordination and ease of reference. Inclusion of such information does not constitute a representation by the consulting arborist, or by Multnomah Tree Experts, Ltd., as to the sufficiency or accuracy of the information.
6. Unless expressed otherwise, information in the report covers only items that were examined, and reflects the condition of those items at the time of inspection. The inspection is limited to visual examination of accessible items without laboratory analysis, dissection, excavation, probing, or coring, unless otherwise stated.
7. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.
8. The report is the completed work product. Any additional work, including production of a site plan, addenda and revisions, construction of tree protection measures, tree work, or inspection of tree protection measures, for example, must be contracted separately.
9. Loss or alteration of any part of the report invalidates the entire report. Ownership of any documents produced passes to the Client only when all fees have been paid.

Peter Torres, M.F.

CCB# 154349 ASCA RCA #372 ISA Certified Arborist PN-0650B

Stafford Meadows

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
20548	SCOULER WILLOW	7"	2	10	viable	remove
20549	SHORE PINE	17"	2	18	viable	remove
20550	SHORE PINE	9"	2	16	viable	remove
20551	DOUGLAS FIR	19"	2	24	viable	remove
20552	DOUGLAS FIR	10"	2	14	viable	remove
20553	DOUGLAS FIR	15"	2	22	viable	remove
20554	NORWAY SPRUCE	24"	2	22	viable	remove
20555	NORWAY SPRUCE	12"	2	16	plantation	remove
20556	NORWAY SPRUCE	7"	2	10	plantation	remove
20557	NORWAY SPRUCE	25"	2	26	plantation	remove
20558	NORWAY SPRUCE	11"	2	14	plantation	remove
20559	NORWAY SPRUCE	20"	2	18	plantation	remove
20560	NORWAY SPRUCE	13"	2	16	plantation	remove
20561	NORWAY SPRUCE	8"	2	8	plantation	remove
20562	NORWAY SPRUCE	11"	2	10	plantation	remove
20563	NORWAY SPRUCE	17"	2	20	plantation	remove
20564	NORWAY SPRUCE	8"	2	12	plantation	remove
20565	NORWAY SPRUCE	9"	1	8	plantation	remove
20566	NORWAY SPRUCE	8"	1	8	plantation	remove
20567	DOUGLAS FIR	8"	2	12	plantation	remove
20568	NORWAY SPRUCE	17"	2	18	plantation	remove
20569	NORWAY SPRUCE	19"	2	20	plantation	remove
20570	NORWAY SPRUCE	12"	2	12	plantation	remove
20571	NORWAY SPRUCE	11"	2	8	plantation	remove
20572	PONDEROSA PINE	14"	2	16	plantation	remove
20573	NORWAY SPRUCE	2X7"-10"	2	14	plantation	remove
20574	NORWAY SPRUCE	10"	1	10	plantation	remove
20575	PONDEROSA PINE	22"	2	18	viable	remove
20576	NORWAY SPRUCE	8"	1	6	plantation	remove
20577	NORWAY SPRUCE	10"	1	6	plantation	remove
20578	NORWAY SPRUCE	7"	1	6	plantation	remove
20579	PONDEROSA PINE	14"	2	8	plantation	remove
20580	NORWAY SPRUCE	7"	1	6	plantation	remove
20581	NORWAY SPRUCE	7"	1	6	plantation	remove
20582	NORWAY SPRUCE	9"	1	8	plantation	remove
20583	NORWAY SPRUCE	10"	2	12	plantation	remove
20584	NORWAY SPRUCE	9"	2	8	plantation	remove
20585	NORWAY SPRUCE	10"	2	26	plantation	remove
20586	NORWAY SPRUCE	10"	1	8	plantation	remove
20587	NORWAY SPRUCE	7"	1	6	plantation	remove
20588	NORWAY SPRUCE	7"	1	4	plantation	remove
20589	NORWAY SPRUCE	12"	2	12	plantation	remove
20590	PONDEROSA PINE	25"	2	26	viable	remove
20591	DOUGLAS FIR	12"	1	20		remove
20592	NORWAY SPRUCE	12"	2	14	plantation	remove
20593	NORWAY SPRUCE	10"	1	12	plantation	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
20594	NORWAY SPRUCE	6"	1	4	plantation	remove
20595	NORWAY SPRUCE	10"	1	6	plantation	remove
20596	NORWAY SPRUCE	6"	1	4	plantation	remove
20597	NORWAY SPRUCE	15"	2	12	plantation	remove
20598	NORWAY SPRUCE	9"	1	8	plantation	remove
20599	NORWAY SPRUCE	11"	1	10	plantation	remove
20600	NORWAY SPRUCE	3X5"-6"	1	6	plantation	remove
20601	DOUGLAS FIR	18"	2	22	viable	remove
20602	DOUGLAS FIR	23"	2	24	viable	remove
20603	DOUGLAS FIR	17"	2	12		remove
20604	DOUGLAS FIR	12"	2	12	stand grown	remove
20605	DOUGLAS FIR	12"	2	12	viable	remove
20606	DOUGLAS FIR	15"	2	18	viable	remove
20607	DOUGLAS FIR	17"	2	30	viable	remove
20608	DOUGLAS FIR	25"	2	30	viable	remove
20609	DOUGLAS FIR	13"	2	30	viable	remove
20610	NORWAY SPRUCE	11"	2	10	plantation	remove
20611	NORWAY SPRUCE	9"	1	8	plantation	remove
20612	NORWAY SPRUCE	2X8"-9"	1	12	plantation	remove
20613	NORWAY SPRUCE	11"	1	8	plantation	remove
20614	NORWAY SPRUCE	10"	1	6	plantation	remove
20615	NORWAY SPRUCE	8"	1	12	plantation	remove
20616	NORWAY SPRUCE	13"	2	14	plantation	remove
20617	NORWAY SPRUCE	13"	2	16	plantation	remove
20618	NORWAY SPRUCE	14"	2	20	plantation	remove
20619	NORWAY SPRUCE	11"	1	10	plantation	remove
20620	NORWAY SPRUCE	9"	1	6	plantation	remove
20621	NORWAY SPRUCE	9"	1	8	plantation	remove
20622	NORWAY SPRUCE	10"	1	8	plantation	remove
20623	NORWAY SPRUCE	10"	1	6	plantation	remove
20624	NORWAY SPRUCE	15"	2	12	plantation	remove
20625	PONDEROSA PINE	10"	1	6	plantation	remove
20626	NORWAY SPRUCE	12"	2	10	plantation	remove
20627	NORWAY SPRUCE	12"	2	10	plantation	remove
20628	NORWAY SPRUCE	7"	0	0	dead	remove
20629	NORWAY SPRUCE	9"	1	8	plantation	remove
20630	NORWAY SPRUCE	16"	2	20	plantation	remove
20631	NORWAY SPRUCE	17"	2	24	plantation	remove
20632	NORWAY SPRUCE	13"	2	16	plantation	remove
20633	NORWAY SPRUCE	14"	2	18	plantation	remove
20634	NORWAY SPRUCE	12"	2	16	plantation	remove
20635	PONDEROSA PINE	15"	2	18	plantation	remove
20636	NORWAY SPRUCE	14"	1	22	plantation	remove
20637	PONDEROSA PINE	7"	1	8	plantation	remove
20638	NORWAY SPRUCE	11"	2	8	plantation	remove
20639	NORWAY SPRUCE	15"	2	14	plantation	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
20640	NORWAY SPRUCE	2X4"-10"	2	4	plantation	remove
20641	NORWAY SPRUCE	13"	1	8	plantation	remove
20642	NORWAY SPRUCE	7"	2	6	plantation	remove
20643	NORWAY SPRUCE	10"	1	8	plantation	remove
20644	NORWAY SPRUCE	14"	2	16	plantation	remove
20645	PONDEROSA PINE	9"	0	0	dead	remove
20646	DOUGLAS FIR	11"	2	18	viable	remove
20647	NORWAY SPRUCE	19"	2	20	plantation	remove
20648	NORWAY SPRUCE	2X9"-17"	1	20	plantation	remove
20649	SCOTS PINE	8"	2	8	plantation	remove
20650	SCOTS PINE	10"	1	8	plantation	remove
20651	SCOTS PINE	6"	1	8	plantation	remove
20652	SCOTS PINE	10"	1	8	plantation	remove
20655	SCOTS PINE	8"	2	6	plantation	remove
20656	SCOTS PINE	7"	2	4	plantation	remove
20657	SCOTS PINE	8"	2	4	plantation	remove
20658	SCOTS PINE	7"	2	4	plantation	remove
20659	SCOTS PINE	9"	2	8	plantation	remove
20660	SCOTS PINE	8"	1	8	plantation	remove
20661	SCOTS PINE	6"	1	6	plantation	remove
20662	SCOTS PINE	7"	1	8	plantation	remove
20663	SCOTS PINE	8"	1	8	plantation	remove
20664	SCOTS PINE	8"	2	8	plantation	remove
20665	SCOTS PINE	6"	1	6	plantation	remove
20666	SCOTS PINE	7"	1	6	plantation	remove
20667	SCOTS PINE	7"	1	4	plantation	remove
20668	SCOTS PINE	6"	1	6	plantation	remove
20669	SCOTS PINE	13"	2	12	plantation	remove
20670	SCOTS PINE	8"	1	6	plantation	remove
20671	SCOTS PINE	8"	1	6	plantation	remove
20672	SCOTS PINE	6"	1	6	plantation	remove
20673	SCOTS PINE	9"	1	6	plantation	remove
20674	SCOTS PINE	8"	1	6	plantation	remove
20675	SCOTS PINE	7"	1	8	plantation	remove
20676	SCOTS PINE	6"	1	4	plantation	remove
20677	SCOTS PINE	10"	1	8	plantation	remove
20678	SCOTS PINE	9"	2	10	plantation	remove
20679	SCOTS PINE	9"	2	8	plantation	remove
20680	SCOTS PINE	9"	2	8	plantation	remove
20681	SCOTS PINE	9"	2	10	plantation	remove
50095	PONDEROSA PINE	25"	2	28	viable	remove
50096	PONDEROSA PINE	28"	2	30	viable	remove
50097	SHORE PINE	5"	2	16	viable	remove
50098	SHORE PINE	6"	2	16	viable	remove
50147	GIANT SEQUOIA	22"	3	8		remove
50148	GIANT SEQUOIA	21"	3	6		remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
50149	GIANT SEQUOIA	31"	3	16		remove
50150	GONE	25"	0	0	stump ground	remove
50151	GONE	23"	0	0	stump ground	remove
50152	GIANT SEQUOIA	16"	3	10		remove
50153	GIANT SEQUOIA	12"	3	8		remove
50154	GIANT SEQUOIA	18"	3	12		remove
50155	GIANT SEQUOIA	13"	3	8		remove
50156	GIANT SEQUOIA	13"	3	6		remove
50157	GIANT SEQUOIA	2X6"-11"	2	10		remove
50158	GIANT SEQUOIA	12"	2	8		remove
50161	ENGLISH WALNUT	2X6"-10"	2	20	viable	remove
50162	BIRD CHERRY	2X7"-10"	1	14	orchard pruned	remove
50164	APPLE	2X3"-6"	1	10	orchard pruned	remove
50165	APPLE	12"	1	14	orchard pruned	remove
50167	APPLE	4X7"-12"	1	16	orchard pruned	remove
50168	APPLE	11"	1	16	orchard pruned	remove
50169	PONDEROSA PINE	28"	2	32	viable	PROTECT
50181	JAPANESE MAPLE	3X5"-8"	2	16	approx. 4' from house	remove
50188	APPLE	2X9"-10"	1	16	orchard pruned	remove
50189	SHORE PINE	20"	2	20	viable	remove
50190	SHORE PINE	20"	2	22	viable	remove
50191	DOUGLAS FIR	9"	2	10	stand grown; blackberries	remove
50192	DOUGLAS FIR	8"	2	10	stand grown; blackberries	remove
50193	DOUGLAS FIR	11"	2	10	stand grown; blackberries	remove
50195	DOUGLAS FIR	8"	2	16	stand grown; blackberries	remove
50196	DOUGLAS FIR	9"	2	16	stand grown; blackberries	remove
50197	DOUGLAS FIR	9"	2	16	stand grown; blackberries	remove
50198	DOUGLAS FIR	7"	2	12	stand grown; blackberries	remove
50199	DOUGLAS FIR	10"	2	12	stand grown; blackberries	remove
50200	DOUGLAS FIR	8"	2	10	stand grown; blackberries	remove
50201	DOUGLAS FIR	9"	2	10	stand grown; blackberries	remove
50202	DOUGLAS FIR	10"	2	12	stand grown; blackberries	remove
50204	DOUGLAS FIR	10"	2	12	stand grown; blackberries	remove
50205	SCOTS PINE	16"	2	20	plantation; blackberries	remove
50206	SCOTS PINE	17"	2	18	plantation; blackberries	remove
50207	SCOTS PINE	15"	2	18	plantation; blackberries	remove
50208	SCOTS PINE	18"	2	18	plantation; blackberries	remove
50209	SCOTS PINE	14"	2	16	plantation; blackberries	remove
50210	SCOTS PINE	12"	2	16	plantation; blackberries	remove
50211	SCOTS PINE	12"	2	16	plantation; blackberries	remove
50212	SCOTS PINE	11"	2	12	plantation; blackberries	remove
50213	SCOTS PINE	12"	2	12	plantation; blackberries	remove
50214	SCOTS PINE	15"	2	16	plantation; blackberries	remove
50215	SCOTS PINE	9"	2	8	plantation; blackberries	remove
50216	SCOTS PINE	17"	2	18	plantation; blackberries	remove
50217	SCOTS PINE	10"	2	12	plantation; blackberries	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
50218	SCOTS PINE	8"	2	10	plantation; blackberries	remove
50219	SCOTS PINE	12"	2	16	plantation; blackberries	remove
50220	SCOTS PINE	11"	2	10	plantation; blackberries	remove
50221	SCOTS PINE	8"	2	8	plantation; blackberries	remove
50222	SCOTS PINE	12"	2	12	plantation; blackberries	remove
50223	SCOTS PINE	13"	2	12	plantation; blackberries	remove
50224	SCOTS PINE	14"	2	10	plantation; blackberries	remove
50225	SCOTS PINE	8"	2	10	plantation; blackberries	remove
50226	SCOTS PINE	12"	2	12	plantation; blackberries	remove
50227	SCOTS PINE	10"	2	8	plantation; blackberries	remove
50228	SCOTS PINE	9"	2	8	plantation; blackberries	remove
50229	SCOTS PINE	11"	2	8	plantation; blackberries	remove
50230	SCOTS PINE	2X7"-10"	2	8	plantation; blackberries	remove
50231	SCOTS PINE	9"	2	8	plantation; blackberries	remove
50232	SCOTS PINE	10"	2	8	plantation; blackberries	remove
50233	SCOTS PINE	9"	2	8	plantation; blackberries	remove
50234	SCOTS PINE	9"	2	16	plantation; blackberries	remove
50235	SCOTS PINE	13"	2	4	plantation; blackberries	remove
50236	SCOTS PINE	9"	2	8	plantation	remove
50237	SCOTS PINE	11"	2	12	plantation	remove
50238	SCOTS PINE	12"	2	18	plantation	remove
50239	SCOTS PINE	13"	2	18	plantation	remove
50243	SCOTS PINE	15"	1	28	plantation	remove
50244	SCOTS PINE	12"	2	22	plantation	remove
50245	SCOTS PINE	9"	2	22	plantation	remove
50246	SCOTS PINE	12"	2	26	plantation	remove
50247	SCOTS PINE	11"	2	20	plantation	remove
50248	SCOTS PINE	14"	2	23	plantation	remove
50249	SCOTS PINE	10"	2	20	plantation	remove
50250	SCOTS PINE	16"	2	23	plantation	remove
50251	SCOTS PINE	14"	2	26	plantation	remove
50252	SCOTS PINE	14"	2	24	plantation	remove
50253	SCOTS PINE	13"	2	18	plantation	remove
50254	SCOTS PINE	10"	1	16	plantation	remove
50255	SCOTS PINE	9"	1	14	plantation	remove
50256	SCOTS PINE	10"	2	18	plantation	remove
50257	SCOTS PINE	5"	1	8	plantation	remove
50258	SCOTS PINE	13"	2	18	plantation	remove
50259	SCOTS PINE	12"	2	20	plantation	remove
50260	SCOTS PINE	9"	2	10	plantation	remove
50261	SCOTS PINE	8"	0	0	on ground	remove
50262	SCOTS PINE	9"	1	12	plantation	remove
50263	SCOTS PINE	7"	1	8	plantation	remove
50264	SCOTS PINE	9"	1	16	plantation	remove
50265	SCOTS PINE	11"	2	16	plantation	remove
50266	SCOTS PINE	9"	1	12	plantation	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
50267	SCOTS PINE	14"	2	24	plantation	remove
50268	SCOTS PINE	14"	2	26	plantation	remove
50269	SCOTS PINE	9"	1	12	plantation	remove
50270	SCOTS PINE	12"	2	16	plantation	remove
50271	SCOTS PINE	7"	1	8	plantation	remove
50272	SCOTS PINE	6"	1	10	plantation	remove
50273	SCOTS PINE	8"	2	12	plantation	remove
50274	SCOTS PINE	10"	2	12	plantation	remove
50275	SCOTS PINE	9"	2	14	plantation	remove
50276	SCOTS PINE	7"	1	8	plantation	remove
50277	SCOTS PINE	11"	1	14	plantation	remove
50278	SCOTS PINE	13"	2	26	plantation	remove
50279	SCOTS PINE	12"	2	18	plantation	remove
50280	SCOTS PINE	9"	1	12	plantation	remove
50281	SCOTS PINE	7"	1	8	plantation	remove
50282	SCOTS PINE	8"	1	8	plantation	remove
50283	SCOTS PINE	9"	1	8	plantation	remove
50284	SCOTS PINE	7"	1	8	plantation	remove
50285	SCOTS PINE	9"	2	12	plantation	remove
50286	SCOTS PINE	10"	2	18	plantation	remove
50287	SCOTS PINE	10"	2	14	plantation	remove
50288	SCOTS PINE	14"	2	22	plantation	remove
50289	SCOTS PINE	5"	0	0	dead	remove
50290	SCOTS PINE	12"	2	16	plantation	remove
50291	SCOTS PINE	9"	2	14	plantation	remove
50292	SCOTS PINE	9"	2	16	plantation	remove
50293	SCOTS PINE	10"	2	10	plantation	remove
50294	SCOTS PINE	6"	2	4	plantation	remove
50295	SCOTS PINE	12"	2	14	plantation	remove
50296	SCOTS PINE	10"	0	0		remove
50297	SCOTS PINE	10"	1	6	plantation	remove
50298	SCOTS PINE	7"	1	4	plantation	remove
50299	SCOTS PINE	9"	2		plantation	remove
50300	SCOTS PINE	11"	2	2	plantation	remove
50301	SCOTS PINE	9"	2	12	plantation	remove
50302	SCOTS PINE	13"	2	16	plantation	remove
50303	SCOTS PINE	12"	2	14	plantation	remove
50304	SCOTS PINE	11"	2	12	plantation	remove
50305	SCOTS PINE	13"	2	16	plantation	remove
50306	SCOTS PINE	12"	2	14	plantation	remove
50307	SCOTS PINE	8"	1	18	plantation	remove
51045	BLACK COTTONWOOD	32"	2	42		remove
51046	FLOWERING PEAR	15"	2	14		remove
51047	SHORE PINE	20"	2	18		remove
51048	GIANT SEQUOIA	11"	2	8		remove
51049	GIANT SEQUOIA	13"	3	12		remove

Tag	**Species**	**DBH**	**Rating**	**Crown Diameter**	**Remarks**	**Action**
51050	GIANT SEQUOIA	12"	3	10		remove
51052	PIN OAK	28"	2	56	viable	remove
51053	HONEY LOCUST	2X9"-13"	2	28		remove
51054	KWANZAN CHERRY	23"	2	22		remove
51055	PONDEROSA PINE	21"	2	20	viable	PROTECT
51056	KWANZAN CHERRY	33"	2	32	viable	PROTECT
51057	KWANZAN CHERRY	26"	2	20	ganoderma	PROTECT
51076	SCOTS PINE	15"	2	20	plantation	remove
51077	SCOTS PINE	10"	2	20	plantation	remove
51078	SCOTS PINE	14"	2	20	plantation	remove
51079	SCOTS PINE	10"	2	8	plantation	remove
51080	SCOTS PINE	15"	2	18	plantation	remove
51081	SCOTS PINE	8"	2	6	plantation	remove
51082	SCOTS PINE	13"	2	18	plantation	remove
51083	SCOTS PINE	11"	2	18	plantation	remove
51084	SCOTS PINE	11"	2	16	plantation	remove
51085	SCOTS PINE	9"	2	10	plantation	remove
51086	SCOTS PINE	10"	2	16	plantation	remove
51087	SCOTS PINE	12"	2	18	plantation	remove
51088	SCOTS PINE	12"	2	16	plantation	remove
51089	SCOTS PINE	14"	2	20	plantation	remove
51090	SCOTS PINE	12"	2	22	plantation	remove
51091	SCOTS PINE	10"	2	16	plantation	remove
51092	SCOTS PINE	14"	2	20	plantation	remove
51093	SCOTS PINE	17"	2	20	plantation	remove
51094	PONDEROSA PINE	20"	2	20	viable	remove
51095	SCOTS PINE	14"	2	18	plantation	remove
51096	SCOTS PINE	14"	2	20	plantation	remove
51097	SCOTS PINE	12"	2	18	plantation	remove
51098	SCOTS PINE	12"	2	16	plantation	remove
51099	SCOTS PINE	6"	1	6	plantation	remove
51100	SCOTS PINE	9"	0	0	dead	remove
51101	SCOTS PINE	7"	2	8	plantation	remove
51102	SCOTS PINE	9"	1	12	plantation	remove
51103	SCOTS PINE	10"	2	8	plantation	remove
51104	SCOTS PINE	10"	2	8	plantation	remove
51105	SCOTS PINE	12"	2	16	plantation	remove
51106	SCOTS PINE	8"	2	16	plantation	remove
51107	SCOTS PINE	13"	2	16	plantation	remove
51108	SCOTS PINE	9"	2	8	plantation	remove
51109	SCOTS PINE	9"	2	10	plantation	remove
51110	SCOTS PINE	9"	2	12	plantation	remove
51111	SCOTS PINE	8"	1	6	plantation	remove
51112	SCOTS PINE	8"	1	6	plantation	remove
51113	SCOTS PINE	7"	1	4	plantation	remove
51114	SCOTS PINE	8"	1	4	plantation	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
51115	SCOTS PINE	9"	2	6	plantation	remove
51116	SCOTS PINE	7"	2	6	plantation	remove
51117	SCOTS PINE	8"	2	8	plantation	remove
51120	SCOTS PINE	12"	2	12	plantation	remove
51121	SCOTS PINE	8"	2	6	plantation	remove
51122	SCOTS PINE	8"	1	6	plantation	remove
51123	SCOTS PINE	8"	2	6	plantation	remove
51124	SCOTS PINE	7"	2	8	plantation	remove
51125	SCOTS PINE	9"	2	6	plantation	remove
51126	SCOTS PINE	9"	2	6	plantation	remove
51127	SCOTS PINE	7"	1	6	plantation	remove
51128	SCOTS PINE	7"	1	6	plantation	remove
51129	SCOTS PINE	10"	2	10	plantation	remove
51130	SCOTS PINE	7"	1	8	plantation	remove
51131	SCOTS PINE	8"	2	8	plantation	remove
51132	SCOTS PINE	8"	0	0	dead	remove
51133	SCOTS PINE	7"	0	0	dead	remove
51134	SCOTS PINE	9"	2	8	plantation	remove
51135	SCOTS PINE	6"	1	4	plantation	remove
51136	SCOTS PINE	10"	2	10	plantation	remove
51137	SCOTS PINE	11"	2	16	plantation	remove
51138	SCOTS PINE	9"	2	12	plantation	remove
51139	SCOTS PINE	14"	2	16	plantation	remove
51140	SCOTS PINE	9"	2	10	plantation	remove
51141	SCOTS PINE	9"	2		plantation	remove
51142	SCOTS PINE	11"	2	12	plantation	remove
51143	SCOTS PINE	9"	1	10	plantation	remove
51144	SCOTS PINE	9"	2	8	plantation	remove
51145	SCOTS PINE	7"	1	8	plantation	remove
51146	SCOTS PINE	11"	2	12	plantation	remove
51147	SCOTS PINE	8"	2	10	plantation	remove
51148	SCOTS PINE	6"	1	4	plantation	remove
51149	SCOTS PINE	7"	1	8	plantation	remove
51150	SCOTS PINE	7"	1	6	plantation	remove
51151	SCOTS PINE	9"	1	8	plantation	remove
51152	SCOTS PINE	7"	1	6	plantation	remove
51153	SCOTS PINE	8"	2	4	plantation	remove
51154	SCOTS PINE	8"	2	4	plantation	remove
51155	SCOTS PINE	12"	2	12	plantation	remove
51158	NORWAY SPRUCE	12"	2	14	plantation	remove
51159	NORWAY SPRUCE	12"	2	16	plantation	remove
51160	NORWAY SPRUCE	10"	1	10	plantation	remove
51161	NORWAY SPRUCE	12"	2	18	plantation	remove
51162	NORWAY SPRUCE	16"	2	26	plantation	remove
51163	NORWAY SPRUCE	16"	2	22	plantation	remove
51164	NORWAY SPRUCE	14"	2	28	plantation	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
51165	NORWAY SPRUCE	14"	2	24	plantation	remove
51166	NORWAY SPRUCE	12"	2	18	plantation	remove
51167	NORWAY SPRUCE	7"	1	8	plantation	remove
51168	NORWAY SPRUCE	10"	2	12	plantation	remove
51169	NORWAY SPRUCE	9"	2	14	stand grown	remove
51170	PONDEROSA PINE	16"	2	22	stand grown	remove
51171	NORWAY SPRUCE	12"	2	16	stand grown	remove
51172	NORWAY SPRUCE	10"	2	14	viable	remove
51173	DOUGLAS FIR	18"	2	24	viable	remove
51176	DOUGLAS FIR	2X14"	2	20	viable; co-dominant from base	PROTECT
51177	DOUGLAS FIR	16"	2	20	viable	PROTECT
51178	DOUGLAS FIR	18"	2	32	viable	remove
51179	DOUGLAS FIR	30"	2	36	viable	remove
51180	PONDEROSA PINE	21"	2	22	viable	remove
51181	PONDEROSA PINE	28"	2	36	viable	remove
51182	NORWAY SPRUCE	16"	2	18		remove
51183	NORWAY SPRUCE	14"	2	20		remove
51184	NORWAY SPRUCE	11"	2	16		remove
51185	NORWAY SPRUCE	15"	2	22	multiple tops	remove
51186	NORWAY SPRUCE	15"	1	20	excessive lean	remove
51187	DOUGLAS FIR	16"	2	22	viable; stand grown	remove
51188	DOUGLAS FIR	21"	2	28	viable	remove
51189	NORWAY SPRUCE	13"	1	24	excessive lean	remove
51190	NORWAY SPRUCE	18"	2	28	viable	remove
51191	PONDEROSA PINE	17"	2	24		remove
51192	SCOULER WILLOW	2X12"-21"	2	20	viable	remove
51193	NORWAY SPRUCE	12"	2	18		remove
51194	NORWAY SPRUCE	8"	2	12	stand grown	remove
51195	NORWAY SPRUCE	11"	2	16	stand grown	remove
51196	PONDEROSA PINE	21"	2	32	viable	remove
51197	PONDEROSA PINE	15"	2	20	viable	remove
51198	NORWAY SPRUCE	10"	2	10		remove
51199	NORWAY SPRUCE	16"	2	24	viable	remove
51200	SCOTS PINE	6"	2	12	viable	remove
51201	PONDEROSA PINE	26"	2	30	viable	remove
51202	PONDEROSA PINE	22"	2	26	viable	remove
51203	SCOTS PINE	6"	2	12	viable	remove
51204	PORT-ORFORD CEDAR	3X6"-8"	2	20	viable	remove
51205	NORWAY MAPLE	12"	2	20	viable	remove
51206	PIN OAK	6"	2	16	viable	remove
51207	DOUGLAS FIR	22"	2	20	viable; stand grown	PROTECT
51208	DOUGLAS FIR	16"	2	16	viable; stand grown	PROTECT
51209	DOUGLAS FIR	17"	2	22	viable; stand grown	PROTECT
51210	DOUGLAS FIR	23"	2	30	viable; stand grown	PROTECT
51211	DOUGLAS FIR	19"	2	26	viable; stand grown	remove
51212	DOUGLAS FIR	18"	2	20	viable; stand grown	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
51214	NORWAY SPRUCE	15"	2	22	hedgerow	remove
51215	gone	0	0	0	stump	remove
51216	NORWAY SPRUCE	12"	2	14	viable; hedgerow	remove
51217	NORWAY SPRUCE	14"	2	18	viable; hedgerow	remove
51218	NORWAY SPRUCE	13"	2	18	viable; hedgerow	remove
51219	NORWAY SPRUCE	9"	1	8	hedgerow	remove
51220	NORWAY SPRUCE	12"	2	16	hedgerow	remove
51221	NORWAY SPRUCE	13"	2	18	hedgerow; windthrow	remove
51223	NORWAY SPRUCE	16"	2	18	hedgerow	remove
51224	NORWAY SPRUCE	23"	2	26	hedgerow	remove
51225	NORWAY SPRUCE	8"	1	8	hedgerow; windthrow	remove
51226	NORWAY SPRUCE	11"	2	14	hedgerow; windthrow	remove
51227	NORWAY SPRUCE	18"	2	18	viable; hedgerow	remove
51228	NORWAY SPRUCE	20"	2	20	viable; hedgerow	remove
51231	NORWAY SPRUCE	16"	2	26	hedgrow; windthrow	remove
51232	NORWAY SPRUCE	15"	2	22	hedgrow; windthrow	remove
51233	NORWAY SPRUCE	10"	2	12	hedgrow; windthrow	remove
51234	NORWAY SPRUCE	17"	2	22	viable; hedgerow	remove
51235	NORWAY SPRUCE	12"	1	12	viable; hedgerow	remove
51236	NORWAY SPRUCE	16"	2	20	viable; hedgerow	remove
51237	gone	0	0	0	stump	remove
51238	NORWAY SPRUCE	19"	2	24	viable; hedgerow	remove
51239	APPLE	10"	1	16	orchard pruned	remove
51240	APPLE	11"	1	18	orchard pruned	remove
51241	SCOTS PINE	3X14"-16"	2	40	viable; hedgerow	remove
51242	SCOTS PINE	2X10"-15"	2	28	viable; hedgerow	remove
51243	SCOTS PINE	21"	2	28	viable; hedgerow	remove
51244	SCOTS PINE	20"	2	36	viable; hedgerow	remove
51245	SCOTS PINE	19"	2	32	viable; hedgerow	remove
51246	SCOTS PINE	28"	2	36	viable; hedgerow	remove
51247	SCOTS PINE	21"	2	34	viable; hedgerow	remove
51248	SCOTS PINE	16"	2	32	viable; hedgerow	remove
51249	SCOTS PINE	21"	2	30	viable; hedgerow	remove
51250	SCOTS PINE	19"	2	23	viable; hedgerow	remove
51251	SCOTS PINE	17"	2	23	viable; hedgerow	remove
51252	SCOTS PINE	15"	2	28	viable; hedgerow	remove
51253	SCOTS PINE	14"	2	30	viable; hedgerow	remove
51254	SCOTS PINE	16"	2	36	viable; hedgerow	remove
51255	SCOTS PINE	14"	2	28	viable; hedgerow	remove
51256	SCOTS PINE	27"	2	28	viable; hedgerow	remove
51257	SCOTS PINE	16"	2	24	viable; hedgerow	remove
51258	SCOTS PINE	17"	2	26	viable; hedgerow	remove
51259	SCOTS PINE	18"	2	30	viable; hedgerow	remove
51260	SCOTS PINE	23"	2	40	viable; hedgerow	remove
51261	SCOTS PINE	23"	2	38	viable; hedgerow	remove
51262	SCOTS PINE	19"	2	36	viable; hedgerow	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
51263	SCOTS PINE	17"	2	34	viable; hedgerow	remove
51264	SCOTS PINE	24"	2	38	viable; hedgerow	remove
51265	SCOTS PINE	22"	2	32	viable; hedgerow	remove
51266	SCOTS PINE	4X7"-20"	2	38	viable; hedgerow	remove
51267	SCOTS PINE	3X10"-36"	2	40	viable; hedgerow	remove
51268	PONDEROSA PINE	24"	2	30	viable	remove
51269	PORT-ORFORD CEDAR	9"	2	18	viable	remove
52608	NORWAY MAPLE	20"	2	26		remove
52609	NORWAY SPRUCE	18"	1	22	wound on base	remove
52610	NORWAY SPRUCE	18"	2	30		remove
52611	HONEY LOCUST	18"	2	30	co-dominant	remove
52612	DOUGLAS FIR	20"	2	36		remove
52613	WESTERN RED CEDAR	12"	2	22	viable;	remove
52614	WESTERN RED CEDAR	12"	1	16	decline	remove
52615	PONDEROSA PINE	24"	2	30		remove
52616	PACIFIC YEW	10"	2	18		remove
52617	ENGLISH HOLLY	8"	2	8		remove
52618	ENGLISH HOLLY	8"	2	8		remove
52648	SHORE PINE	10"	2	20		remove
52649	NORWAY MAPLE	8"	2	16		remove
52650	PACIFIC YEW	8X4"-8"	2	10		remove
53538	CHERRY	12"	2	20	grafted fruiting variety	remove
53539	CHERRY	10"	2	16	grafted fruiting variety	remove
53540	CHERRY	10"	2	14	grafted fruiting variety	remove
53541	CHERRY	10"	2	22	grafted fruiting variety	remove
53542	CHERRY	12"	2	16	grafted fruiting variety	remove
53543	CHERRY	12"	2	16	grafted fruiting variety	remove
53544	BLUE SPRUCE	12"	2	14	grow under high voltage lines	remove
53545	APPLE	8"	2	14	orchard pruned	remove
53546	APPLE	8"	2	16	orchard pruned	remove
53547	APPLE	8"	2	14	orchard pruned	remove
53548	APPLE	8"	2	12	orchard pruned	remove
53549	APPLE	12"	2	20	orchard pruned	remove
53550	APPLE	8"	2	16	orchard pruned	remove
53551	CRYPTOMERIA	10X3"-10"	2	16	multiple stems	remove
53552	DOUGLAS FIR	22"	2	28	stand grown	remove
53553	DOUGLAS FIR	20"	2	28	stand grown	remove
53556	DOUGLAS FIR	20"	2	30	stand grown	remove
53558	DOUGLAS FIR	14"	2	26	stand grown	remove
53559	DOUGLAS FIR	18"	2	26	stand grown	remove
53561	DOUGLAS FIR	24"	2	24	stand grown	remove
53756	DOUGLAS FIR	10"	2	12	hedgerow	remove
53757	DOUGLAS FIR	12"	2	16	hedgerow	remove
53758	DOUGLAS FIR	12"	2	16	hedgerow	remove
53759	DOUGLAS FIR	12"	2	18	hedgerow	remove
53760	DOUGLAS FIR	12"	2	16	hedgerow	remove

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
53761	DOUGLAS FIR	10"	2	16	hedgerow	remove
53762	DOUGLAS FIR	10"	2	18	hedgerow	remove
53763	DOUGLAS FIR	12"	2	14	hedgerow	remove
53764	DOUGLAS FIR	12"	2	20	hedgerow	remove
53765	DOUGLAS FIR	12"	2	18	hedgerow	remove
53766	DOUGLAS FIR	10"	2	16	hedgerow	remove
53767	DOUGLAS FIR	12"	2	18	hedgerow	remove
53768	DOUGLAS FIR	9"	2	14	hedgerow	remove
53769	DOUGLAS FIR	9"	2	12	hedgerow	remove
53770	DOUGLAS FIR	14"	2	20	hedgerow	remove
53771	DOUGLAS FIR	10"	2	18	hedgerow	remove
53772	DOUGLAS FIR	12"	2	18	hedgerow	remove
53773	DOUGLAS FIR	12"	2	14	hedgerow	remove
53774	DOUGLAS FIR	9"	2	14	hedgerow	remove
53775	DOUGLAS FIR	12"	2	14	hedgerow	remove
53776	DOUGLAS FIR	10"	2	12	hedgerow	remove
53777	DOUGLAS FIR	10"	2	12	hedgerow	remove
53778	DOUGLAS FIR	9"	2	12	hedgerow	remove
53779	DOUGLAS FIR	9"	2	10	hedgerow	remove
53780	DOUGLAS FIR	8"	2	10	hedgerow	remove
53781	DOUGLAS FIR	9"	2	12	hedgerow	remove
53782	DOUGLAS FIR	9"	2	12	hedgerow	remove
53783	DOUGLAS FIR	11"	2	14	hedgerow	remove
53784	DOUGLAS FIR	8"	2	12	hedgerow	remove
53785	DOUGLAS FIR	10"	2	26	hedgerow	remove
53786	DOUGLAS FIR	8"	2	26	hedgerow	remove
53787	DOUGLAS FIR	8"	2	30	hedgerow	remove
53788	DOUGLAS FIR	9"	2	28	hedgerow	remove
53789	DOUGLAS FIR	6"	1	8	hedgerow	remove
53790	DOUGLAS FIR	9"	1	10	teminal decline	remove
53791	DOUGLAS FIR	7"	1	10	chlorotic	remove
53792	DOUGLAS FIR	9"	1	14	chlorotic	remove
53793	DOUGLAS FIR	8"	1	14	dying	remove
53794	DOUGLAS FIR	10"	0	0	dead	remove
53795	DOUGLAS FIR	10"	0	0	dead	remove
53796	EUROPEAN BIRCH	12"	2	26		remove
53822	BLACK COTTONWOOD	3X10"-16"	2	34	3 stems from base	remove
53823	BLACK COTTONWOOD	6"	2	14		remove
53824	BLACK COTTONWOOD	10"	2	20		remove
53827	CRABAPPLE	6"	2	16		remove
53976	DOUGLAS FIR	20"	2	34	viable	remove
53977	SCOULER WILLOW	9X6"-12"	2	30	multiple stems	remove
53978	PONDEROSA PINE	24"	2	24	viable	remove
53979	DOUGLAS FIR	18"	2	24	viable	remove
53980	EUROPEAN BIRCH	10"	1	12	dead top; wood borers	remove
53981	DOUGLAS FIR	24"	2	36	viable	PROTECT

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action
53982	PONDEROSA PINE	30"	2	36	viable; co-dominant @ 8'	remove
53983	DOUGLAS FIR	18"	2	18	viable	remove
53984	DOUGLAS FIR	6"	1	10	suppressed	remove
53985	DOUGLAS FIR	20"	2	22	viable	remove
53986	DOUGLAS FIR	9"	1	10	dead top	remove
53987	DOUGLAS FIR	14"	2	12	viable	remove
53988	DOUGLAS FIR	16"	2	22	viable	remove
53989	DOUGLAS FIR	14"	2	20	viable	remove
53990	DOUGLAS FIR	10"	2	16	viable	remove
53991	DOUGLAS FIR	17"	2	16	viable	remove
53992	DOUGLAS FIR	12"	2	18	viable	remove
53993	DOUGLAS FIR	14"	2	16	viable	remove
53994	EUROPEAN BIRCH	12"	2	18		remove
53995	EUROPEAN BIRCH	10"	1	18	wood borers	remove
54626	DOUGLAS FIR	12"	2	16	viable	remove
54627	DOUGLAS FIR	14"	2	24	viable	remove
54628	DOUGLAS FIR	12"	2	22	viable	remove
54629	ENGLISH HAWTHORN	6"	2	20		remove

Rating Column: 0 is dead or hazardous; 1 is declining; 2 is average; 3 is excellent.

Tag	Species	DBH	Rating	Crown Diameter	Remarks	Action

SPECIES:

APPLE- Malus sp.
BIRD CHERRY- Prunus avium
BLACK COTTONWOOD- Populus trichocarpa
BLUE SPRUCE- Picea pungens
CHERRY- Prunus sp.
CRABAPPLE- Malus sp.
CRYPTOMERIA- Cryptomeria sp.
DOUGLAS FIR- Pseudotsuga menziesii
EUROPEAN BIRCH- Betula pendula
ENGLISH HAWTHORN- Crataegus laevigata
ENGLISH HOLLY- Ilex aquifolium
ENGLISH WALNUT- Juglans regia
FLOWERING PEAR- Pyrus sp.
GIANT SEQUOIA- Sequoiadendron giganteum
HONEY LOCUST- Gleditsia triacanthos
JAPANESE MAPLE- Acer palmatum
KWANZAN CHERRY- Prunus 'Kanazan
NORWAY MAPLE- Acer platanoides
NORWAY SPRUCE- Picea abies
PACIFIC YEW- Taxus brevifolia
PIN OAK- Quercus palustris
PONDEROSA PINE- Pinus ponderosa
PORT-ORFORD CEDAR- Chamaecyparis lawsoniana
SCOTS PINE- Pinus sylvestris
SCOULER WILLOW- Salix scouleriana
SHORE PINE- Pinus contorta
WESTERN RED CEDAR- Thuja plicata

Appendix G

HGSI | HARDMAN GEOTECHNICAL SERVICES INC.
Practical, Cost-Effective Geotechnical Solutions

November 17, 2017
Project No. 17-2248

Dan Grimberg / Miriam Wilson
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, Oregon 97210

Copy: Mike Peebles / Matt Klym / Rose Horton, Otak, Inc.

Via email (pdf format); hard copies provided on request

Subject: **Supplemental Infiltration Testing**
Frog Pond
Wilsonville, Clackamas County, Oregon

References:

1. *Geotechnical Engineering Report, Pike Property, 7025 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* Hardman Geotechnical Services Inc. (HGSI) report dated January 13, 2017.
2. *Geotechnical Engineering Report, Krielkamp Property, 6875 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* HGSI report dated October 26, 2016.
3. *Geotechnical Engineering Report, Wehler Property, 6855 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* HGSI report dated October 26, 2016.
4. *Geotechnical Engineering Report, Killinger Property, 6651 SW Boeckman Road, Wilsonville, Clackamas County, Oregon;* HGSI report dated February 2, 2017.

As requested, Hardman Geotechnical Services Inc. (HGSI) performed supplemental soil infiltration testing for the property currently referred to as “Frog Pond.” This property is an assemblage of separate properties that have had geotechnical reports prepared for them, as listed in the above References 1-4. Figure 1 shows the approximate extent of the original separate properties, and the overall project boundary. The previous report areas and geotechnical report dates are also shown on Figure 1, at the bottom.

The purpose of this supplemental work was to evaluate infiltration rates for subsurface disposal of storm water. We understand that design of the stormwater infiltration system is to be completed by others. Results of the infiltration testing are summarized below.

SITE AND PROJECT DESCRIPTION

The four properties comprising the site total about 16.2 acres based on information obtained from the Clackamas County GIS website. There is an existing home on each of the four properties, and numerous barns and outbuildings. The site is flat to gently sloping.

We understand the proposed development will consist of a residential subdivision with new streets, underground utilities, stormwater facilities and other appurtenant facilities. The site grading plan has not yet been completed; although we anticipate relatively short / high cuts and fills due to the relatively flat relief of the site.

Figure 1 shows preliminary locations of LIDA facilities that may be planned as part of the project. Based on conversations with the project design team, target infiltration depth of about 4 feet below ground surface (bgs) was selected for the infiltration testing, which is consistent with the bottom depth of LIDA structures and the stormwater swale planned in the central portion of the site (see Figure 1).

FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Previously, HGSI excavated multiple exploratory test pits on the various properties, as reported in References 1-4. Dynamic cone penetrometer (DCP) testing was also performed at various locations on the properties, to provide subgrade soil strength for pavement section design. To provide a more complete picture of subsurface conditions as they are presently characterized for the site, the logs of the previous explorations are attached to this report. For each of the four properties, the Site and Exploration Plan from the previous geotechnical reports (References 1-4) is attached, followed by the test pit logs from those previous reports.

For the current study, HGSI drilled six exploratory hand auger borings for infiltration testing to approximate depths of 4 feet bgs. The hand auger / infiltration test locations are designated IT-1 through IT-6. The test holes were drilled using hand auger tools, at the approximate locations shown on the attached site plan (Figure 1). Hand auger boring logs are attached to this report, immediately following Figure 1.

It should be noted that exploration locations were determined in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided and should therefore be considered approximate. During the exploration, HGSI observed and recorded pertinent soil information such as color, stratigraphy, strength, and soil moisture. Soils were classified in general accordance with the Unified Soil Classification System (USCS). At the completion of each infiltration test, the excavation was backfilled using the excavated soils, and tamped into place.

SOIL CONDITIONS

Results of the previous test pits, and the hand auger borings conducted for the current study, indicate the on-site soils to consist of topsoil, clayey silt, and clay, as described below.

> ***Topsoil*** **–** From the ground surface, all test pits and hand auger borings encountered 1.5 to 2 feet of topsoil, comprised of moist silt. The upper about 1 foot of the topsoil was highly organic.
>
> ***Gray Clay*** **–** Directly beneath the top soil in several of the test pits we encountered gray clay. The clay was encountered in IT-5 (Current Study); TP-2 (Pike Property); TP-5 and TP-6 (Krielkamp and Wehler Properties); and was not encountered at the Killinger Property. The clay ranged from medium stiff to stiff and dry to very moist. The clay was highly plastic and extended to roughly depths of about 2 to 3.5 feet bgs.
>
> ***Clayey Silt*** **–** Beneath the topsoil and clay (where encountered) in the test pits and hand auger borings, we encountered very stiff to hard, moist to dry, brown clayey silt with orange and gray mottling. All of the hand auger borings and test pits terminated in the clayey silt unit, at depths of about 4 feet bgs (hand auger borings), and 7 to 10 feet bgs (excavator test pits).

GROUNDWATER

During the field exploration, no static groundwater table was encountered in any of the explorations. Perched surface water / seepage was encountered at shallow depths in several of the hand auger borings and test pits, as summarized on the following table.

Table 1. Summary of Perched Surface Water / Seepage in Explorations

Test Pit	Property / Former Study	Seepage Depth (feet bgs)	Date of Exploration (MM-DD-YY)
HA-6	Current	2	11-10-17
TP-1	Pike	7	12-28-16
TP-3	Pike	2	12-28-16
TP-4	Pike	2	12-28-16
TP-1	Krielkamp / Wehler	3	10-18-16
TP-3	Krielkamp / Wehler	3.5	10-18-16
TP-1	Killinger	3 and 7	01-27-17
TP-2	Killinger	3	01-27-17
TP-3	Killinger	3 and 6.5	01-27-17
TP-4	Killinger	3 and 8	01-27-17

Perched surface water or seepage was not encountered in any of the other explorations, at the time of exploration. Perched water conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. When using the above information it is important to take into account the time of year of the particular exploration. For example, the Killinger Property test pits were conducted during a period of historic, heavy rainfall last winter, while the Pike Property test pits were conducted at the end of the dry season in 2016.

It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. The groundwater conditions reported above are for the specific date and locations indicated, and therefore may not necessarily be indicative of other times and/or locations.

INFILTRATION TESTING

Soil infiltration testing was performed using the open hole, falling head method in hand auger borings IT-1 through IT-7, on November 9 and 10, 2017. Soils in the boring were pre-saturated overnight, a minimum of 12 hours prior to testing. Following the soil saturation, the infiltration test was conducted. The water level was measured to the nearest 0.1 inch from a fixed point. The change in water level was recorded at intervals for a total period of at least 2 hours. Table 2 presents the results of the falling head infiltration tests.

Table 2. Summary of Infiltration Test Results

Test Pit	Depth (feet bgs)	Soil Type	Infiltration Rate (in/hr)	Approx. Average Hydraulic Head Range (inches)
HA-1	4	Clayey Silt	**0.1**	15.5
HA-2	4	Clayey Silt	**0.15**	11.6
HA-3	4	Clayey Silt	**0.5**	9.5
HA-4	4	Clayey Silt	**0.5**	16.5
HA-5	4	Clayey Silt	**0.2**	17.5
HA-6	4	Clayey Silt	Not Tested – Perched Water	N/A

CONCLUSIONS AND RECOMMENDATIONS
INFILTRATION RATES AND STORMWATER SYSTEM DESIGN

Based on results of the soil infiltration testing, soils on site exhibit low infiltration rate where test holes did not encounter perched water. Infiltration rates ranged from 0.1 to 0.5 inches/hour as tabulated. We recommend shallow systems in the range of 2 to 5 feet bgs be designed using an infiltration rate of **0.2 inches/hour**. This is slightly less than the average test value of 0.29 inches/hour, but we feel 0.2 inches/hour is more representative of overall site conditions. Also, please note that the potential for infiltration of stormwater will be reduced during the wet season due to saturated soils / perched water conditions over much of the site. We do not believe the site is well suited for use of deeper infiltration facilities such as dry wells due to the very low-permeability site soils, and perched water conditions.

The designer should select an appropriate infiltration value based on our test results and the location of the proposed infiltration facility. The recommended infiltration rates do not incorporate a factor of safety. For the design infiltration rate, the system designer should incorporate an appropriate factor of safety against slowing of the rate over time due to biological and sediment clogging.

Infiltration test methods and procedures attempt to simulate the as-built conditions of the planned disposal system. However, due to natural variations in soil properties, actual infiltration rates may vary from the measured and/or recommended design rates. All systems should be constructed such that potential overflow is discharged in a controlled manner away from structures, and all systems should include an adequate factor of safety. Infiltration rates presented in this report should not be applied to inappropriate or complex hydrological models such as a closed basin without extensive further studies.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and his/her consultants for use in design of this project only. The conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HGSI should be notified for review of the recommendations of this report, and revision of such if necessary.

Within the limitations of scope, schedule and budget, HGSI executed these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

HARDMAN GEOTECHNICAL SERVICES INC.

64,422PE
SEPTEMBER 26, 2000
SCOTT L. HARDMAN

11-17-17

EXPIRES: 06-30-2019

Scott L. Hardman, P.E., G.E.
Geotechnical Engineer

Attachments: Figure 1 - Site and Exploration Plan
Logs of Hand Auger Borings HA-1 through HA-6 (Current Study)
Figure 2 and Previous Test Pit Logs, Pike Property (Reference 1)
Figure 2 and Previous Test Pit Logs, Krielkamp and Wehler Properties (References 2 and 3)
Figure 2 and Previous Test Pit Logs, Killinger Property (Reference 4)

HARDMAN GEOTECHNICAL SERVICES INC.
Practical, Cost-Effective Geotechnical Solutions

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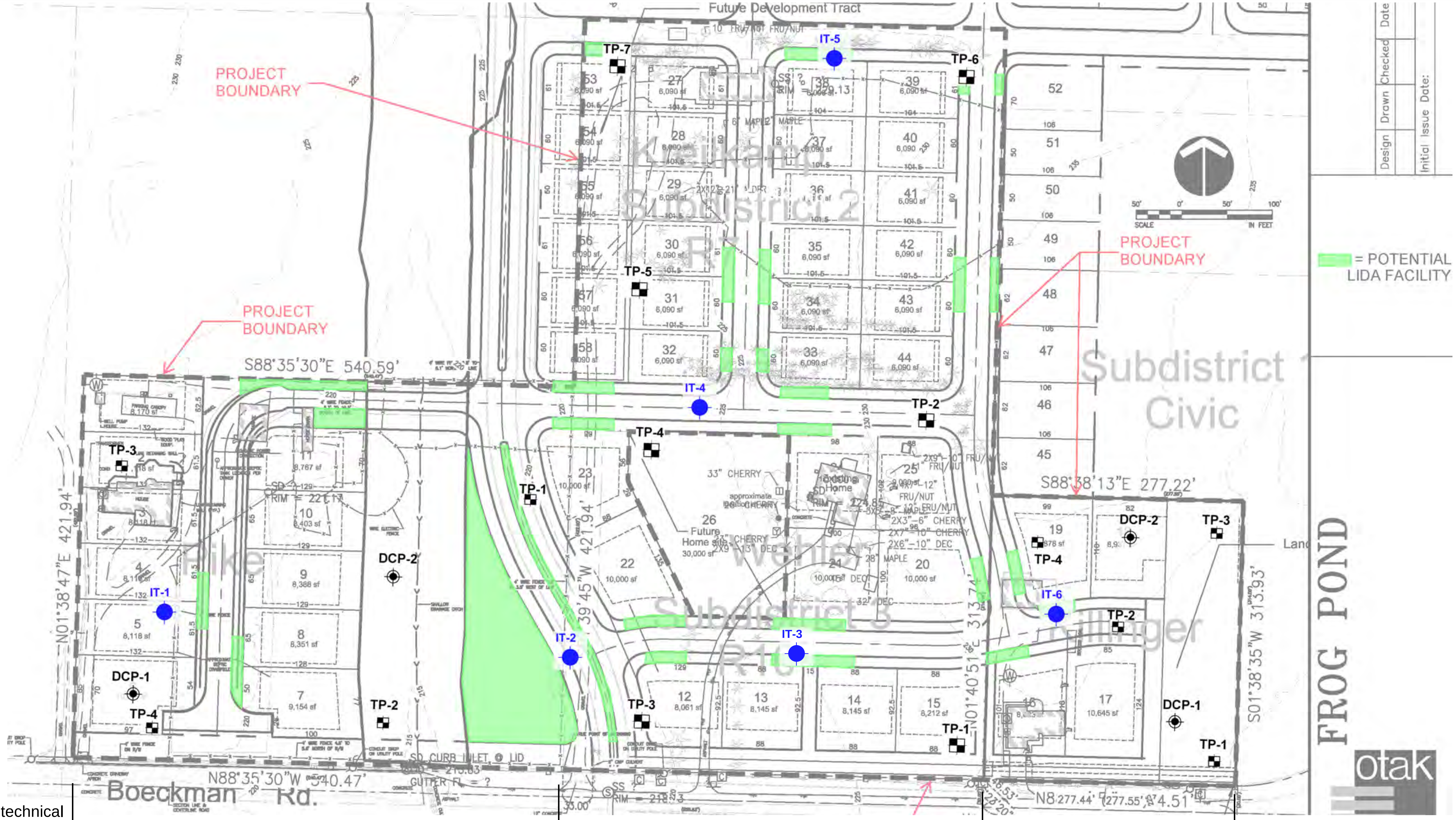
EXPLORATION LOCATIONS



Previous Geotechnical Report Area:	Pike Property	Krielkamp & Wehler Properties	Killinger Property
HGSI Report Date:	January 13, 2017	October 26, 2016	February 2, 2017

LEGEND

TP-5 ◪	Previous Test Pit Location
DCP-2 ⊕	Previous Dynamic Cone Penetrometer (DCP) Test Location
IT-6 ●	Infiltration Test (Hand Auger Boring) Approx. Location

Project No. 17-2248

Frog Pond
Wilsonville, Oregon

FIGURE 1

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1						
2						Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3						
4						Auger boring terminated at 4 feet No seepage encountered
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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(503) 530-8076

LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11-10-17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties Wilsonville, Oregon	Project No. 17-2248	Test Pit No. IT- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	**Material Description**
1						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2						Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
3						
4						
5						Auger boring terminated at 4 feet No seepage encountered
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 11-10-17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2 3						Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4 5 6 7 8 9 10 11 12 13 14 15 16 17						Auger boring terminated at 4 feet No seepage encountered

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11- 9 -17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 4

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1						
2						Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
3						
4						Auger boring terminated at 4 feet No seepage encountered
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11- 9 -17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties
Wilsonville, Oregon

Project No. 17-2248

Test Pit No. IT- 5

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2						Medium stiff, Clay, gray, moist
3						Stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4						
5						Auger boring terminated at 4 feet No seepage encountered
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11- 9 -17

Logged By: EAH

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Frog Pond Properties Wilsonville, Oregon	Project No. 17-2248	Test Pit No. IT- 6

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1						
2					▽	Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3						
4						
5						Auger boring terminated at 4 feet Wet soils / seepage encountered at 2 feet
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 11-10-17

Logged By: EAH

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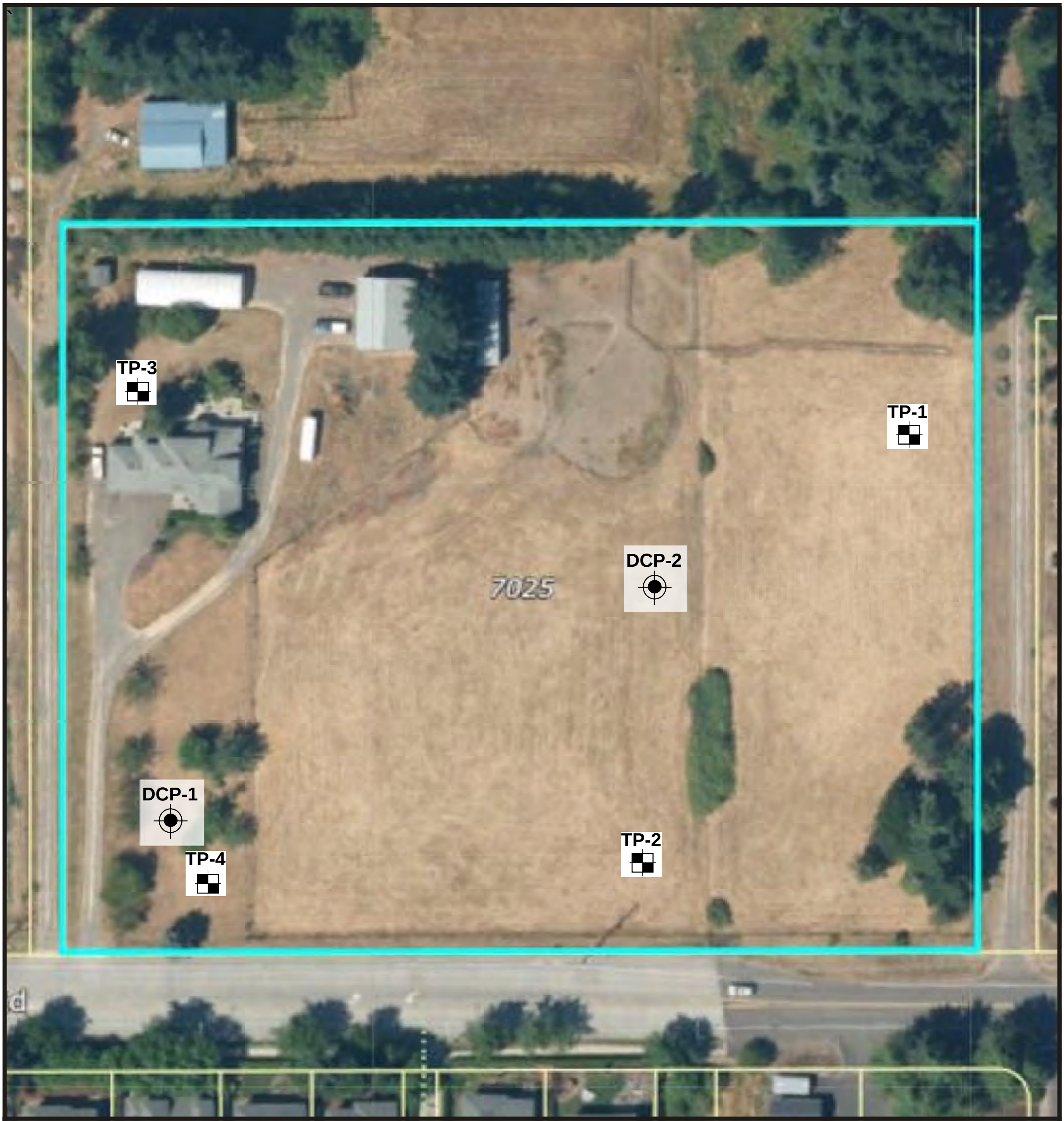
SITE AND EXPLORATION PLAN



Legend

TP-1 ▨ Test Pit Designation and Approximate Location

DCP-1 ⊕ DCP Test Designation and Approximate Location

Base map obtained from Portland Maps

Project: Pike Property Wilsonville, Oregon	Project No. 16-2151	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.0					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	3.5					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 7 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1	▽
Soil Sample Depth Interval and Designation	Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.5					Medium stiff, Clay, gray, moist to slightly moist
2	1.5					
3	2.5					Stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
4	>4					
5						
6						
7						Test pit terminated at 7 feet due to hard soils No groundwater or seepage encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.5					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						Test pit terminated at 8 feet due to hard soils Seepage encountered at 2 feet
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	2.5					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 9 feet due to hard soils Seepage encountered at 3 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

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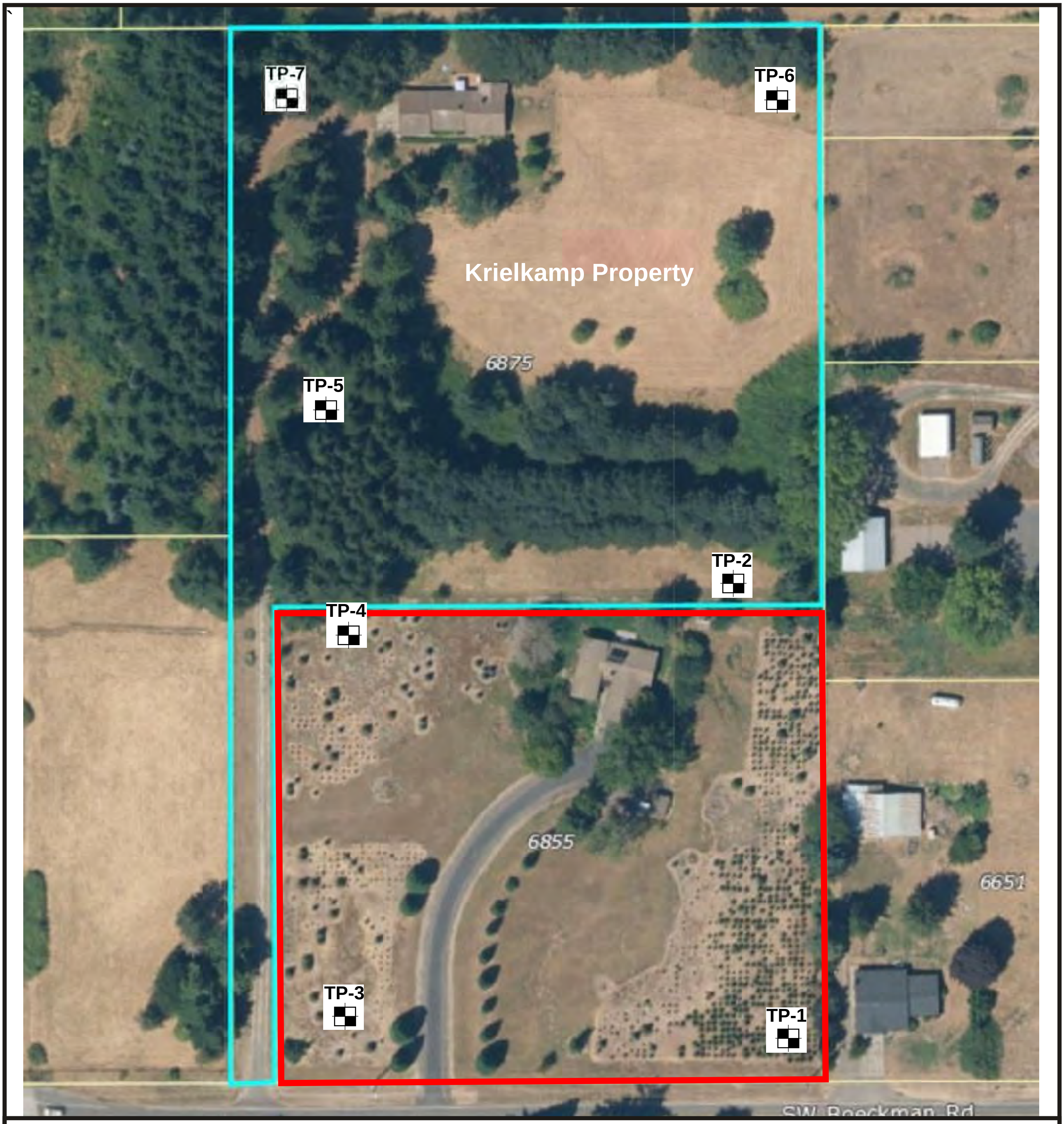
SITE AND EXPLORATION PLAN



Legend

TP-7 ▣ Test Pit Designation and Approximate Location

Base map obtained from
www.portlandmaps.com

Project Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet Slight seepage encountered at 3 feet
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet No seepage or groundwater encountered
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP-3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet Slight seepage at 3.5 feet
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties Wilsonville, Oregon	Project No. 16-2119	Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 5

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	1.0					
2	2.0					Stiff, Clay, gray, dry
3	3.5					
4	>4					Very stiff to hard, Clayey silt, brown with orange and gray mottling, dry
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP-6

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.0					
2	0.75					Medium stiff, Clay, gray, moist
3	1.5					
4	2.5					
5						Stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 7

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.0					
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

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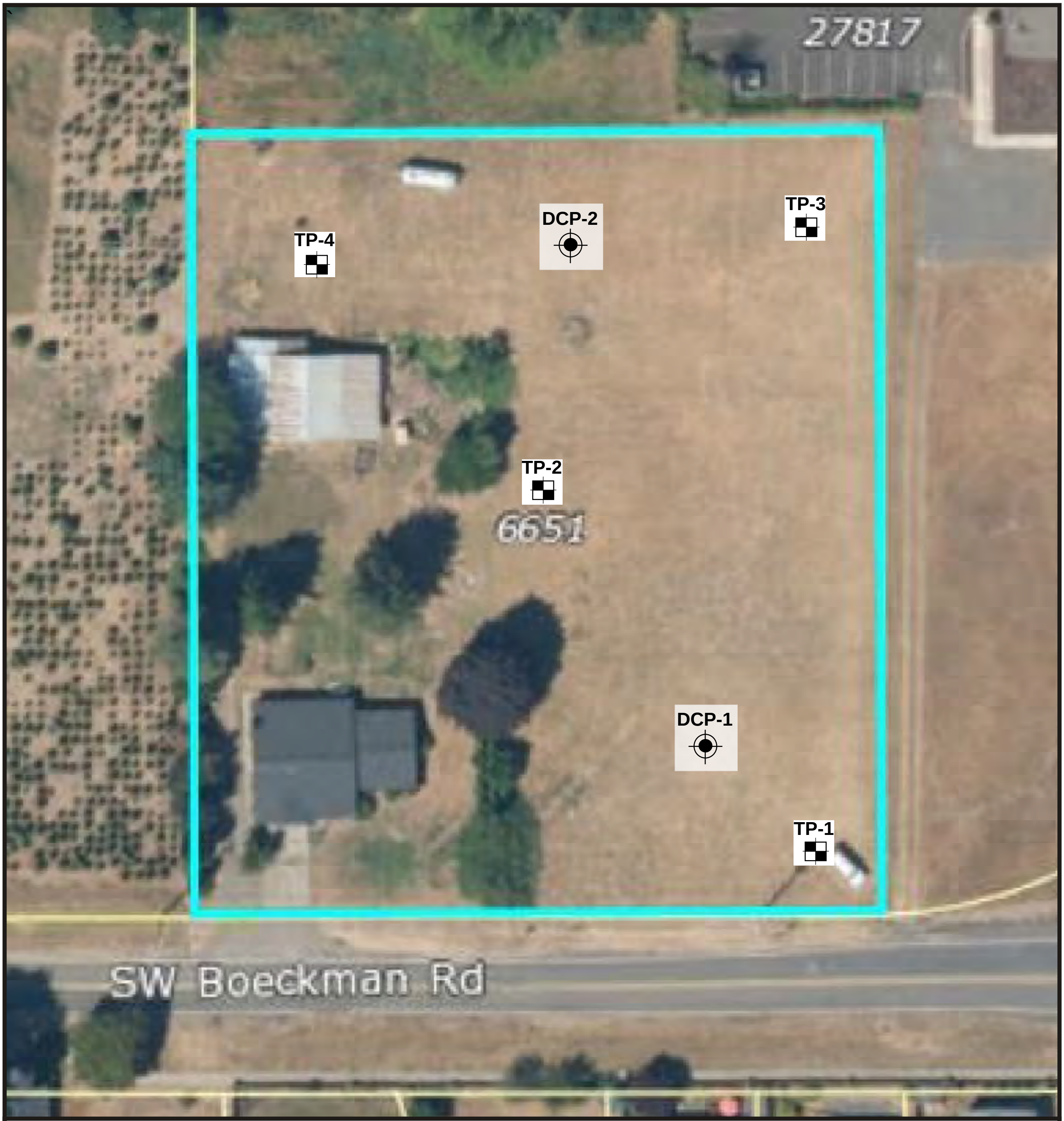
SITE AND EXPLORATION PLAN



Legend

TP-1 ▨ Test Pit Designation and Approximate Location

DCP-1 ⊕ DCP Designation and Approximate Location

Base map provided by Portland Maps

Project: Killinger Property Wilsonville, Oregon	Project No. 16-2159	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	1.0					
2	4.0					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	>4					
4	>4					
5						
6						
7						
8						
9						
10						
11						Test pit terminated at 10 feet Seepage encountered at 3 and 7 feet
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.25					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 3 feet
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.25					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 3 and 6.5 feet
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	3.0					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	2.5					
4	4.0					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 3 and 8 feet
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

HARDMAN GEOTECHNICAL SERVICES INC.
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February 2, 2017
HGSI Project No. 16-2159

Dan Grimberg / Miriam Wilson
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, Oregon 97210

Via e-mail (pdf format); hard copies can be mailed on request

Subject: **GEOTECHNICAL ENGINEERING REPORT**
KILLINGER PROPERTY
6651 SW BOECKMAN ROAD
WILSONVILLE, CLACKAMAS COUNTY, OREGON

This report presents the results of a geotechnical engineering study conducted by Hardman Geotechnical Services Inc. (HGSI) for the above-referenced project. The purpose of this study was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with your authorization of the proposed scope of work and *General Conditions for Geotechnical Services*.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

This geotechnical evaluation was performed the Killinger Property (6651 SW Boeckman Road). The property totals roughly 2.0 acres and is rectangular in shape. There are a few structures occupying the site including a single family home and a barn. Vegetation consists of grasses, trees, and bushes.

The intent of this geotechnical report is to provide adequate geotechnical information for design and construction. A grading plan has not been finalized and should be reviewed by HGSI when completed. Underground utilities and onsite stormwater systems are also planned. HGSI should review the grading plan when available to verify consistency with the geotechnical recommendations, and to provide any supplemental or revised input to the design needed based on geotechnical considerations.

REGIONAL GEOLOGY AND SEISMIC SETTING

The subject site lies within the Portland Basin, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. The Portland Basin is a northwest-southwest trending structural basin produced by broad regional downwarping of the area. The Portland Basin is approximately 20 miles wide and 45 miles long and is filled with consolidated and unconsolidated sedimentary rocks of late Miocene, Pliocene and Pleistocene age.

The subject site is underlain by Quaternary age (last 1.6 million years) loess, a windblown silt deposit that mantles older deposits and basalt bedrock in the Portland Hills (Madin, 1990). The loess generally consists of massive silt deposited following repeated catastrophic flooding events in the Willamette Valley, the last of which occurred about 10,000 years ago. In localized areas, the loess includes buried paleosols that developed between depositional events. Regionally, the total thickness of loess ranges from 5 feet to greater than 100 feet.

The loess is underlain by residual soil formed by in place weathering of the underlying Columbia River Basalt Formation (Madin, 1990). The Miocene aged (about 14.5 to 16.5 million years ago) Columbia River Basalts are a thick sequence of lava flows which form the crystalline basement of the Tualatin Valley. The basalts are composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. Individual basalt flow units typically range from 25 to 125 feet thick and interflow zones are typically vesicular, scoriaceous, brecciated, and sometimes include sedimentary rocks.

At least three major fault zones capable of generating damaging earthquakes are known to exist in the region. These include the Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone. These potential earthquake source zones are included in the determination of seismic design values for structures, as presented in the *Seismic Design* section. None of the known faults extend beneath the site.

FIELD EXPLORATION – EXPLORATORY TEST PITS

The site-specific exploration for this study was conducted on January 27, 2017 and consisted of four test pits (designated TP-1 through TP-4) excavated to depths of approximately 10 feet below ground surface (bgs) at the approximate locations shown on Figure 2. It should be noted that exploration locations were determined in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

Explorations were conducted under the full-time observation of HGSI personnel. Soil samples obtained from the borings were classified in the field and representative portions were placed in relatively air-tight plastic bags. These soil samples were then returned to the laboratory for further examination. Pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence was recorded. Soils were classified in general accordance with the Unified Soil Classification System.

Summary test pit logs are attached to this report. The stratigraphic contacts shown on the individual borehole logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times.

Subgrade Soil Evaluation – DCP Testing

On January 27, 2017, HGSI conducted Dynamic Cone Penetrometer (DCP) tests to determine the strength parameters of the in-situ soil for support of pavement. Tests were performed at the approximate locations shown on Figure 2. Test equipment and methodology were in general accordance with ASTM Test Method D6951/D6951M – 09, *Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications*. Correlated California Bearing Ratio (CBR) values at the test locations are summarized on Table 1, for the depth intervals indicated. Correlated CBR values were determined using ASTM D6951/D6951M - 09.

Table 1. DCP Field Test Results and Correlated CBR Values

Test Designation	Material Tested	Depth Interval (feet)	Average Penetration Per Blow (mm)	Correlated CBR
DCP-1	Native Soil	1.6 – 3.3	14	7.5
DCP-2	Native Soil	2.4 – 3.4	9.5	11

SUBSURFACE CONDITIONS

The following discussion is a summary of subsurface conditions encountered in our explorations. For more detailed information regarding subsurface conditions at specific exploration locations, refer to the attached test pit logs. Also, please note that subsurface conditions can vary between exploration locations, as discussed in the *Uncertainty and Limitations* section below.

Soil

On-site soils are anticipated to consist of topsoil and clayey silt, as described below.

> ***Topsoil –*** From the ground surface, all test pits encountered about 1 foot of topsoil, comprised of moist silt. The upper about 6 inches of the topsoil was highly organic.
>
> ***Clayey Silt –*** Beneath the topsoil in the test pits, we encountered medium stiff to hard, moist to slightly moist, brown clayey silt with orange and gray mottling. All of the test pits terminated in the clayey silt unit, at depths of 10 feet bgs.

Groundwater

During the field exploration, slight to moderate seepage was encountered in all test pits at about 3 and 7 feet bgs. Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. The groundwater conditions reported above are for the specific date and locations indicated, and therefore may not necessarily be indicative of other times and/or locations.

CONCLUSIONS AND RECOMMENDATIONS

Results of this study indicate that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. Recommendations are presented below regarding site preparation and undocumented fill removal, engineered fill, wet weather earthwork, spread footing foundations, below grade structural retaining walls, concrete slabs-on-grade, perimeter footing drains, seismic design, excavating conditions and utility trench backfill, and erosion control considerations.

Site Preparation and Undocumented Fill Removal

The areas of the site to be graded should first be cleared of vegetation, undocumented fill, and any loose debris; and debris from clearing should be removed from the site. Organic-rich topsoil should then be removed to competent native soils. We anticipate that the average depth of topsoil stripping will be about 12 inches over most of the site, however deeper stripping may be needed in localized areas. The final depth of stripping removal may vary depending on local subsurface conditions and the contractor's methods, and should be determined on the basis of site observations after the initial stripping has been performed. Stripped organic soil should be stockpiled only in designated areas or removed from the site and stripping operations should be observed and documented by HGSI. Existing subsurface structures (tile drains, old utility lines, septic leach fields, etc.) beneath areas of proposed structures and pavement should be removed and the excavations backfilled with engineered fill.

There is potential for old fills to be present on site in areas beyond our explorations. Where encountered beneath proposed structures, pavements, or other settlement-sensitive improvements, undocumented fill should be removed down to firm inorganic native soils and the removal area backfilled with engineered fill (see below). HGSI should observe removal excavations (if any) prior to fill placement to verify that overexcavations are adequate and an appropriate bearing stratum is exposed.

In construction areas, once stripping has been verified, the area should be ripped or tilled to a depth of 12 inches, moisture conditioned, and compacted in-place prior to the placement of engineered fill. Exposed subgrade soils should be evaluated by HGSI. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition or over-excavated and replaced with engineered fill, as described below. The depth of overexcavation, if required, should be evaluated by HGSI at the time of construction.

Engineered Fill

In general, we anticipate that on-site soils will be suitable for use as engineered fill in dry weather conditions, provided they are relatively free of organics and are properly moisture conditioned for compaction. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 90 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. On-site soils may be wet or dry of optimum; therefore, we anticipate that moisture conditioning of native soil will be necessary for compaction operations.

Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Field density testing should conform to ASTM D2922 and D3017, or D1556. Engineered fill should be periodically observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing.

Wet Weather Earthwork

The on-site soils are moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than about 7 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, HGSI should be contacted to provide additional recommendations and field monitoring.

Spread Footing Foundations

Shallow, conventional isolated or continuous spread footings may be used to support the proposed structures, provided they are founded on competent native soils, or compacted engineered fill placed directly upon the competent native soils. We recommend a maximum allowable bearing pressure of 2,000 pounds per square foot (psf) for designing spread footings bearing on undisturbed native soils or engineered fill. The recommended maximum allowable bearing pressure may be increased by a factor of 1.33 for short term transient conditions such as wind and seismic loading. Exterior footings should be founded at least 18 inches below the lowest adjacent finished grade. Minimum footing widths should be determined by the project engineer/architect in accordance with applicable design codes.

Assuming construction is accomplished as recommended herein, and for the foundation loads anticipated, we estimate total settlement of spread foundations of less than about 1 inch and differential settlement between two adjacent load-bearing components supported on competent soil of less than about ½ inch. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied.

Wind, earthquakes, and unbalanced earth loads will subject the proposed structure to lateral forces. Lateral forces on a structure will be resisted by a combination of sliding resistance of its base or footing on the underlying soil and passive earth pressure against the buried portions of the structure. For use in design, a coefficient of friction of 0.5 may be assumed along the interface between the base of the footing and subgrade soils. Passive earth pressure for buried portions of structures may be calculated using an equivalent fluid weight of 390 pounds per cubic foot (pcf), assuming footings are cast against dense, natural soils or engineered fill. The recommended coefficient of friction and passive earth pressure values do not include a safety factor. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

Footing excavations should be trimmed neat and the bottom of the excavation should be carefully prepared. Loose, wet or otherwise softened soil should be removed from the footing excavation prior to placing reinforcing steel bars. HGSI should observe foundation excavations prior to placing crushed rock, to verify that adequate bearing soils have been reached. Due to the high moisture sensitivity of on-site soils, construction during wet weather may require overexcavation of footings and backfill with compacted, crushed aggregate.

Below-Grade Structural Retaining Walls

Lateral earth pressures against below-grade retaining walls will depend upon the inclination of any adjacent slopes, type of backfill, degree of wall restraint, method of backfill placement, degree of backfill compaction, drainage provisions, and magnitude and location of any adjacent surcharge loads. At-rest soil pressure is exerted on a retaining wall when it is restrained against rotation. In contrast, active soil pressure will be exerted on a wall if its top is allowed to rotate or yield a distance of roughly 0.001 times its height or greater. If the subject retaining walls will be free to rotate at the top, they should be designed for an active earth pressure equivalent to that generated by a fluid weighing 35 pcf for level backfill against the wall. For restrained walls, an at-reset equivalent fluid pressure of 54 pcf should be used in design, again assuming level backfill against the wall. These values assume that the recommended drainage provisions are incorporated, and hydrostatic pressures are not allowed to develop against the wall.

During a seismic event, lateral earth pressures acting on below-grade structural walls will increase by an incremental amount that corresponds to the earthquake loading. Based on the Mononobe-Okabe equation and peak horizontal accelerations appropriate for the site location, seismic loading should be modeled using the active or at-rest earth pressures recommended above, plus an incremental rectangular-shaped seismic load of magnitude 5H, where H is the total height of the wall.

We assume relatively level ground surface below the base of the walls. As such, we recommend passive earth pressure of 390 pcf for use in design, assuming wall footings are cast against competent native soils or engineered fill. If the ground surface slopes down and away from the base of any of the walls, a lower passive earth pressure should be used and HGSI should be contacted for additional recommendations.

A coefficient of friction of 0.5 may be assumed along the interface between the base of the wall footing and subgrade soils. The recommended coefficient of friction and passive earth pressure values do not include a safety factor, and an appropriate safety factor should be included in design. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

The above recommendations for lateral earth pressures assume that the backfill behind the subsurface walls will consist of properly compacted structural fill, and no adjacent surcharge loading. If the walls will be subjected to the influence of surcharge loading within a horizontal distance equal to or less than the height of the wall, the walls should be designed for the additional horizontal pressure. For uniform surcharge pressures, a uniformly distributed lateral pressure of 0.3 times the surcharge pressure should be added.

The recommended equivalent fluid densities assume a free-draining condition behind the walls so that hydrostatic pressures do not build up. This can be accomplished by placing a 12-inch wide zone of crushed drain rock containing less than 5 percent fines against the walls. A 3-inch minimum diameter perforated, plastic drain pipe should be installed at the base of the walls and connected to a sump to remove water from the crushed drain rock zone. The drain pipe should be wrapped in filter fabric (Mirafi 140N or other as approved by the geotechnical engineer) to minimize clogging. The above drainage measures are intended to remove water from behind the wall to prevent hydrostatic pressures from building up. Additional drainage measures may be specified by the project architect or structural engineer, for damp-proofing or other reasons.

HGSI should be contacted during construction to verify subgrade strength in wall keyway excavations, to verify that backslope soils are in accordance with our assumptions, and to take density tests on the wall backfill materials.

Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as recommended in the *Site Preparation* section. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content, and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed and the removal zone backfilled with additional crushed rock. For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 200 kcf (115 pci) should be assumed for the soils anticipated at subgrade depth. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of crushed rock of 8 inches beneath the slab.

Interior slab-on-grade floors should be provided with an adequate moisture break. The capillary break material should consist of ODOT open graded aggregate per ODOT Standard Specifications 02630-2. The minimum recommended thickness of capillary break materials on re-compacted soil subgrade is 8 inches. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction, and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 90% of its maximum dry density as determined by ASTM D1557 or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. A commonly applied vapor barrier system consists of a 10-mil polyethylene vapor barrier placed directly over the capillary break material. With this type of system, an approximately 2-inch thick layer of sand is often placed over the vapor barrier to protect it from damage, to aid in curing of the concrete, and also to help prevent cement from bleeding down into the underlying capillary break materials. Other damp/vapor barrier systems may also be feasible. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside HGSI's area of expertise.

Perimeter Footing Drains

Due to the potential for perched surface water above fine grained deposits such as those encountered at the site, we recommend the outside edge of perimeter footings be provided with a drainage system consisting of 3-inch minimum diameter perforated PVC pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining sand and gravel or 1"- ¼" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. The footing drains should include clean-outs to allow periodic maintenance and inspection.

Down spouts and roof drains should collect roof water in a system separate from the footing drains in order to reduce the potential for clogging. Roof drain water should be directed to an appropriate discharge point well away from structural foundations. Grades should be sloped downward and away from buildings to reduce the potential for ponded water near structures.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2012 International Building Code (IBC) with applicable 2014 Oregon Structural Specialty Code (OSSC) revisions. We recommend Site Class C be used for design per the OSSC, which references ASCE 7-10, Chapter 20, Table 20.3-1. Design values determined for the site using the USGS (United States Geological Survey) *Earthquake Ground Motion Parameters* utility are summarized on Table 2.

Table 2. Recommended Earthquake Ground Motion Parameters (2012 IBC / 2014 OSSC)

Parameter	Value
Location (Lat, Long), degrees	45.3175, -122.7454
Mapped Spectral Acceleration Values (MCE, Site Class B):	
Short Period, S_s	0.928 g
1.0 Sec Period, S_1	0.408 g
Soil Factors for Site Class D:	
F_a	1.129
F_v	1.592
$SD_s = 2/3 \times F_a \times S_s$	0.698 g
$SD_1 = 2/3 \times F_v \times S_1$	0.433 g

Potential seismic impacts also include secondary effects such as soil liquefaction, fault rupture potential, and other hazards as discussed below:

- **Soil Liquefaction Potential –** Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or stiff clayey native soils above the water table, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.
- **Fault Rupture Potential** – Based on our review of available geologic literature, we are not aware of any mapped active (demonstrating movement in the last 10,000 years) faults on the site. During our field investigation, we did not observe any evidence of surface rupture or recent faulting. Therefore, we conclude that the potential for fault rupture on site is low.
- **Seismic Induced Landslide** – Topography in the vicinity of the subject site is generally flat to gently sloping. The potential for slope instability and seismic induced landslide on site is considered very low.
- **Effects of Local Geology and Topography** – In our opinion, no additional seismic hazard will occur due to local geology or topography. The site is expected to have no greater seismic hazard than surrounding properties and the Wilsonville area in general.

Excavating Conditions and Utility Trench Backfill

We anticipate that on-site soils can be excavated using conventional heavy equipment such as scrapers and trackhoes to a depth of 10 feet and likely greater. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native soils classify as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only.

Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. If encountered, the contractor should be prepared to implement an appropriate dewatering system for installation of the utilities. At this time, we anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of groundwater where encountered during construction conducted during the dry season. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

Utility trench backfill should consist of ¾"-0 crushed rock, compacted to at least 90% of the maximum dry density obtained by Modified Proctor (ASTM D1557) or equivalent. Initial backfill lift thick nesses for a ¾"-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw, bio-bags, silt fences, or other appropriate technology. Where used, erosion control devices should be in place and remain in place throughout site preparation and construction. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and his/her consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HGSI should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, HGSI executed these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

* * *

We appreciate this opportunity to be of service.

Sincerely,

HARDMAN GEOTECHNICAL SERVICES INC.

REGISTERED PROFESSIONAL ENGINEER
64,422PE
OREGON
SEPTEMBER 26, 2000
SCOTT L. HARDMAN
EXPIRES: 06-30-2017

2-2-17

Scott L. Hardman, P.E., G.E.
Geotechnical Engineer

Attachments:
- References
- Figure 1 – Vicinity Map
- Figure 2 – Site and Exploration Plan
- Logs of Test Pits TP-1 through TP-4

REFERENCES

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Portland Quadrangle, Multnomah, and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-75, scale 1:24,000.

Madin, I.P., 1990, Earthquake hazard geology maps of the Portland metropolitan area, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2, scale 1:24,000, 22 p.

Snyder, D.T., 2008, Estimated Depth to Ground Water and Configuration of the Water Table in the Portland, Oregon Area: U.S. Geological Survey Scientific Investigations Report 2008–5059, 41 p., 3 plates.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, Vol. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

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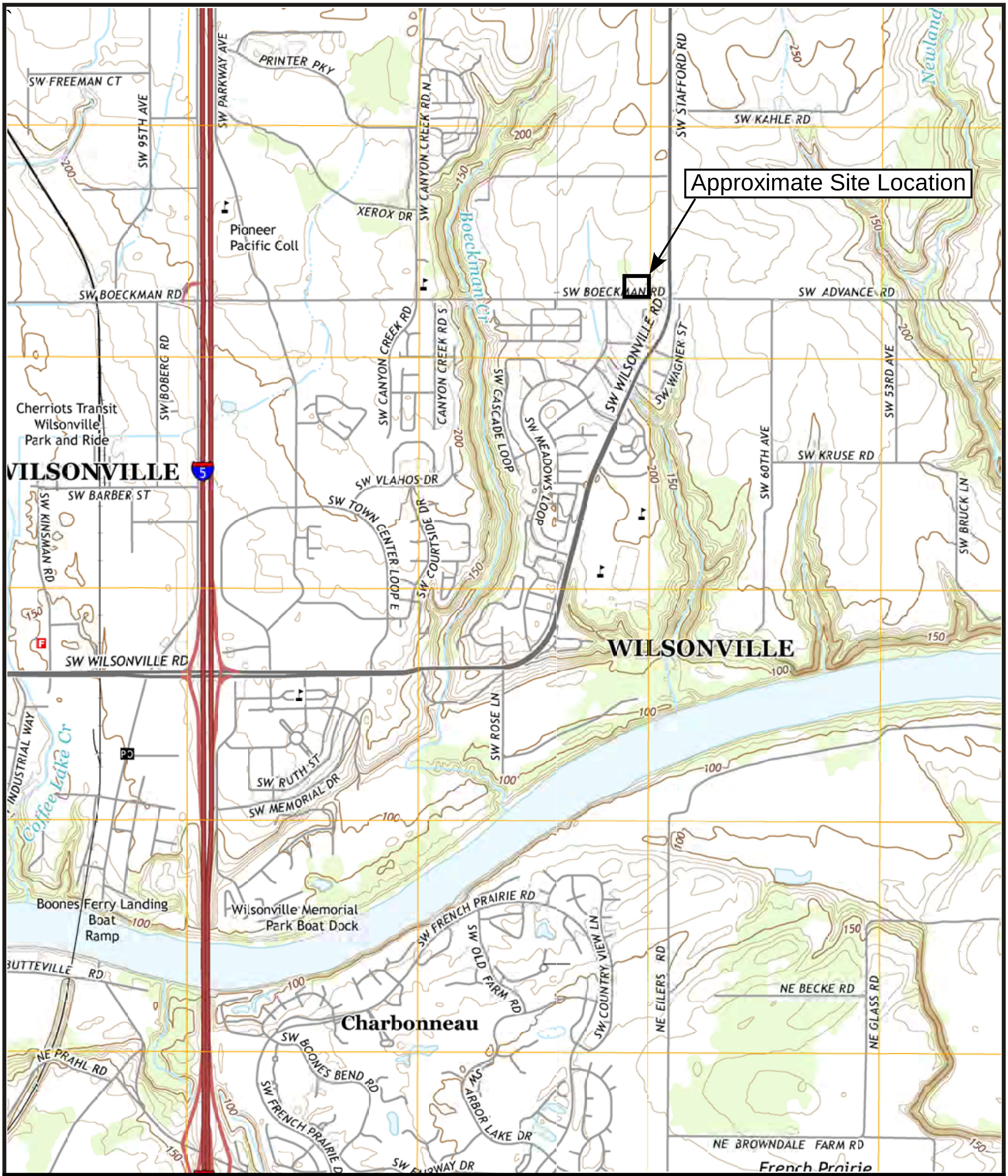
VICINITY MAP



Project: Killinger Property Wilsonville, Oregon	Project No. 16-2160	FIGURE 1

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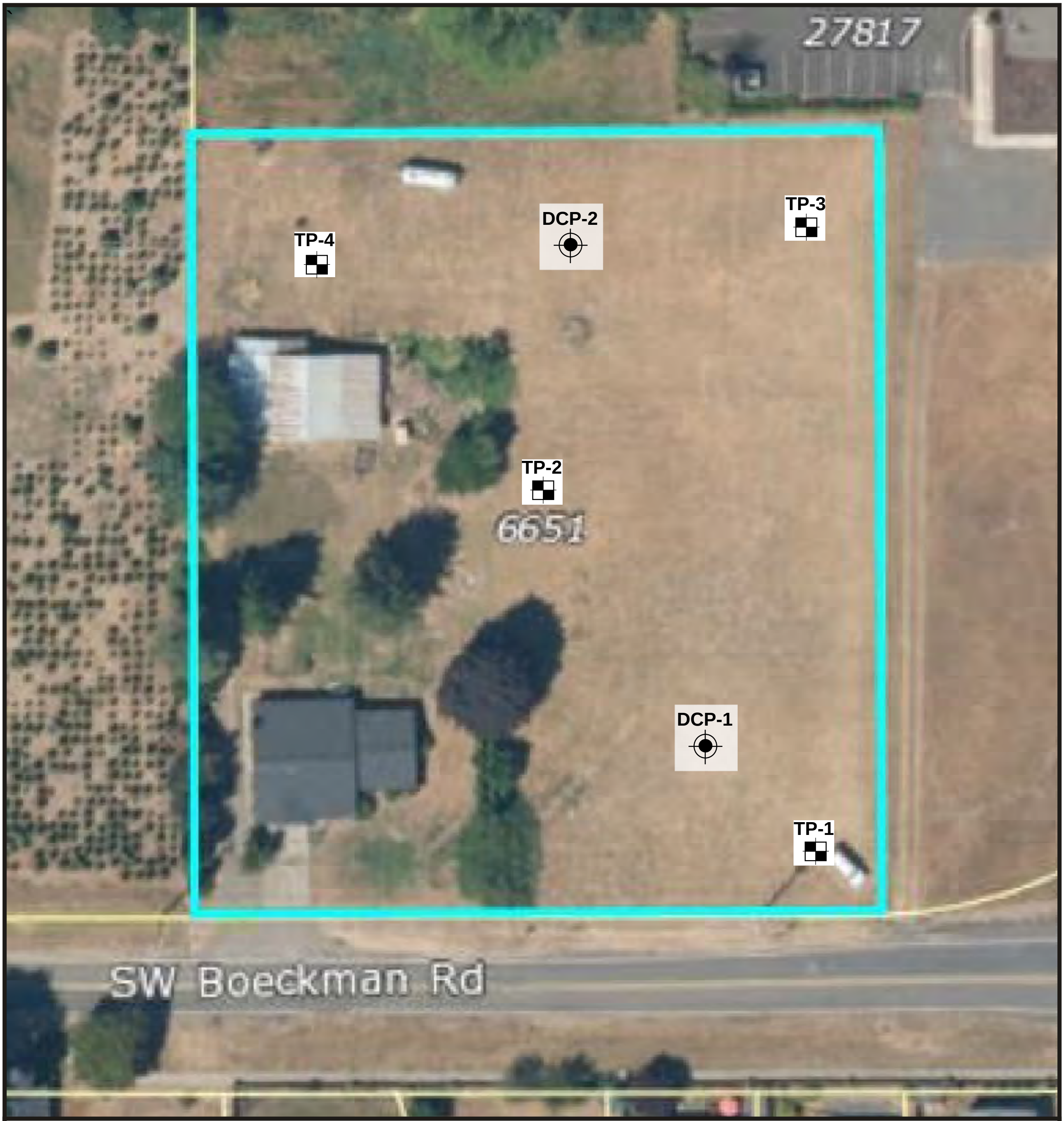
SITE AND EXPLORATION PLAN



Legend

TP-1 Test Pit Designation and Approximate Location

DCP-1 DCP Designation and Approximate Location

Base map provided by Portland Maps

Project: Killinger Property Wilsonville, Oregon	Project No. 16-2159	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property Wilsonville, Oregon	Project No. 16-2159	Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	1.0					
2	4.0					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	>4					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 3 and 7 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
						Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
2	1.25					
3	4.0					
4	>4					
5						
6						
7						
8						
9						
10						
						Test pit terminated at 10 feet Seepage encountered at 3 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.25					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						
10						
						Test pit terminated at 10 feet Seepage encountered at 3 and 6.5 feet
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1
Soil Sample Depth
Interval and Designation

▽
Water Level at
Time of Excavation

Date Excavated: 1-27-17
Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Killinger Property
Wilsonville, Oregon

Project No. 16-2159

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	3.0					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	2.5					
4	4.0					
5						
6						
7						
8						
9						
10						
						Test pit terminated at 10 feet Seepage encountered at 3 and 8 feet
11						
12						
13						
14						
15						
16						
17						

HGSI HARDMAN GEOTECHNICAL SERVICES INC.
Practical Cost-Effective Geotechnical Solutions
10110 SW Nimbus Avenue, Suite B-5,
Portland, OR 97223, (503) 530-8076

LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 1-27-17

Logged By: IDM

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January 13, 2017
HGSI Project No. 16-2151

Dan Grimberg / Miriam Wilson
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, Oregon 97210

Via e-mail (pdf format); hard copies can be mailed on request

Subject: **GEOTECHNICAL ENGINEERING REPORT**
PIKE PROPERTY
7025 SW BOECKMAN ROAD
WILSONVILLE, CLACKAMAS COUNTY, OREGON

This report presents the results of a geotechnical engineering study conducted by Hardman Geotechnical Services Inc. (HGSI) for the above-referenced project. The purpose of this study was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with HGSI Proposal No. 16-545, dated December 14, 2016, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

This geotechnical evaluation was performed the Pike Property (7025 SW Boeckman Road). The property totals roughly 5.33 acres and is rectangular. There are a few structures occupying the site including a single family home and two shops/garages. Vegetation consists of grasses, trees, and bushes.

Topographically, the site is generally flat to gently sloping. A shallow drainage traverses the eastern portion of the site in a roughly north-south direction. The property owner indicates he had over 2,600 lineal feet of drain tile placed throughout the site in 1989 (see Figure 3).

The intent of this geotechnical report is to provide adequate geotechnical information for design and construction. A grading plan has not been finalized and should be reviewed by HGSI when completed. Underground utilities and onsite stormwater systems are also planned. HGSI should review the grading plan when available to verify consistency with the geotechnical recommendations, and to provide any supplemental or revised input to the design needed based on geotechnical considerations.

REGIONAL GEOLOGY AND SEISMIC SETTING

The subject site lies within the Portland Basin, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. The Portland Basin is a northwest-southwest trending structural basin produced by broad regional downwarping of the area. The Portland Basin is approximately 20 miles wide and 45 miles long and is filled with consolidated and unconsolidated sedimentary rocks of late Miocene, Pliocene and Pleistocene age.

The subject site is underlain by Quaternary age (last 1.6 million years) loess, a windblown silt deposit that mantles older deposits and basalt bedrock in the Portland Hills (Madin, 1990). The loess generally consists of massive silt deposited following repeated catastrophic flooding events in the Willamette Valley, the last of which occurred about 10,000 years ago. In localized areas, the loess includes buried paleosols that developed between depositional events. Regionally, the total thickness of loess ranges from 5 feet to greater than 100 feet.

The loess is underlain by residual soil formed by in place weathering of the underlying Columbia River Basalt Formation (Madin, 1990). The Miocene aged (about 14.5 to 16.5 million years ago) Columbia River Basalts are a thick sequence of lava flows which form the crystalline basement of the Tualatin Valley. The basalts are composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. Individual basalt flow units typically range from 25 to 125 feet thick and interflow zones are typically vesicular, scoriaceous, brecciated, and sometimes include sedimentary rocks.

At least three major fault zones capable of generating damaging earthquakes are known to exist in the region. These include the Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone. These potential earthquake source zones are included in the determination of seismic design values for structures, as presented in the *Seismic Design* section. None of the known faults extend beneath the site.

FIELD EXPLORATION – EXPLORATORY TEST PITS

The site-specific exploration for this study was conducted on December 28, 2016 and consisted of four test pits (designated TP-1 through TP-4) excavated to depths of approximately 7 to 10 feet below ground surface (bgs) at the approximate locations shown on Figure 2. It should be noted that exploration locations were determined in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

Explorations were conducted under the full-time observation of HGSI personnel. Soil samples obtained from the borings were classified in the field and representative portions were placed in relatively air-tight plastic bags. These soil samples were then returned to the laboratory for further examination. Pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence was recorded. Soils were classified in general accordance with the Unified Soil Classification System. Rock hardness was generally classified in accordance with Table 1, modified from the ODOT Rock Hardness Classification Chart (following page).

Summary test pit logs are attached to this report. The stratigraphic contacts shown on the individual borehole logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times.

Subgrade Soil Evaluation – DCP Testing

On January 5, 2017, HGSI conducted Dynamic Cone Penetrometer (DCP) tests to determine the strength parameters of the in-situ soil for support of pavement. Tests were performed at the approximate locations shown on Figure 2. Test equipment and methodology were in general accordance with ASTM Test Method D6951/D6951M – 09, *Standard Test Method for Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications*. Correlated California Bearing Ratio (CBR) values at the test locations are summarized on Table 1, for the depth intervals indicated. Correlated CBR values were determined using ASTM D6951/D6951M - 09.

Table 1. DCP Field Test Results and Correlated CBR Values

Test Designation	Material Tested	Depth Interval (feet)	Average Penetration Per Blow (mm)	Correlated CBR
DCP-1	Native Soil	0.4 – 3.0	13	8
DCP-2	Native Soil	0.8 – 3.35	16	6.5

SUBSURFACE CONDITIONS

The following discussion is a summary of subsurface conditions encountered in our explorations. For more detailed information regarding subsurface conditions at specific exploration locations, refer to the attached test pit logs. Also, please note that subsurface conditions can vary between exploration locations, as discussed in the *Uncertainty and Limitations* section below.

Soil

On-site soils are anticipated to consist of topsoil, clayey silt, and clay, as described below.

> ***Topsoil –*** From the ground surface, all test pits encountered about 1foot of topsoil, comprised of moist organic silt. The upper about 6 inches of the topsoil was highly organic.
>
> ***Gray Clay –*** Directly beneath the top soil in test pit TP-2, we encountered gray clay. The clay was medium stiff and moist to slightly moist. The clay was highly plastic and extended to roughly 2 feet bgs.
>
> ***Clayey Silt –*** Beneath the topsoil and clay in the test pits, we encountered medium stiff to hard, moist to slightly moist, brown clayey silt with orange and gray mottling. All of the test pits terminated in the clayey silt unit, at depths of 7 to 10 feet bgs.

Groundwater

During the field exploration, no groundwater was encountered to the maximum depth of exploration at 10 feet bgs. Slight seepage was encountered in test pits TP-1, TP-3 and TP-4 at about 3 to 7 feet bgs. Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. The groundwater conditions reported above are for the specific date and locations indicated, and therefore may not necessarily be indicative of other times and/or locations.

CONCLUSIONS AND RECOMMENDATIONS

Results of this study indicate that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. Recommendations are presented below regarding site preparation and undocumented fill removal, engineered fill, wet weather earthwork, spread footing foundations, below grade structural retaining walls, concrete slabs-on-grade, perimeter footing drains, seismic design, excavating conditions and utility trench backfill, and erosion control considerations.

Site Preparation and Undocumented Fill Removal

The areas of the site to be graded should first be cleared of vegetation, undocumented fill, and any loose debris; and debris from clearing should be removed from the site. Organic-rich topsoil should then be removed to competent native soils. We anticipate that the average depth of topsoil stripping will be about 12 inches over most of the site, however deeper stripping may be needed in localized areas. The final depth of stripping removal may vary depending on local subsurface conditions and the contractor's methods, and should be determined on the basis of site observations after the initial stripping has been performed. Stripped organic soil should be stockpiled only in designated areas or removed from the site and stripping operations should be observed and documented by HGSI. Existing subsurface structures (tile drains, old utility lines, septic leach fields, etc.) beneath areas of proposed structures and pavement should be removed and the excavations backfilled with engineered fill.

There is potential for old fills to be present on site in areas beyond our explorations. Where encountered beneath proposed structures, pavements, or other settlement-sensitive improvements, undocumented fill should be removed down to firm inorganic native soils and the removal area backfilled with engineered fill (see below). HGSI should observe removal excavations (if any) prior to fill placement to verify that overexcavations are adequate and an appropriate bearing stratum is exposed.

In construction areas, once stripping has been verified, the area should be ripped or tilled to a depth of 12 inches, moisture conditioned, and compacted in-place prior to the placement of engineered fill. Exposed subgrade soils should be evaluated by HGSI. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition or over-excavated and replaced with engineered fill, as described below. The depth of overexcavation, if required, should be evaluated by HGSI at the time of construction.

Engineered Fill

In general, we anticipate that on-site soils will be suitable for use as engineered fill in dry weather conditions, provided they are relatively free of organics and are properly moisture conditioned for compaction. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 90 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. On-site soils may be wet or dry of optimum; therefore, we anticipate that moisture conditioning of native soil will be necessary for compaction operations.

Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Field density testing should conform to ASTM D2922 and D3017, or D1556. Engineered fill should be periodically observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing.

Wet Weather Earthwork

The on-site soils are moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than about 7 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, HGSI should be contacted to provide additional recommendations and field monitoring.

Spread Footing Foundations

Shallow, conventional isolated or continuous spread footings may be used to support the proposed structures, provided they are founded on competent native soils, or compacted engineered fill placed directly upon the competent native soils. We recommend a maximum allowable bearing pressure of 2,000 pounds per square foot (psf) for designing spread footings bearing on undisturbed native soils or engineered fill. The recommended maximum allowable bearing pressure may be increased by a factor of 1.33 for short term transient conditions such as wind and seismic loading. Exterior footings should be founded at least 18 inches below the lowest adjacent finished grade. Minimum footing widths should be determined by the project engineer/architect in accordance with applicable design codes.

Assuming construction is accomplished as recommended herein, and for the foundation loads anticipated, we estimate total settlement of spread foundations of less than about 1 inch and differential settlement between two adjacent load-bearing components supported on competent soil of less than about ½ inch. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied.

Wind, earthquakes, and unbalanced earth loads will subject the proposed structure to lateral forces. Lateral forces on a structure will be resisted by a combination of sliding resistance of its base or footing on the underlying soil and passive earth pressure against the buried portions of the structure. For use in design, a coefficient of friction of 0.5 may be assumed along the interface between the base of the footing and subgrade soils. Passive earth pressure for buried portions of structures may be calculated using an equivalent fluid weight of 390 pounds per cubic foot (pcf), assuming footings are cast against dense, natural soils or engineered fill. The recommended coefficient of friction and passive earth pressure values do not include a safety factor. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

Footing excavations should be trimmed neat and the bottom of the excavation should be carefully prepared. Loose, wet or otherwise softened soil should be removed from the footing excavation prior to placing reinforcing steel bars. HGSI should observe foundation excavations prior to placing crushed rock, to verify that adequate bearing soils have been reached. Due to the high moisture sensitivity of on-site soils, construction during wet weather may require overexcavation of footings and backfill with compacted, crushed aggregate.

Below-Grade Structural Retaining Walls

Lateral earth pressures against below-grade retaining walls will depend upon the inclination of any adjacent slopes, type of backfill, degree of wall restraint, method of backfill placement, degree of backfill compaction, drainage provisions, and magnitude and location of any adjacent surcharge loads. At-rest soil pressure is exerted on a retaining wall when it is restrained against rotation. In contrast, active soil pressure will be exerted on a wall if its top is allowed to rotate or yield a distance of roughly 0.001 times its height or greater. If the subject retaining walls will be free to rotate at the top, they should be designed for an active earth pressure equivalent to that generated by a fluid weighing 35 pcf for level backfill against the wall. For restrained walls, an at-reset equivalent fluid pressure of 54 pcf should be used in design, again assuming level backfill against the wall. These values assume that the recommended drainage provisions are incorporated, and hydrostatic pressures are not allowed to develop against the wall.

During a seismic event, lateral earth pressures acting on below-grade structural walls will increase by an incremental amount that corresponds to the earthquake loading. Based on the Mononobe-Okabe equation and peak horizontal accelerations appropriate for the site location, seismic loading should be modeled using the active or at-rest earth pressures recommended above, plus an incremental rectangular-shaped seismic load of magnitude 5H, where H is the total height of the wall.

We assume relatively level ground surface below the base of the walls. As such, we recommend passive earth pressure of 390 pcf for use in design, assuming wall footings are cast against competent native soils or engineered fill. If the ground surface slopes down and away from the base of any of the walls, a lower passive earth pressure should be used and HGSI should be contacted for additional recommendations.

A coefficient of friction of 0.5 may be assumed along the interface between the base of the wall footing and subgrade soils. The recommended coefficient of friction and passive earth pressure values do not include a safety factor, and an appropriate safety factor should be included in design. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

The above recommendations for lateral earth pressures assume that the backfill behind the subsurface walls will consist of properly compacted structural fill, and no adjacent surcharge loading. If the walls will be subjected to the influence of surcharge loading within a horizontal distance equal to or less than the height of the wall, the walls should be designed for the additional horizontal pressure. For uniform surcharge pressures, a uniformly distributed lateral pressure of 0.3 times the surcharge pressure should be added.

The recommended equivalent fluid densities assume a free-draining condition behind the walls so that hydrostatic pressures do not build up. This can be accomplished by placing a 12-inch wide zone of crushed drain rock containing less than 5 percent fines against the walls. A 3-inch minimum diameter perforated, plastic drain pipe should be installed at the base of the walls and connected to a sump to remove water from the crushed drain rock zone. The drain pipe should be wrapped in filter fabric (Mirafi 140N or other as approved by the geotechnical engineer) to minimize clogging. The above drainage measures are intended to remove water from behind the wall to prevent hydrostatic pressures from building up. Additional drainage measures may be specified by the project architect or structural engineer, for damp-proofing or other reasons.

HGSI should be contacted during construction to verify subgrade strength in wall keyway excavations, to verify that backslope soils are in accordance with our assumptions, and to take density tests on the wall backfill materials.

Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as recommended in the *Site Preparation* section. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content, and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed and the removal zone backfilled with additional crushed rock. For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 200 kcf (115 pci) should be assumed for the soils anticipated at subgrade depth. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of crushed rock of 8 inches beneath the slab.

Interior slab-on-grade floors should be provided with an adequate moisture break. The capillary break material should consist of ODOT open graded aggregate per ODOT Standard Specifications 02630-2. The minimum recommended thickness of capillary break materials on re-compacted soil subgrade is 8 inches. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction, and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 90% of its maximum dry density as determined by ASTM D1557 or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. A commonly applied vapor barrier system consists of a 10-mil polyethylene vapor barrier placed directly over the capillary break material. With this type of system, an approximately 2-inch thick layer of sand is often placed over the vapor barrier to protect it from damage, to aid in curing of the concrete, and also to help prevent cement from bleeding down into the underlying capillary break materials. Other damp/vapor barrier systems may also be feasible. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside HGSI's area of expertise.

Perimeter Footing Drains

Due to the potential for perched surface water above fine grained deposits such as those encountered at the site, we recommend the outside edge of perimeter footings be provided with a drainage system consisting of 3-inch minimum diameter perforated PVC pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining sand and gravel or 1"- ¼" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. The footing drains should include clean-outs to allow periodic maintenance and inspection.

Down spouts and roof drains should collect roof water in a system separate from the footing drains in order to reduce the potential for clogging. Roof drain water should be directed to an appropriate discharge point well away from structural foundations. Grades should be sloped downward and away from buildings to reduce the potential for ponded water near structures.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2012 International Building Code (IBC) with applicable 2014 Oregon Structural Specialty Code (OSSC) revisions. We recommend Site Class C be used for design per the OSSC, which references ASCE 7-10, Chapter 20, Table 20.3-1. Design values determined for the site using the USGS (United States Geological Survey) *Earthquake Ground Motion Parameters* utility are summarized on Table 2.

Table 2. Recommended Earthquake Ground Motion Parameters (2012 IBC / 2014 OSSC)

Parameter	Value
Location (Lat, Long), degrees	45.3175, -122.7481
Mapped Spectral Acceleration Values (MCE, Site Class B):	
Short Period, S_s	0.928 g
1.0 Sec Period, S_1	0.408 g
Soil Factors for Site Class D:	
F_a	1.129
F_v	1.592
$SD_s = 2/3 \times F_a \times S_s$	0.698 g
$SD_1 = 2/3 \times F_v \times S_1$	0.433 g

Potential seismic impacts also include secondary effects such as soil liquefaction, fault rupture potential, and other hazards as discussed below:

- **Soil Liquefaction Potential –** Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or stiff clayey native soils above the water table, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.
- **Fault Rupture Potential** – Based on our review of available geologic literature, we are not aware of any mapped active (demonstrating movement in the last 10,000 years) faults on the site. During our field investigation, we did not observe any evidence of surface rupture or recent faulting. Therefore, we conclude that the potential for fault rupture on site is low.
- **Seismic Induced Landslide** – Topography in the vicinity of the subject site is generally flat to gently sloping. The potential for slope instability and seismic induced landslide on site is considered very low.
- **Effects of Local Geology and Topography** – In our opinion, no additional seismic hazard will occur due to local geology or topography. The site is expected to have no greater seismic hazard than surrounding properties and the Wilsonville area in general.

Excavating Conditions and Utility Trench Backfill

We anticipate that on-site soils can be excavated using conventional heavy equipment such as scrapers and trackhoes to a depth of 10 feet and likely greater. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native soils classify as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only.

Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. If encountered, the contractor should be prepared to implement an appropriate dewatering system for installation of the utilities. At this time, we anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of groundwater where encountered during construction conducted during the dry season. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

Utility trench backfill should consist of ¾”-0 crushed rock, compacted to at least 90% of the maximum dry density obtained by Modified Proctor (ASTM D1557) or equivalent. Initial backfill lift thick nesses for a ¾”-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw, bio-bags, silt fences, or other appropriate technology. Where used, erosion control devices should be in place and remain in place throughout site preparation and construction. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and his/her consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HGSI should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, HGSI executed these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

HARDMAN GEOTECHNICAL SERVICES INC.

64,422PE
SEPTEMBER 26, 2000
SCOTT L. HARDMAN

1-13-17

EXPIRES: 06-30-2017

Scott L. Hardman, P.E., G.E.
Geotechnical Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site Plan
Logs of Test Pits TP-1 through TP-5

* * *

REFERENCES

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Portland Quadrangle, Multnomah, and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-75, scale 1:24,000.

Madin, I.P., 1990, Earthquake hazard geology maps of the Portland metropolitan area, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2, scale 1:24,000, 22 p.

Snyder, D.T., 2008, Estimated Depth to Ground Water and Configuration of the Water Table in the Portland, Oregon Area: U.S. Geological Survey Scientific Investigations Report 2008–5059, 41 p., 3 plates.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, Vol. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

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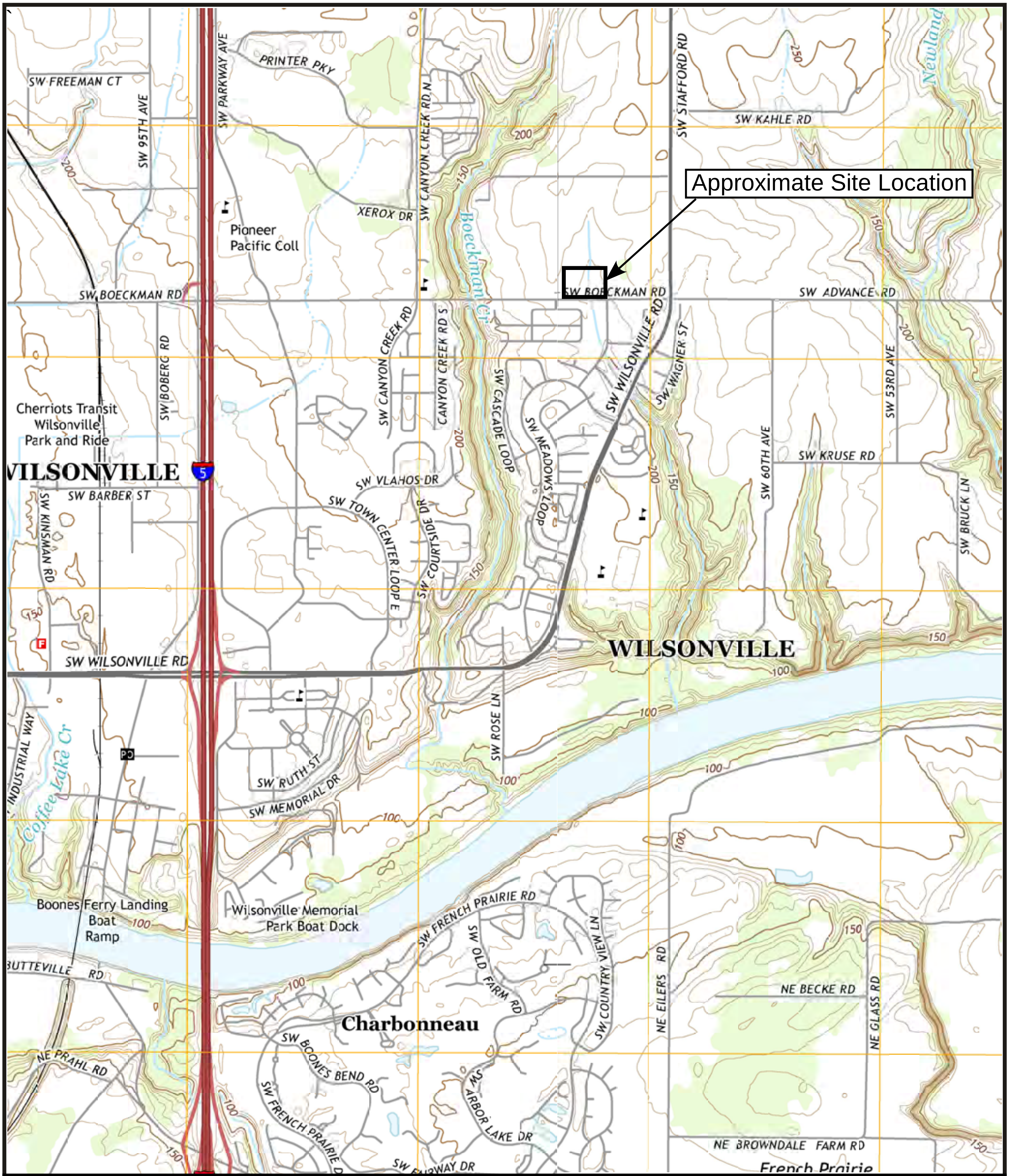
VICINITY MAP



Project: Pike Property Wilsonville, Oregon	Project No. 16-2150	FIGURE 1

HGSI HARDMAN GEOTECHNICAL SERVICES INC.

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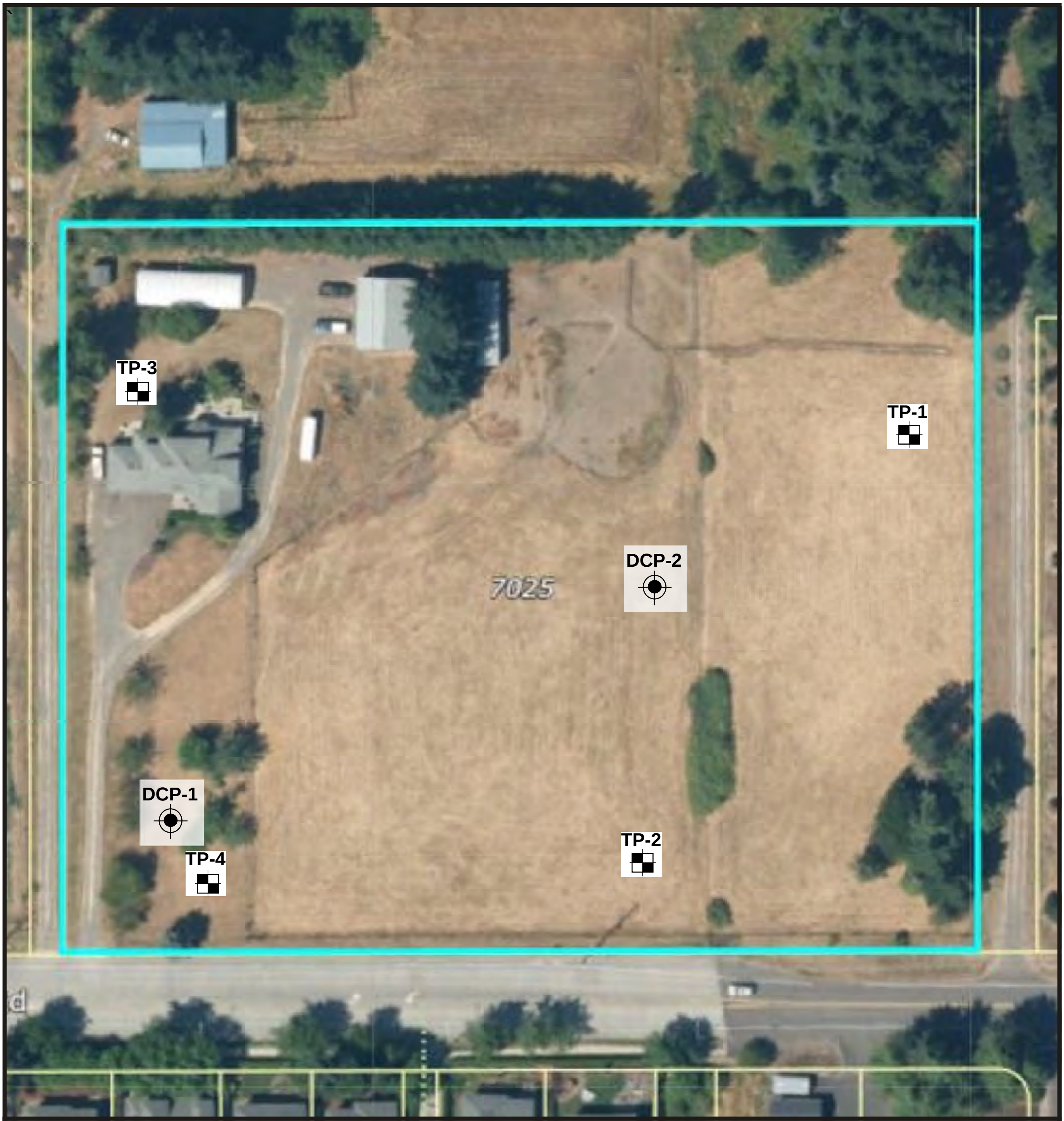
SITE AND EXPLORATION PLAN



Legend

TP-1 ▣ Test Pit Designation and Approximate Location

DCP-1 ⊕ DCP Test Designation and Approximate Location

Base map obtained from Portland Maps

Project: Pike Property Wilsonville, Oregon	Project No. 16-2151	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.0					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	3.5					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 10 feet Seepage encountered at 7 feet
11						
12						
13						
14						
15						
16						
17						

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SERVICES INC.
Practical Cost-Effective Geotechnical Solutions
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Portland, Oregon 97223
(503) 530-8076

LEGEND

☒ S-1	▽
Soil Sample Depth Interval and Designation	Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.5					Medium stiff, Clay, gray, moist to slightly moist
2	1.5					
3	2.5					Stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet due to hard soils No groundwater or seepage encountered
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.5					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	4.0					
4	>4					
5						
6						
7						
8						
9						Test pit terminated at 8 feet due to hard soils Seepage encountered at 2 feet
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Pike Property
Wilsonville, Oregon

Project No. 16-2151

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.75					
2	1.5					Medium stiff to hard, clayey silt, brown with orange and gray mottling to just brown, slightly moist to moist
3	2.5					
4	>4					
5						
6						
7						
8						
9						
10						Test pit terminated at 9 feet due to hard soils Seepage encountered at 3 feet
11						
12						
13						
14						
15						
16						
17						

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☒ S-1
Soil Sample Depth Interval and Designation

▽
Water Level at Time of Excavation

Date Excavated: 12-28-16

Logged By: IDM

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Practical, Cost-Effective Geotechnical Solutions

October 26, 2016
HGSI Project No. 16-2119

Dan Grimberg / Miriam Wilson
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, Oregon 97210

Via e-mail (pdf format); hard copies can be mailed on request

Subject: **GEOTECHNICAL ENGINEERING REPORT**
KRIELKAMP PROPERTY
6875 SW BOECKMAN ROAD
WILSONVILLE, CLACKAMAS COUNTY, OREGON

This report presents the results of a geotechnical engineering study conducted by Hardman Geotechnical Services Inc. (HGSI) for the above-referenced project. The purpose of this study was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with HGSI Proposal No. 16-570, dated October 12, 2016, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

This geotechnical evaluation was performed for an area including the subject site, and the Wehler Property (6855 SW Boeckman Road) to the south. The properties total roughly 8.85 acres and are rectangular in shape. There are a few structures occupying the site including two single family homes and several outbuildings. Vegetation consists of grasses, trees, and bushes with a small heavy treed area.

The intent of this geotechnical report is to provide adequate geotechnical information for design and construction applicable to the entire site, or to the Krielkamp Property individually. A grading plan has not been finalized and should be reviewed by HGSI when completed. Underground utilities and onsite stormwater systems are also planned. HGSI should review the grading plan when available to verify consistency with the geotechnical recommendations, and to provide any supplemental or revised input to the design needed based on geotechnical considerations.

REGIONAL GEOLOGY AND SEISMIC SETTING

The subject site lies within the Portland Basin, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. The Portland Basin is a northwest-southwest trending structural basin produced by broad regional downwarping of the area. The Portland Basin is approximately 20 miles wide and 45 miles long and is filled with consolidated and unconsolidated sedimentary rocks of late Miocene, Pliocene and Pleistocene age.

The subject site is underlain by Quaternary age (last 1.6 million years) loess, a windblown silt deposit that mantles older deposits and basalt bedrock in the Portland Hills (Madin, 1990). The loess generally consists of massive silt deposited following repeated catastrophic flooding events in the Willamette Valley, the last of which occurred about 10,000 years ago. In localized areas, the loess includes buried paleosols that developed between depositional events. Regionally, the total thickness of loess ranges from 5 feet to greater than 100 feet.

The loess is underlain by residual soil formed by in place weathering of the underlying Columbia River Basalt Formation (Madin, 1990). The Miocene aged (about 14.5 to 16.5 million years ago) Columbia River Basalts are a thick sequence of lava flows which form the crystalline basement of the Tualatin Valley. The basalts are composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. Individual basalt flow units typically range from 25 to 125 feet thick and interflow zones are typically vesicular, scoriaceous, brecciated, and sometimes include sedimentary rocks.

At least three major fault zones capable of generating damaging earthquakes are known to exist in the region. These include the Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone. These potential earthquake source zones are included in the determination of seismic design values for structures, as presented in the *Seismic Design* section. None of the known faults extend beneath the site.

FIELD EXPLORATION – EXPLORATORY TEST PITS

The site-specific exploration for this study was conducted on October 18, 2016 and consisted of seven test pits (designated TP-1 through TP-7) excavated to depths of approximately 7 feet below ground surface (bgs) at the approximate locations shown on Figure 2. It should be noted that exploration locations were determined in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

Explorations were conducted under the full-time observation of HGSI personnel. Soil samples obtained from the borings were classified in the field and representative portions were placed in relatively air-tight plastic bags. These soil samples were then returned to the laboratory for further examination. Pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence was recorded. Soils were classified in general accordance with the Unified Soil Classification System. Rock hardness was generally classified in accordance with Table 1, modified from the ODOT Rock Hardness Classification Chart (following page).

Summary test pit logs are attached to this report. The stratigraphic contacts shown on the individual borehole logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times.

SUBSURFACE CONDITIONS

The following discussion is a summary of subsurface conditions encountered in our explorations. For more detailed information regarding subsurface conditions at specific exploration locations, refer to the attached test pit logs. Also, please note that subsurface conditions can vary between exploration locations, as discussed in the *Uncertainty and Limitations* section below.

Soil

On-site soils are anticipated to consist of topsoil, clayey silt, and clay, as described below.

> ***Topsoil –*** From the ground surface, all test pits encountered 1.5 to 2 feet of topsoil, comprised of moist silt. The upper about 1 foot of the topsoil was highly organic.

Gray Clay – Directly beneath the top soil in test pits TP-5 and TP-6, we encountered gray clay. The clay ranged from medium stiff to stiff and dry to very moist. The clay was highly plastic and extended to roughly 3.5 feet bgs.

Clayey Silt – Beneath the topsoil and clay in the test pits, we encountered very stiff to hard, moist to dry, brown clayey silt with orange and gray mottling. All of the test pits terminated in the clayey silt unit, at depths of about 7 feet bgs.

Groundwater

During the field exploration, no groundwater was encountered to the maximum depth of exploration at 7 feet bgs. Slight seepage was encountered in test pits TP-1 and TP-3 at about 3 feet bgs. Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. The groundwater conditions reported above are for the specific date and locations indicated, and therefore may not necessarily be indicative of other times and/or locations.

CONCLUSIONS AND RECOMMENDATIONS

Results of this study indicate that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. Recommendations are presented below regarding site preparation and undocumented fill removal, engineered fill, wet weather earthwork, spread footing foundations, below grade structural retaining walls, concrete slabs-on-grade, perimeter footing drains, seismic design, excavating conditions and utility trench backfill, and erosion control considerations.

Site Preparation and Undocumented Fill Removal

The areas of the site to be graded should first be cleared of vegetation, undocumented fill, and any loose debris; and debris from clearing should be removed from the site. Organic-rich topsoil should then be removed to competent native soils. We anticipate that the average depth of topsoil stripping will be about 12 inches over most of the site, however deeper stripping may be needed in localized areas. The final depth of stripping removal may vary depending on local subsurface conditions and the contractor's methods, and should be determined on the basis of site observations after the initial stripping has been performed. Stripped organic soil should be stockpiled only in designated areas or removed from the site and stripping operations should be observed and documented by HGSI. Existing subsurface structures (tile drains, old utility lines, septic leach fields, etc.) beneath areas of proposed structures and pavement should be removed and the excavations backfilled with engineered fill.

There is potential for old fills to be present on site in areas beyond our explorations. Where encountered beneath proposed structures, pavements, or other settlement-sensitive improvements, undocumented fill should be removed down to firm inorganic native soils and the removal area backfilled with engineered fill (see below). HGSI should observe removal excavations (if any) prior to fill placement to verify that overexcavations are adequate and an appropriate bearing stratum is exposed.

In construction areas, once stripping has been verified, the area should be ripped or tilled to a depth of 12 inches, moisture conditioned, and compacted in-place prior to the placement of engineered fill. Exposed subgrade soils should be evaluated by HGSI. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition or over-excavated and replaced with engineered fill, as described below. The depth of overexcavation, if required, should be evaluated by HGSI at the time of construction.

Engineered Fill

In general, we anticipate that on-site soils will be suitable for use as engineered fill in dry weather conditions, provided they are relatively free of organics and are properly moisture conditioned for compaction. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 90 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. On-site soils may be wet or dry of optimum; therefore, we anticipate that moisture conditioning of native soil will be necessary for compaction operations.

Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Field density testing should conform to ASTM D2922 and D3017, or D1556. Engineered fill should be periodically observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing.

Wet Weather Earthwork

The on-site soils are moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than about 7 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, HGSI should be contacted to provide additional recommendations and field monitoring.

Spread Footing Foundations

Shallow, conventional isolated or continuous spread footings may be used to support the proposed structures, provided they are founded on competent native soils, or compacted engineered fill placed directly upon the competent native soils. We recommend a maximum allowable bearing pressure of 2,000 pounds per square foot (psf) for designing spread footings bearing on undisturbed native soils or engineered fill. The recommended maximum allowable bearing pressure may be increased by a factor of 1.33 for short term transient conditions such as wind and seismic loading. Exterior footings should be founded at least 18 inches below the lowest adjacent finished grade. Minimum footing widths should be determined by the project engineer/architect in accordance with applicable design codes.

Assuming construction is accomplished as recommended herein, and for the foundation loads anticipated, we estimate total settlement of spread foundations of less than about 1 inch and differential settlement between two adjacent load-bearing components supported on competent soil of less than about ½ inch. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied.

Wind, earthquakes, and unbalanced earth loads will subject the proposed structure to lateral forces. Lateral forces on a structure will be resisted by a combination of sliding resistance of its base or footing on the underlying soil and passive earth pressure against the buried portions of the structure. For use in design, a coefficient of friction of 0.5 may be assumed along the interface between the base of the footing and subgrade soils. Passive earth pressure for buried portions of structures may be calculated using an equivalent fluid weight of 390 pounds per cubic foot (pcf), assuming footings are cast against dense, natural soils or engineered fill. The recommended coefficient of friction and passive earth pressure values do not include a safety factor. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

Footing excavations should be trimmed neat and the bottom of the excavation should be carefully prepared. Loose, wet or otherwise softened soil should be removed from the footing excavation prior to placing reinforcing steel bars. HGSI should observe foundation excavations prior to placing crushed rock, to verify that adequate bearing soils have been reached. Due to the high moisture sensitivity of on-site soils, construction during wet weather may require overexcavation of footings and backfill with compacted, crushed aggregate.

Below-Grade Structural Retaining Walls

Lateral earth pressures against below-grade retaining walls will depend upon the inclination of any adjacent slopes, type of backfill, degree of wall restraint, method of backfill placement, degree of backfill compaction, drainage provisions, and magnitude and location of any adjacent surcharge loads. At-rest soil pressure is exerted on a retaining wall when it is restrained against rotation. In contrast, active soil pressure will be exerted on a wall if its top is allowed to rotate or yield a distance of roughly 0.001 times its height or greater. If the subject retaining walls will be free to rotate at the top, they should be designed for an active earth pressure equivalent to that generated by a fluid weighing 35 pcf for level backfill against the wall. For restrained walls, an at-reset equivalent fluid pressure of 54 pcf should be used in design, again assuming level backfill against the wall. These values assume that the recommended drainage provisions are incorporated, and hydrostatic pressures are not allowed to develop against the wall.

During a seismic event, lateral earth pressures acting on below-grade structural walls will increase by an incremental amount that corresponds to the earthquake loading. Based on the Mononobe-Okabe equation and peak horizontal accelerations appropriate for the site location, seismic loading should be modeled using the active or at-rest earth pressures recommended above, plus an incremental rectangular-shaped seismic load of magnitude 5H, where H is the total height of the wall.

We assume relatively level ground surface below the base of the walls. As such, we recommend passive earth pressure of 390 pcf for use in design, assuming wall footings are cast against competent native soils or engineered fill. If the ground surface slopes down and away from the base of any of the walls, a lower passive earth pressure should be used and HGSI should be contacted for additional recommendations.

A coefficient of friction of 0.5 may be assumed along the interface between the base of the wall footing and subgrade soils. The recommended coefficient of friction and passive earth pressure values do not include a safety factor, and an appropriate safety factor should be included in design. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

The above recommendations for lateral earth pressures assume that the backfill behind the subsurface walls will consist of properly compacted structural fill, and no adjacent surcharge loading. If the walls will be subjected to the influence of surcharge loading within a horizontal distance equal to or less than the height of the wall, the walls should be designed for the additional horizontal pressure. For uniform surcharge pressures, a uniformly distributed lateral pressure of 0.3 times the surcharge pressure should be added.

The recommended equivalent fluid densities assume a free-draining condition behind the walls so that hydrostatic pressures do not build up. This can be accomplished by placing a 12-inch wide zone of crushed drain rock containing less than 5 percent fines against the walls. A 3-inch minimum diameter perforated, plastic drain pipe should be installed at the base of the walls and connected to a sump to remove water from the crushed drain rock zone. The drain pipe should be wrapped in filter fabric (Mirafi 140N or other as approved by the geotechnical engineer) to minimize clogging. The above drainage measures are intended to remove water from behind the wall to prevent hydrostatic pressures from building up. Additional drainage measures may be specified by the project architect or structural engineer, for damp-proofing or other reasons.

HGSI should be contacted during construction to verify subgrade strength in wall keyway excavations, to verify that backslope soils are in accordance with our assumptions, and to take density tests on the wall backfill materials.

Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as recommended in the *Site Preparation* section. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content, and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed and the removal zone backfilled with additional crushed rock. For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 200 kcf (115 pci) should be assumed for the soils anticipated at subgrade depth. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of crushed rock of 8 inches beneath the slab.

Interior slab-on-grade floors should be provided with an adequate moisture break. The capillary break material should consist of ODOT open graded aggregate per ODOT Standard Specifications 02630-2. The minimum recommended thickness of capillary break materials on re-compacted soil subgrade is 8 inches. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction, and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 90% of its maximum dry density as determined by ASTM D1557 or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. A commonly applied vapor barrier system consists of a 10-mil polyethylene vapor barrier placed directly over the capillary break material. With this type of system, an approximately 2-inch thick layer of sand is often placed over the vapor barrier to protect it from damage, to aid in curing of the concrete, and also to help prevent cement from bleeding down into the underlying capillary break materials. Other damp/vapor barrier systems may also be feasible. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside HGSI's area of expertise.

Perimeter Footing Drains

Due to the potential for perched surface water above fine grained deposits such as those encountered at the site, we recommend the outside edge of perimeter footings be provided with a drainage system consisting of 3-inch minimum diameter perforated PVC pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining sand and gravel or 1"- ¼" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. The footing drains should include clean-outs to allow periodic maintenance and inspection.

Down spouts and roof drains should collect roof water in a system separate from the footing drains in order to reduce the potential for clogging. Roof drain water should be directed to an appropriate discharge point well away from structural foundations. Grades should be sloped downward and away from buildings to reduce the potential for ponded water near structures.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2012 International Building Code (IBC) with applicable 2014 Oregon Structural Specialty Code (OSSC) revisions. We recommend Site Class C be used for design per the OSSC, which references ASCE 7-10, Chapter 20, Table 20.3-1. Design values determined for the site using the USGS (United States Geological Survey) *Earthquake Ground Motion Parameters* utility are summarized on Table 1.

Table 1. Recommended Earthquake Ground Motion Parameters (2012 IBC / 2014 OSSC)

Parameter	Value
Location (Lat, Long), degrees	45.3175, -122.7474
Mapped Spectral Acceleration Values (MCE, Site Class B):	
Short Period, S_s	0.928 g
1.0 Sec Period, S_1	0.408 g
Soil Factors for Site Class D:	
F_a	1.129
F_v	1.592
$SD_s = 2/3 \times F_a \times S_s$	0.698 g
$SD_1 = 2/3 \times F_v \times S_1$	0.433 g

Potential seismic impacts also include secondary effects such as soil liquefaction, fault rupture potential, and other hazards as discussed below:

- **Soil Liquefaction Potential –** Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or stiff clayey native soils above the water table, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.
- **Fault Rupture Potential** – Based on our review of available geologic literature, we are not aware of any mapped active (demonstrating movement in the last 10,000 years) faults on the site. During our field investigation, we did not observe any evidence of surface rupture or recent faulting. Therefore, we conclude that the potential for fault rupture on site is low.
- **Seismic Induced Landslide** – Topography in the vicinity of the subject site is generally flat to gently sloping. The potential for slope instability and seismic induced landslide on site is considered very low.
- **Effects of Local Geology and Topography** – In our opinion, no additional seismic hazard will occur due to local geology or topography. The site is expected to have no greater seismic hazard than surrounding properties and the Wilsonville area in general.

Excavating Conditions and Utility Trench Backfill

We anticipate that on-site soils can be excavated using conventional heavy equipment such as scrapers and trackhoes to a depth of 7 feet and likely greater. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native soils classify as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only.

Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. If encountered, the contractor should be prepared to implement an appropriate dewatering system for installation of the utilities. At this time, we anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of groundwater where encountered during construction conducted during the dry season. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

Utility trench backfill should consist of ¾”-0 crushed rock, compacted to at least 90% of the maximum dry density obtained by Modified Proctor (ASTM D1557) or equivalent. Initial backfill lift thick nesses for a

¾”-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw, bio-bags, silt fences, or other appropriate technology. Where used, erosion control devices should be in place and remain in place throughout site preparation and construction. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and his/her consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HGSI should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, HGSI executed these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

HARDMAN GEOTECHNICAL SERVICES INC.

REGISTERED PROFESSIONAL ENGINEER
84,422PE
OREGON
SEPTEMBER 26, 2000
SCOTT L. HARDMAN

10-26-16

EXPIRES: 06-30-2017

Scott L. Hardman, P.E., G.E.
Geotechnical Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site Plan
Logs of Test Pits TP-1 through TP-7

REFERENCES

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Portland Quadrangle, Multnomah, and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-75, scale 1:24,000.

Madin, I.P., 1990, Earthquake hazard geology maps of the Portland metropolitan area, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2, scale 1:24,000, 22 p.

Snyder, D.T., 2008, Estimated Depth to Ground Water and Configuration of the Water Table in the Portland, Oregon Area: U.S. Geological Survey Scientific Investigations Report 2008–5059, 41 p., 3 plates.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, Vol. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

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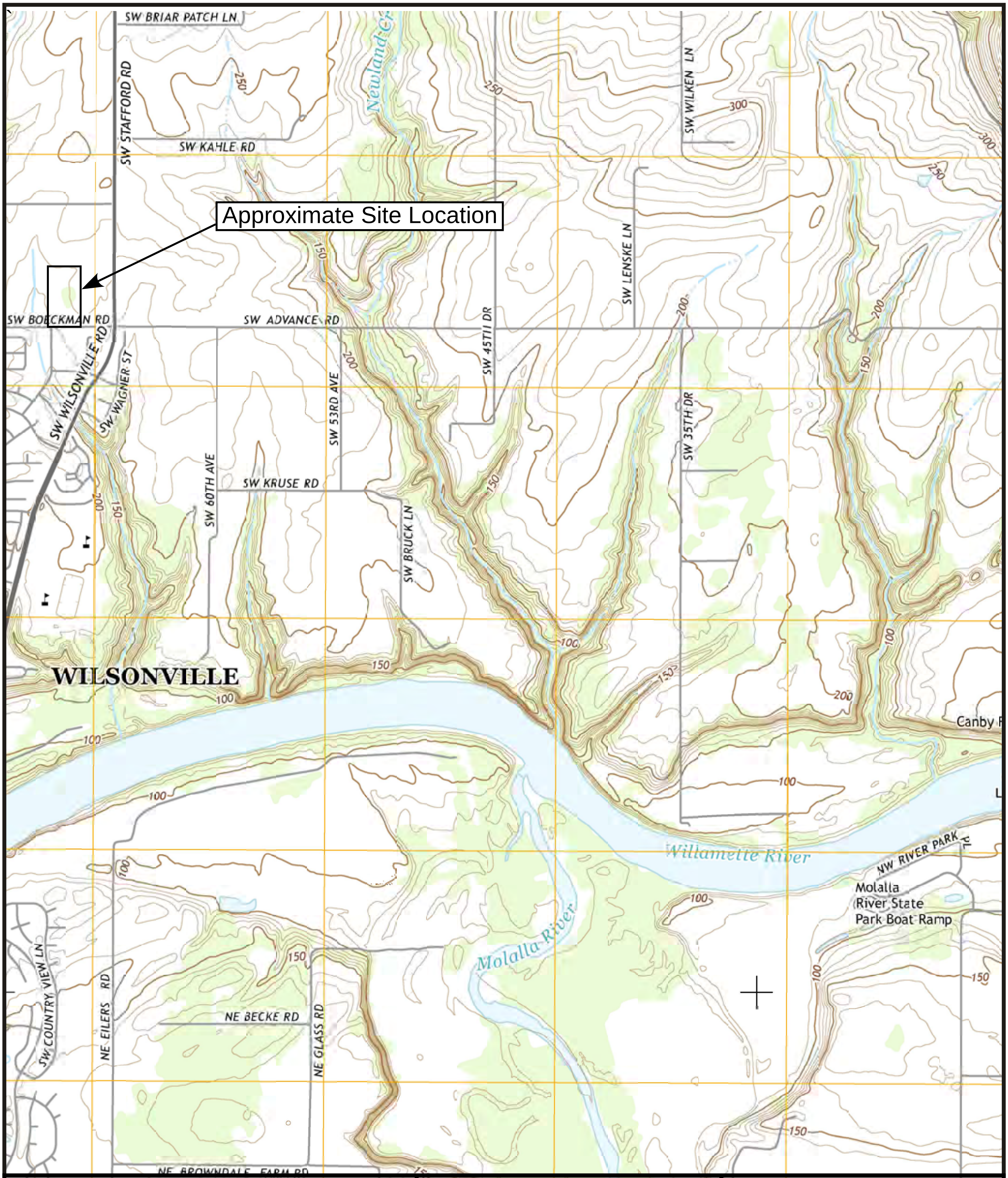
VICINITY MAP



Project: Krielkamp and Wehler Properties Wilsonville, Oregon	Project No. 16-2119	FIGURE 1

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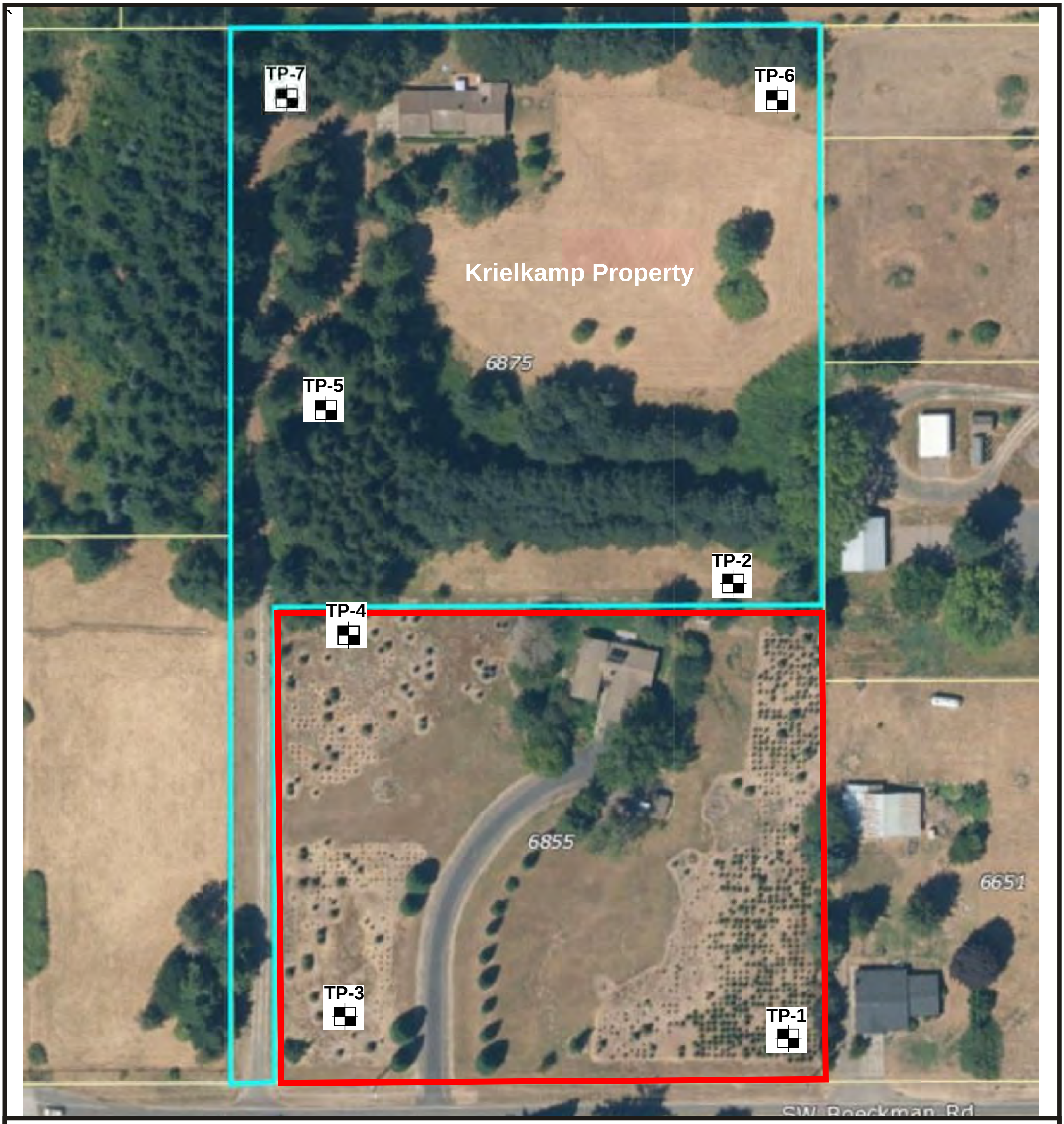
SITE AND EXPLORATION PLAN



Legend

TP-7 ▚ Test Pit Designation and Approximate Location

Base map obtained from www.portlandmaps.com

Project Krielkamp & Wehler Properties Wilsonville, Oregon	Project No. 16-2119	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					– – – – – – – – – – – – – – – –
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet Slight seepage encountered at 3 feet
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1	▽
Soil Sample Depth Interval and Designation	Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP-3

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet Slight seepage at 3.5 feet
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1 — Soil Sample Depth Interval and Designation

▽ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
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☒ S-1
Soil Sample Depth Interval and Designation

▽
Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 5

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	1.0					Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	2.0					Stiff, Clay, gray, dry
3	3.5					
4	>4					Very stiff to hard, Clayey silt, brown with orange and gray mottling, dry
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 6

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
						Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
1	0.0					
2	0.75					Medium stiff, Clay, gray, moist
3	1.5					
4	2.5					
5						Stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
6						
7						
						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 7

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
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▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

HGSI HARDMAN GEOTECHNICAL SERVICES INC.
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October 26, 2016
HGSI Project No. 16-2119

Dan Grimberg / Miriam Wilson
West Hills Land Development
3330 NW Yeon Avenue, Suite 200
Portland, Oregon 97210

Via e-mail (pdf format); hard copies can be mailed on request

Subject: **GEOTECHNICAL ENGINEERING REPORT**
WEHLER PROPERTY
6855 SW BOECKMAN ROAD
WILSONVILLE, CLACKAMAS COUNTY, OREGON

This report presents the results of a geotechnical engineering study conducted by Hardman Geotechnical Services Inc. (HGSI) for the above-referenced project. The purpose of this study was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with HGSI Proposal No. 16-570, dated October 12, 2016, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

This geotechnical evaluation was performed for an area including the subject site, and the Krielkamp Property (6875 SW Boeckman Road) to the north. The properties total roughly 8.85 acres and are rectangular in shape. There are a few structures occupying the site including two single family homes and several outbuildings. Vegetation consists of grasses, trees, and bushes with a small heavy treed area.

The intent of this geotechnical report is to provide adequate geotechnical information for design and construction applicable to the entire site, or to the Wehler Property individually. A grading plan has not been finalized and should be reviewed by HGSI when completed. Underground utilities and onsite stormwater systems are also planned. HGSI should review the grading plan when available to verify consistency with the geotechnical recommendations, and to provide any supplemental or revised input to the design needed based on geotechnical considerations.

REGIONAL GEOLOGY AND SEISMIC SETTING

The subject site lies within the Portland Basin, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. The Portland Basin is a northwest-southwest trending structural basin produced by broad regional downwarping of the area. The Portland Basin is approximately 20 miles wide and 45 miles long and is filled with consolidated and unconsolidated sedimentary rocks of late Miocene, Pliocene and Pleistocene age.

The subject site is underlain by Quaternary age (last 1.6 million years) loess, a windblown silt deposit that mantles older deposits and basalt bedrock in the Portland Hills (Madin, 1990). The loess generally consists of massive silt deposited following repeated catastrophic flooding events in the Willamette Valley, the last of which occurred about 10,000 years ago. In localized areas, the loess includes buried paleosols that developed between depositional events. Regionally, the total thickness of loess ranges from 5 feet to greater than 100 feet.

The loess is underlain by residual soil formed by in place weathering of the underlying Columbia River Basalt Formation (Madin, 1990). The Miocene aged (about 14.5 to 16.5 million years ago) Columbia River Basalts are a thick sequence of lava flows which form the crystalline basement of the Tualatin Valley. The basalts are composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. Individual basalt flow units typically range from 25 to 125 feet thick and interflow zones are typically vesicular, scoriaceous, brecciated, and sometimes include sedimentary rocks.

At least three major fault zones capable of generating damaging earthquakes are known to exist in the region. These include the Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone. These potential earthquake source zones are included in the determination of seismic design values for structures, as presented in the *Seismic Design* section. None of the known faults extend beneath the site.

FIELD EXPLORATION – EXPLORATORY TEST PITS

The site-specific exploration for this study was conducted on October 18, 2016 and consisted of seven test pits (designated TP-1 through TP-7) excavated to depths of approximately 7 feet below ground surface (bgs) at the approximate locations shown on Figure 2. It should be noted that exploration locations were determined in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

Explorations were conducted under the full-time observation of HGSI personnel. Soil samples obtained from the borings were classified in the field and representative portions were placed in relatively air-tight plastic bags. These soil samples were then returned to the laboratory for further examination. Pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence was recorded. Soils were classified in general accordance with the Unified Soil Classification System. Rock hardness was generally classified in accordance with Table 1, modified from the ODOT Rock Hardness Classification Chart (following page).

Summary test pit logs are attached to this report. The stratigraphic contacts shown on the individual borehole logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times.

SUBSURFACE CONDITIONS

The following discussion is a summary of subsurface conditions encountered in our explorations. For more detailed information regarding subsurface conditions at specific exploration locations, refer to the attached test pit logs. Also, please note that subsurface conditions can vary between exploration locations, as discussed in the *Uncertainty and Limitations* section below.

Soil

On-site soils are anticipated to consist of topsoil, clayey silt, and clay, as described below.

Topsoil – From the ground surface, all test pits encountered 1.5 to 2 feet of topsoil, comprised of moist silt. The upper about 1 foot of the topsoil was highly organic.

Gray Clay – Directly beneath the top soil in test pits TP-5 and TP-6, we encountered gray clay. The clay ranged from medium stiff to stiff and dry to very moist. The clay was highly plastic and extended to roughly 3.5 feet bgs.

Clayey Silt – Beneath the topsoil and clay in the test pits, we encountered very stiff to hard, moist to dry, brown clayey silt with orange and gray mottling. All of the test pits terminated in the clayey silt unit, at depths of about 7 feet bgs.

Groundwater

During the field exploration, no groundwater was encountered to the maximum depth of exploration at 7 feet bgs. Slight seepage was encountered in test pits TP-1 and TP-3 at about 3 feet bgs. Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. The groundwater conditions reported above are for the specific date and locations indicated, and therefore may not necessarily be indicative of other times and/or locations.

CONCLUSIONS AND RECOMMENDATIONS

Results of this study indicate that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. Recommendations are presented below regarding site preparation and undocumented fill removal, engineered fill, wet weather earthwork, spread footing foundations, below grade structural retaining walls, concrete slabs-on-grade, perimeter footing drains, seismic design, excavating conditions and utility trench backfill, and erosion control considerations.

Site Preparation and Undocumented Fill Removal

The areas of the site to be graded should first be cleared of vegetation, undocumented fill, and any loose debris; and debris from clearing should be removed from the site. Organic-rich topsoil should then be removed to competent native soils. We anticipate that the average depth of topsoil stripping will be about 12 inches over most of the site, however deeper stripping may be needed in localized areas. The final depth of stripping removal may vary depending on local subsurface conditions and the contractor’s methods, and should be determined on the basis of site observations after the initial stripping has been performed. Stripped organic soil should be stockpiled only in designated areas or removed from the site and stripping operations should be observed and documented by HGSI. Existing subsurface structures (tile drains, old utility lines, septic leach fields, etc.) beneath areas of proposed structures and pavement should be removed and the excavations backfilled with engineered fill.

There is potential for old fills to be present on site in areas beyond our explorations. Where encountered beneath proposed structures, pavements, or other settlement-sensitive improvements, undocumented fill should be removed down to firm inorganic native soils and the removal area backfilled with engineered fill (see below). HGSI should observe removal excavations (if any) prior to fill placement to verify that overexcavations are adequate and an appropriate bearing stratum is exposed.

In construction areas, once stripping has been verified, the area should be ripped or tilled to a depth of 12 inches, moisture conditioned, and compacted in-place prior to the placement of engineered fill. Exposed subgrade soils should be evaluated by HGSI. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition or over-excavated and replaced with engineered fill, as described below. The depth of overexcavation, if required, should be evaluated by HGSI at the time of construction.

Engineered Fill

In general, we anticipate that on-site soils will be suitable for use as engineered fill in dry weather conditions, provided they are relatively free of organics and are properly moisture conditioned for compaction. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 90 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. On-site soils may be wet or dry of optimum; therefore, we anticipate that moisture conditioning of native soil will be necessary for compaction operations.

Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Field density testing should conform to ASTM D2922 and D3017, or D1556. Engineered fill should be periodically observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing.

Wet Weather Earthwork

The on-site soils are moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than about 7 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, HGSI should be contacted to provide additional recommendations and field monitoring.

Spread Footing Foundations

Shallow, conventional isolated or continuous spread footings may be used to support the proposed structures, provided they are founded on competent native soils, or compacted engineered fill placed directly upon the competent native soils. We recommend a maximum allowable bearing pressure of 2,000 pounds per square foot (psf) for designing spread footings bearing on undisturbed native soils or engineered fill. The recommended maximum allowable bearing pressure may be increased by a factor of 1.33 for short term transient conditions such as wind and seismic loading. Exterior footings should be founded at least 18 inches below the lowest adjacent finished grade. Minimum footing widths should be determined by the project engineer/architect in accordance with applicable design codes.

Assuming construction is accomplished as recommended herein, and for the foundation loads anticipated, we estimate total settlement of spread foundations of less than about 1 inch and differential settlement between two adjacent load-bearing components supported on competent soil of less than about ½ inch. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied.

Wind, earthquakes, and unbalanced earth loads will subject the proposed structure to lateral forces. Lateral forces on a structure will be resisted by a combination of sliding resistance of its base or footing on the underlying soil and passive earth pressure against the buried portions of the structure. For use in design, a coefficient of friction of 0.5 may be assumed along the interface between the base of the footing and subgrade soils. Passive earth pressure for buried portions of structures may be calculated using an equivalent fluid weight of 390 pounds per cubic foot (pcf), assuming footings are cast against dense, natural soils or engineered fill. The recommended coefficient of friction and passive earth pressure values do not include a safety factor. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

Footing excavations should be trimmed neat and the bottom of the excavation should be carefully prepared. Loose, wet or otherwise softened soil should be removed from the footing excavation prior to placing reinforcing steel bars. HGSI should observe foundation excavations prior to placing crushed rock, to verify that adequate bearing soils have been reached. Due to the high moisture sensitivity of on-site soils, construction during wet weather may require overexcavation of footings and backfill with compacted, crushed aggregate.

Below-Grade Structural Retaining Walls

Lateral earth pressures against below-grade retaining walls will depend upon the inclination of any adjacent slopes, type of backfill, degree of wall restraint, method of backfill placement, degree of backfill compaction, drainage provisions, and magnitude and location of any adjacent surcharge loads. At-rest soil pressure is exerted on a retaining wall when it is restrained against rotation. In contrast, active soil pressure will be exerted on a wall if its top is allowed to rotate or yield a distance of roughly 0.001 times its height or greater. If the subject retaining walls will be free to rotate at the top, they should be designed for an active earth pressure equivalent to that generated by a fluid weighing 35 pcf for level backfill against the wall. For restrained walls, an at-reset equivalent fluid pressure of 54 pcf should be used in design, again assuming level backfill against the wall. These values assume that the recommended drainage provisions are incorporated, and hydrostatic pressures are not allowed to develop against the wall.

During a seismic event, lateral earth pressures acting on below-grade structural walls will increase by an incremental amount that corresponds to the earthquake loading. Based on the Mononobe-Okabe equation and peak horizontal accelerations appropriate for the site location, seismic loading should be modeled using the active or at-rest earth pressures recommended above, plus an incremental rectangular-shaped seismic load of magnitude 5H, where H is the total height of the wall.

We assume relatively level ground surface below the base of the walls. As such, we recommend passive earth pressure of 390 pcf for use in design, assuming wall footings are cast against competent native soils or engineered fill. If the ground surface slopes down and away from the base of any of the walls, a lower passive earth pressure should be used and HGSI should be contacted for additional recommendations.

A coefficient of friction of 0.5 may be assumed along the interface between the base of the wall footing and subgrade soils. The recommended coefficient of friction and passive earth pressure values do not include a safety factor, and an appropriate safety factor should be included in design. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

The above recommendations for lateral earth pressures assume that the backfill behind the subsurface walls will consist of properly compacted structural fill, and no adjacent surcharge loading. If the walls will be subjected to the influence of surcharge loading within a horizontal distance equal to or less than the height of the wall, the walls should be designed for the additional horizontal pressure. For uniform surcharge pressures, a uniformly distributed lateral pressure of 0.3 times the surcharge pressure should be added.

The recommended equivalent fluid densities assume a free-draining condition behind the walls so that hydrostatic pressures do not build up. This can be accomplished by placing a 12-inch wide zone of crushed drain rock containing less than 5 percent fines against the walls. A 3-inch minimum diameter perforated, plastic drain pipe should be installed at the base of the walls and connected to a sump to remove water from the crushed drain rock zone. The drain pipe should be wrapped in filter fabric (Mirafi 140N or other as approved by the geotechnical engineer) to minimize clogging. The above drainage measures are intended to remove water from behind the wall to prevent hydrostatic pressures from building up. Additional drainage measures may be specified by the project architect or structural engineer, for damp-proofing or other reasons.

HGSI should be contacted during construction to verify subgrade strength in wall keyway excavations, to verify that backslope soils are in accordance with our assumptions, and to take density tests on the wall backfill materials.

Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as recommended in the *Site Preparation* section. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content, and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed and the removal zone backfilled with additional crushed rock. For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 200 kcf (115 pci) should be assumed for the soils anticipated at subgrade depth. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of crushed rock of 8 inches beneath the slab.

Interior slab-on-grade floors should be provided with an adequate moisture break. The capillary break material should consist of ODOT open graded aggregate per ODOT Standard Specifications 02630-2. The minimum recommended thickness of capillary break materials on re-compacted soil subgrade is 8 inches. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction, and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 90% of its maximum dry density as determined by ASTM D1557 or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. A commonly applied vapor barrier system consists of a 10-mil polyethylene vapor barrier placed directly over the capillary break material. With this type of system, an approximately 2-inch thick layer of sand is often placed over the vapor barrier to protect it from damage, to aid in curing of the concrete, and also to help prevent cement from bleeding down into the underlying capillary break materials. Other damp/vapor barrier systems may also be feasible. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside HGSI's area of expertise.

Perimeter Footing Drains

Due to the potential for perched surface water above fine grained deposits such as those encountered at the site, we recommend the outside edge of perimeter footings be provided with a drainage system consisting of 3-inch minimum diameter perforated PVC pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining sand and gravel or 1"- ¼" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. The footing drains should include clean-outs to allow periodic maintenance and inspection.

Down spouts and roof drains should collect roof water in a system separate from the footing drains in order to reduce the potential for clogging. Roof drain water should be directed to an appropriate discharge point well away from structural foundations. Grades should be sloped downward and away from buildings to reduce the potential for ponded water near structures.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2012 International Building Code (IBC) with applicable 2014 Oregon Structural Specialty Code (OSSC) revisions. We recommend Site Class C be used for design per the OSSC, which references ASCE 7-10, Chapter 20, Table 20.3-1. Design values determined for the site using the USGS (United States Geological Survey) *Earthquake Ground Motion Parameters* utility are summarized on Table 1.

Table 1. Recommended Earthquake Ground Motion Parameters (2012 IBC / 2014 OSSC)

Parameter	Value
Location (Lat, Long), degrees	45.3175, -122.7474
Mapped Spectral Acceleration Values (MCE, Site Class B):	
Short Period, S_s	0.928 g
1.0 Sec Period, S_1	0.408 g
Soil Factors for Site Class D:	
F_a	1.129
F_v	1.592
$SD_s = 2/3 \times F_a \times S_s$	0.698 g
$SD_1 = 2/3 \times F_v \times S_1$	0.433 g

Potential seismic impacts also include secondary effects such as soil liquefaction, fault rupture potential, and other hazards as discussed below:

- **Soil Liquefaction Potential –** Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or stiff clayey native soils above the water table, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.
- **Fault Rupture Potential** – Based on our review of available geologic literature, we are not aware of any mapped active (demonstrating movement in the last 10,000 years) faults on the site. During our field investigation, we did not observe any evidence of surface rupture or recent faulting. Therefore, we conclude that the potential for fault rupture on site is low.
- **Seismic Induced Landslide** – Topography in the vicinity of the subject site is generally flat to gently sloping. The potential for slope instability and seismic induced landslide on site is considered very low.
- **Effects of Local Geology and Topography** – In our opinion, no additional seismic hazard will occur due to local geology or topography. The site is expected to have no greater seismic hazard than surrounding properties and the Wilsonville area in general.

Excavating Conditions and Utility Trench Backfill

We anticipate that on-site soils can be excavated using conventional heavy equipment such as scrapers and trackhoes to a depth of 7 feet and likely greater. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native soils classify as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only.

Perched groundwater conditions often occur over fine-grained native deposits such as those beneath the site, particularly during the wet season. If encountered, the contractor should be prepared to implement an appropriate dewatering system for installation of the utilities. At this time, we anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of groundwater where encountered during construction conducted during the dry season. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

Utility trench backfill should consist of ¾”-0 crushed rock, compacted to at least 90% of the maximum dry density obtained by Modified Proctor (ASTM D1557) or equivalent. Initial backfill lift thick nesses for a

¾”-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw, bio-bags, silt fences, or other appropriate technology. Where used, erosion control devices should be in place and remain in place throughout site preparation and construction. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and his/her consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HGSI should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, HGSI executed these services in accordance with generally accepted professional principles and practices in the field of geotechnical engineering at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

HARDMAN GEOTECHNICAL SERVICES INC.

REGISTERED PROFESSIONAL ENGINEER
64,422PE
OREGON
SEPTEMBER 26, 2000
SCOTT L. HARDMAN
EXPIRES: 06-30-2017

10-26-16

Scott L. Hardman, P.E., G.E.
Geotechnical Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site Plan
Logs of Test Pits TP-1 through TP-7

REFERENCES

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Portland Quadrangle, Multnomah, and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-75, scale 1:24,000.

Madin, I.P., 1990, Earthquake hazard geology maps of the Portland metropolitan area, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2, scale 1:24,000, 22 p.

Snyder, D.T., 2008, Estimated Depth to Ground Water and Configuration of the Water Table in the Portland, Oregon Area: U.S. Geological Survey Scientific Investigations Report 2008–5059, 41 p., 3 plates.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, Vol. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

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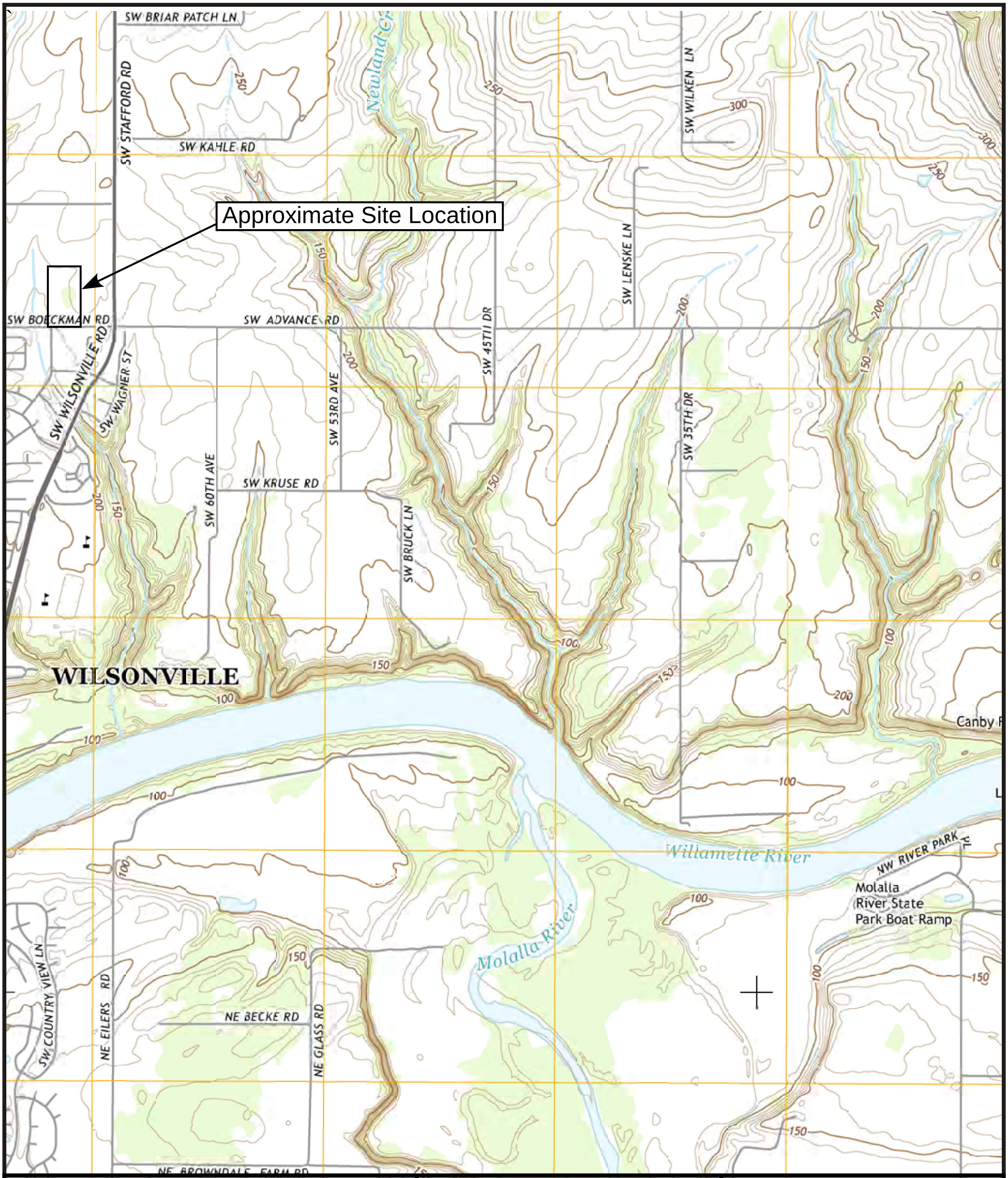
VICINITY MAP



Project: Krielkamp and Wehler Properties Wilsonville, Oregon	Project No. 16-2119	FIGURE 1

HGSI HARDMAN GEOTECHNICAL SERVICES INC.

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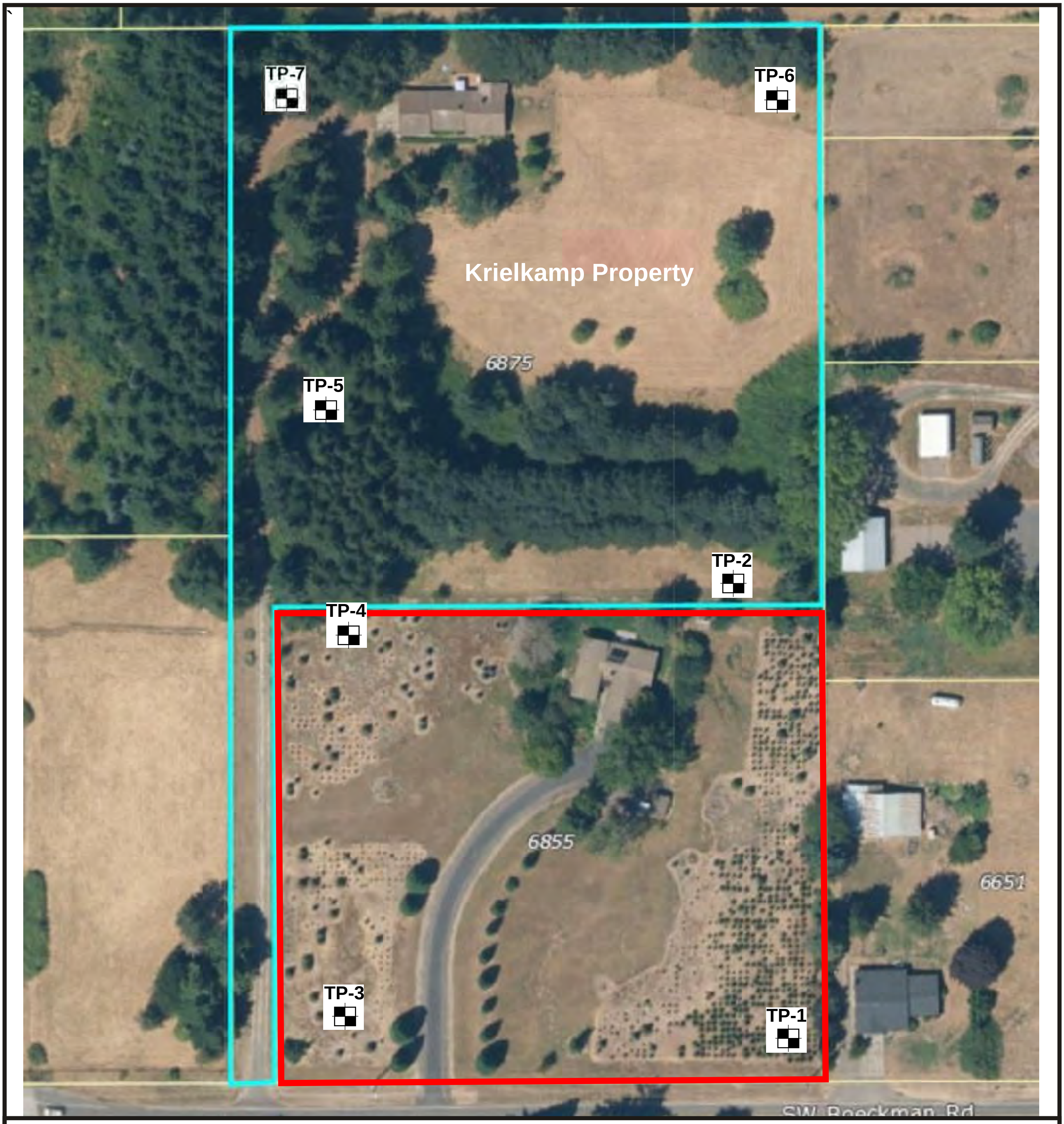
SITE AND EXPLORATION PLAN



Legend

TP-7 ▚ Test Pit Designation and Approximate Location

Base map obtained from
www.portlandmaps.com

Project Krielkamp & Wehler Properties Wilsonville, Oregon	Project No. 16-2119	FIGURE 2

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 1

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet Slight seepage encountered at 3 feet
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 — Soil Sample Depth Interval and Designation

∇ — Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 2

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet No seepage or groundwater encountered
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP-3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						
8						Test pit terminated at 7 feet Slight seepage at 3.5 feet
9						
10						
11						
12						
13						
14						
15						
16						
17						

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☒ S-1	Soil Sample Depth Interval and Designation
▽	Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 4

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
12						
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14						
15						
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17						

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☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 5

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	1.0					Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	2.0					Stiff, Clay, gray, dry
3	3.5					
4	>4					Very stiff to hard, Clayey silt, brown with orange and gray mottling, dry
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
11						
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17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties Wilsonville, Oregon	Project No. 16-2119	Test Pit No. TP-6

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	0.75					Medium stiff, Clay, gray, moist
3	1.5					
4	2.5					
5						Stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
6						
7						
8						Test pit terminated at 7 feet No seepage or groundwater encountered
9						
10						
11						
12						
13						
14						
15						
16						
17						

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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

LOG OF BACKHOE / EXCAVATOR TEST PIT

Project: Krielkamp & Wehler Properties
Wilsonville, Oregon

Project No. 16-2119

Test Pit No. TP- 7

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Interval	Sample Designation	Moisture Content (%)	Groundwater	Material Description
1	0.0					Very soft to medium stiff, Silt with many fine roots, dark brown, moist (top soil)
2	1.5					
3	3.5					Very stiff to hard, Clayey silt, brown with orange and gray mottling, moist to dry
4	>4					
5						
6						
7						Test pit terminated at 7 feet No seepage or groundwater encountered
8						
9						
10						
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LEGEND

☒ S-1 Soil Sample Depth Interval and Designation

▽ Water Level at Time of Excavation

Date Excavated: 10-18-16

Logged By: IDM

Appendix H

AFTER RECORDING, RETURN TO:

Law Office of Michelle D. Da Rosa
1001 SW Fifth Avenue, Suite 1100
Portland, OR 97204

DECLARATION OF PROTECTIVE COVENANTS, CONDITIONS, RESTRICTIONS AND EASEMENTS FOR STAFFORD MEADOWS

____________________, LLC

Declarant

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DECLARATION OF PROTECTIVE COVENANTS,
CONDITIONS, RESTRICTIONS AND EASEMENTS
FOR STAFFORD MEADOWS

THIS DECLARATION is made this _______ day of ____________, 2018 by ___________________ **LLC**, an Oregon limited liability company ("**Declarant**").

RECITALS

A. Declarant has recorded the plat of "**Stafford Meadows**" in the plat records of Clackamas County, Oregon as Plat No. __________. Declarant is the only owner of the land so platted.

B. Declarant desires to subject the Lots and Tracts described in Section 2.1 to the conditions, restrictions and charges set forth in this instrument for the benefit of such property, and its present and subsequent owners, and to establish such property under the Oregon Planned Community Act, ORS 94.550 to 94.783, as the first phase of a Class I planned development to be known as Stafford Meadows.

NOW, THEREFORE, Declarant hereby declares that the property described in Section 2.1 will be held, sold and conveyed subject to the following easements, covenants, restrictions and charges, which run with such property and are binding on all parties having or acquiring any right, title, or interest in such property or any part thereof, unless otherwise provided herein, and inure to the benefit of all such persons.

Article 1

DEFINITIONS

As used in this Declaration, the terms set forth below have the following meanings:

1.1 "**Additional Property**" means any land that is made subject to this Declaration as provided in Section 2.2.

1.2 "**Architectural Review Committee" or "the Committee**" means the committee appointed pursuant to Article 7.

1.3 "**Assessments**" means all assessments and other charges, fines and fees imposed by the Association on an Owner in accordance with this Declaration, the Bylaws of the Association, or the provisions of the Oregon Planned Community Act, including, without limitation, General Assessments, Special Assessments, Emergency Assessments, Limited Common Area Assessments, Working Fund Assessments and Individual Assessments as described in Article 10.

1.4 “**Association**” means the nonprofit corporation formed to serve as the Owners association as provided in Article 8, and its successors and assigns.

1.5 “**Board of Directors” or “the Board**” means the duly appointed or elected board of directors of the Association, which is invested with the authority to operate the Association and to appoint the officers of the Association. Prior to the Turnover Meeting, Declarant will appoint the Board of Directors. After the Turnover Meeting, the Board will be elected by the Owners.

1.6 “**Bylaws**” means the duly adopted bylaws of the Association as the same may hereafter be amended or replaced.

1.7 “**Common Areas**” means those lots or tracts designated as such on any plat of the Property, or in this Declaration or any declaration annexing Additional Property to Stafford Meadows, including any Improvements thereon, and also includes Common Easement Areas and any Lots converted to Common Areas as provided in Section 3.2.

1.8 “**Common Easement Areas**” means the utility, storm water, public sidewalk, and pedestrian and bicycle access easements established for the benefit of all property within Stafford Meadows pursuant to this Declaration.

1.9 “**Common Maintenance Areas**” means the Common Areas and any other areas designated as such in Section 9.1 of this Declaration or in any declaration annexing Additional Property to Stafford Meadows as being maintained by the Association.

1.10 “**Declarant**” means __________________ LLC, and its successors and assigns if such successor or assignee should acquire Declarant’s interest in the remainder of the Property, or less than all of such property if a recorded instrument executed by Declarant assigns to the transferee all of Declarant’s rights under this Declaration, and any affiliate of __________________ LLC. Any such successor declarant will succeed to all of the rights and obligations of the Declarant under this Declaration, including, without limitation, the obligation to complete any Improvements required by Clackamas County as part of its subdivision approval.

1.11 “**Design Guidelines**” means the guidelines adopted from time to time by the Architectural Review Committee pursuant to Article 7.

1.12 “**Emergency Assessments**” means the Assessments described in Section 10.4(c).

1.13 “**Front Yard**” means the front yards and side yards of Lots not enclosed by a fence, including street frontage planter strips for all Lots, street trees and entry monuments, if any.

1.14 “**General Assessments**” means the Assessments described in Section 10.4(a).

1.15 “**General Plan of Development**” means Declarant’s general plan of development of the Property as approved by Clackamas County, as the same may be amended from time to time.

1.16 “**Improvement**” means every structure or improvement of any kind, including, but not limited to, a fence, wall, driveway, swimming pool, storage shelter, mailbox and newspaper receptacle, landscaping and any other product of construction efforts on or in respect to the Property.

1.17 "**Individual Assessments**" means the Assessments described in Section 10.4(d).

1.18 "**Initial Property**" means the real property referred to in Section 2.1.

1.19 "**Limited Common Area**" means those Common Areas established for the exclusive use or enjoyment of certain Lots as designated in this Declaration.

1.20 "**Limited Common Area Assessments**" means the Assessments described in Section 10.4(d).

1.21 "**Limited Common Easement Areas**" means those Limited Common Area easements established for the exclusive use or enjoyment of certain Lots as designated in this Declaration or in the Plat.

1.22 "**Living Unit**" means a building or a portion of a building located upon a Lot within the Property and designated for separate residential occupancy.

1.23 "**Lot**" means a platted or partitioned lot within the Property, with the exception of any lot marked on the Plat as being common or open space or so designated in this Declaration or the declaration annexing such property to Stafford Meadows.

1.24 "**Mortgage**" means a mortgage or a trust deed, "**Mortgagee**" means a mortgagee or a beneficiary of a trust deed, and "**Mortgagor**" means a mortgagor or a grantor of a trust deed.

1.25 "**Occupant**" means the occupant of a Living Unit who is the Owner, lessee or any other Person authorized by the Owner to occupy the premises.

1.26 "**Operations Fund**" means the fund described in Section 10.6.

1.27 "**Owner**" means the Person or Persons, including Declarant, owning any Lot in the Property, but does not include a tenant or holder of a leasehold interest or a contract vendor or other Person holding only a security interest in a Lot. If a Lot is Sold under a recorded real estate installment sale contract, the purchaser (rather than the seller) will be considered the Owner unless the contract specifically provides to the contrary. If a Lot is subject to a written lease with a term in excess of one year and the lease specifically so provides, then upon filing a copy of the lease with the Board of Directors, the lessee (rather than the fee owner) will be considered the Owner during the term of the lease for the purpose of exercising any rights related to such Lot under this Declaration. The rights, obligations and other status of being an Owner commence upon acquisition of the ownership of a Lot and terminate upon disposition of such ownership, but termination of ownership does not discharge an Owner from obligations incurred prior to termination.

1.28 "**Person**" means a human being, a corporation, partnership, limited liability company, trustee or other legal entity.

1.29 "**Plat**" means the plat of Stafford Meadows recorded in the plat records of Clackamas County, Oregon as Document No. _______________ and any annexation plat, as the same may be amended.

1.30 "**Public Areas**" means areas dedicated to the public or established for public use in any plat of the Property, or so designated in this Declaration or the declaration annexing such property to Stafford Meadows.

1.31 "**Reserve Fund**" means the fund described in Section 10.7.

1.32 "**Rules and Regulations**" means those policies, procedures, rules and regulations adopted by the Association pursuant to the authority granted in this Declaration, as the same may be amended from time to time.

1.33 "**Sold**" means that legal title has been conveyed or that a contract of sale has been executed and recorded under which the purchaser has obtained the right to possession.

1.34 "**Special Assessments**" means the Assessments described in Section 10.4(b)

1.35 "**The Property**" means Stafford Meadows.

1.36 "**Stafford Meadows**" means the Initial Property and any Additional Property annexed to this Declaration.

1.37 "**This Declaration**" means all of the easements, covenants, restrictions and charges set forth in this instrument, together with any rules or regulations promulgated hereunder, as the same may be amended or supplemented from time to time in accordance with the provisions hereof, including the provisions of any supplemental declaration annexing property to Stafford Meadows.

1.38 "**Turnover Meeting**" means the meeting called by Declarant pursuant to Section 8.7, at which Declarant will turn over administrative responsibility for the Property to the Association.

1.39 "**Working Fund Assessments**" means the Assessments described in Section 10.4(f).

Article 2

PROPERTY SUBJECT TO THIS DECLARATION

2.1 **Initial Property.** Declarant hereby declares that all of the real property described below is owned and will be owned, conveyed, hypothecated, encumbered, used, occupied and improved subject to this Declaration:

> All real property within that certain plat entitled "**Stafford Meadows**," filed in the plat records of Clackamas County, Oregon, as Document No. _________________, except Tract H.

2.2 **Annexation of Additional Property**. Declarant may from time to time and in its sole discretion annex to Stafford Meadows as "Additional Property" any real property now or hereafter acquired by it, and may also from time to time and in its sole discretion permit other holders of real property to annex the real property owned by them to Stafford Meadows. The annexation of such Additional Property is accomplished as follows:

(a) The Owner or Owners of such real property will record a declaration that is executed by or bear the approval of Declarant and will, among other things, describe the real property to be annexed; establish land classifications for the Additional Property; establish any additional limitations, uses, restrictions, covenants and conditions that are intended to be applicable to such Additional Property; and declare that such property is held and will be held, conveyed, hypothecated, encumbered, used, occupied and improved subject to this Declaration.

(b) The Additional Property described in any such annexation thereby becomes a part of Stafford Meadows and subject to this Declaration, and the Declarant and the Association will have and accept and exercise administration of this Declaration with respect to such Additional Property.

(c) Notwithstanding any provision apparently to the contrary, a declaration with respect to any Additional Property may:

(1) modify or exclude any then existing restrictions and establish such new land classifications and such limitations, uses, restrictions, covenants and conditions with respect to such Additional Property as Declarant may deem to be appropriate for the development of the Additional Property; and

(2) with respect to existing land classifications, modify or exclude any then existing restrictions and establish additional or different limitations, uses, restrictions, covenants and conditions with respect to such property as Declarant may deem to be appropriate for the development of such Additional Property.

(d) There is no limitation on the number of Lots or Living Units that Declarant may create or annex to Stafford Meadows except as may be established by applicable ordinances of Clackamas County. Similarly, there is no limitation on the right of Declarant to annex common property, except as may be established by Clackamas County.

(e) Declarant does not agree to build any specific future Improvement, but does not choose to limit Declarant's right to add additional Improvements.

(f) Nothing in this Declaration establishes any duty or obligation on Declarant to annex any property to this Declaration, and no owner of property excluded from this Declaration has any right to have such property annexed to this Declaration or Stafford Meadows.

(g) Upon annexation to Stafford Meadows, additional Lots so annexed are entitled to voting rights as set forth in Section 8.3.

(h) The formula to be used for reallocating the common expenses if additional Lots are annexed and the manner of reapportioning the common expenses if additional Lots are annexed during a fiscal year are set forth in Section 10.5.

2.3 **Improvements.** Declarant does not agree to build any Improvements on the Property other than as required by Clackamas County, but may elect, at Declarant's option, to build additional Improvements.

2.4 **Withdrawal of Property.** Property may be withdrawn from Stafford Meadows only by duly adopted amendment to this Declaration, except that Declarant may withdraw all or a portion of the Initial Property or any Additional Property annexed pursuant to a declaration described in Section 2.2 at any time prior to the sale of the first Lot in the plat of the Initial Property or, in the case of Additional Property, prior to the sale of the first Lot in the property annexed by the supplemental declaration, subject to the prior approval of Clackamas County. Such withdrawal will be by a declaration executed by Declarant and recorded in the deed records of Clackamas County, Oregon. If a portion of the Property is withdrawn, all voting rights otherwise allocated to Lots being withdrawn will be eliminated, and the common expenses will be reallocated among the remaining Lots.

2.5 **Dedications.** Declarant reserves the right to dedicate any portions of the Property then owned by Declarant to any governmental authority, quasi-governmental entity or entity qualifying under Section 501(c)(3) of the Internal Revenue Code or similar provisions, from time to time, for such purposes as Declarant may deem to be appropriate, including, without limitation, for utility stations, equipment, fixtures and lines; streets and roads; sidewalks; trails; open space; recreational facilities; schools; fire, police, security, medical and similar services; and such other purposes as Declarant and such governmental authority or quasi-governmental entity determines to be appropriate from time to time. Any consideration received by Declarant as a result of such dedication or by reason of any condemnation or any conveyance in lieu of condemnation will belong solely to Declarant.

2.6 **Conversion of Lots to Common Areas**. Declarant may elect to build common facilities on one or more Lots and designate such Lots, or any portion thereof, as Common Areas by a supplemental declaration recorded in the deed records of Clackamas County, Oregon. The supplemental declaration must be executed by Declarant. Additionally, Declarant reserves the right over the Common Areas (excluding the Common Easement Areas) to make boundary line adjustments between any Lot (before the Lot has been sold to someone other than the Declarant or a successor declarant) and an adjacent Common Area by a supplemental declaration and plat recorded in the deed records of Clackamas County, Oregon, notwithstanding that such an adjustment may convert a Lot or a portion thereof to Common Area, or a Common Area, or portion thereof, into a Lot or portion of a Lot. This reserved conversion right will expire upon turnover of the Association to the members by the Declarant as provided for in the Bylaws.

2.7 **Subdivisions**. Declarant reserves the right to subdivide any Lots in the Additional Property then owned by it upon receiving all required approvals from the applicable governing authority. If any two or more Lots are so subdivided or subject to condominium ownership, they will be deemed separate Lots for the purposes of allocating assessments under the Declaration. No other Owner of any Lot in the Additional Property may subdivide any Lot without the prior written approval of Declarant prior to the Turnover Meeting and thereafter by the Architectural Review Committee, which consent may be granted or denied at the sole discretion of Declarant or the Committee, as applicable.

2.8 **Consolidations**. Declarant has the right to consolidate any two or more Lots in the Additional Property then owned by it upon receipt of any required approvals from the applicable governing authority. No other Owner may consolidate any Lots without the prior written approval of Declarant before the Turnover Meeting and thereafter by the Architectural Review Committee, which may be granted or denied at the sole discretion of Declarant or the Committee, as applicable. An approved consolidation will be effected by the recording of a supplemental declaration stating that the affected Lots are consolidated, which declaration must be executed by the Owner(s) of the affected Lots and by the chairperson of the Association. Once so consolidated, the consolidated Lot may not thereafter be partitioned, nor may the consolidation be revoked except as provided in Section 2.7 above. Any Lots consolidated pursuant to this section will be considered one Lot thereafter for the purposes of the Declaration, including voting rights and allocation of Assessments.

Article 3

LAND CLASSIFICATIONS

3.1 **Land Classifications Within Initial Property.** All land within the Initial Property is included in one or another of the following classifications:

(a) Lots, which consist of Lots 1 through 46 of the plat of the Initial Property.

(b) Common Areas, including the area marked as Tracts A, B, C, D, E, F and G on the plat of the Initial Property, plus the Common Easement Areas and Public Areas referred to below. Tract A is an Open Space, natural resource area; Tract B is a storm water facility subject to an easement over its entirety in favor of ______________; Tracts C is a landscape buffer along Boeckman Road; Tracts, D, E, and F are pedestrian access tracts subject to public pedestrian easements of their entirety.

(c) Common Easement Areas, which are wall maintenance easement areas over Lots 6, 7, 12-18, inclusive, public sidewalk easements, clean water service and storm facility easement areas, utility easements, sight distance easements, and any other easements established on the plat of the Initial Property or in any recorded document for entrance signage, monuments, or landscaping over Lots.

(d) There are no Limited Common Areas or Limited Common Easement Areas in the Initial Property.

3.2 **Conversion of Lots to Common Areas**. Declarant may elect to build common facilities on one or more Lots and designate such Lots as Common Areas by a declaration recorded in the deed records of Clackamas County, Oregon. Such declaration must be executed by Declarant as Owner of the Lots.

3.3 **Subdivisions.** Declarant reserves the right to subdivide any Lots then owned by it upon receiving all required approvals from Clackamas County. If a Lot or Lots are so subdivided, the new lots will be deemed separate Lots for the purposes of allocating Assessments under this Declaration. No other Owner of any Lot in the Property may subdivide any Lot without the prior written approval of the Declarant prior to the Turnover Meeting and thereafter by the Architectural Review Committee, which consent may be granted or denied at the sole discretion of the Declarant or the Committee, as applicable.

3.4 **Consolidations.** Declarant has the right to consolidate any two or more Lots then owned by it upon receipt of any required approvals from Clackamas County. No other Owner may consolidate any Lots without the prior written approval of the Declarant prior to the Turnover Meeting and thereafter by the Architectural Review Committee, which may be granted or denied at the sole discretion of the Declarant or Committee, as applicable. An approved consolidation will be effected by the recording of a supplemental declaration stating that the affected Lots are consolidated, which declaration must be executed by the Owner(s) of the affected Lots and by the president of the Association. Once so consolidated, the consolidated Lot may not thereafter be partitioned, nor may the consolidation be revoked except as provided in Section 3.3. Any Lots consolidated pursuant to this section will be considered one Lot thereafter for the purposes of this Declaration, including voting rights and allocation of Assessments.

Article 4

PROPERTY RIGHTS IN COMMON AREAS

4.1 **Owners' Easements of Enjoyment.** Subject to the provisions of this Article 4, every Owner and his or her invitees have a right and easement of enjoyment in and to the Common Areas, which easement is appurtenant to and passes with the title to every Lot. The use of the Common Easement Areas, however, are limited to the Owners and invitees of the Lots designated in the declaration establishing the Limited Common Easement Area.

4.2 **Title to Common Areas.** Except for portions dedicated to the public or any governmental authority and otherwise provided in this Section 4.2, title to the Common Areas will be conveyed to the Association by Declarant AS IS, but free and clear of monetary liens, on or before the Turnover Meeting. The Association, upon such conveyance, will assume all obligations to maintain, insure, and otherwise assume the obligations of the Declarant in respect of the Common Areas set forth in this Agreement or the Plat. Title to Common Easement Areas and Limited Common Easement Areas, if any, subject to the easements set forth in this Declaration or the supplemental declaration creating such areas, rests in the Owners of the respective Lots within which such areas are located, or to the public if part of dedicated street rights-of-way.

4.3 **Extent of Owners' Rights.** The rights and easements of enjoyment in the Common Areas created hereby are subject to the following and to all other provisions of this Declaration:

(a) **Association Easements.** Declarant grants to the Association for the benefit of the Association and all Owners of Lots within the Property the following easements over, under and upon the Common Maintenance Areas:

(1) An easement for underground installation and maintenance of power, gas, electric, water and other utility and communication lines and services installed by Declarant or with the approval of the Board of Directors of the Association and any such easement shown on any plat of the Property.

(2) An easement for construction, maintenance, repair, and use of such areas, including any common facilities on Tracts A, B, C, D, E, F or G.

(3) An easement for access for regular upkeep, maintenance, modification and replacement of the Front Yard landscaping and related irrigation equipment, including drainage systems, if any, and for making emergency repairs to the landscaping and related equipment and settings in the Front Yards of the Lots necessary for the public safety or to prevent damage to the Common Maintenance Areas or to another Lot, or to enforce this Declaration or the Rules and Regulations, or with the approval of the Board of Directors of the Association.

(4) An easement for the purpose of making repairs to any existing structures on Common Areas.

(b) **Public and Utility Easements.**

The Common Areas are subject to the public and utility easements established the Plat. In addition, the public is hereby granted access easements over all sidewalks, pedestrian accesses and trails in the Common Areas within the Property as designated on the Plat. In addition, Declarant or the Association may (and, to the extent required by law will) grant or assign such easements to municipalities or other utilities performing utility services and to communication companies, and the Association may grant free access thereon to police, fire and other public officials, and to employees of utility companies and communications companies serving the Property.

(c) **Use of the Common Areas.** The Common Areas will be used for the purposes set forth in any plat of the Property and not be partitioned or otherwise divided into parcels for residential use, and no private structure of any type will be constructed on the Common Areas. Except as otherwise provided in this Declaration, the Common Areas are reserved for the use and enjoyment of all Owners. No private use may be made of the Common Areas except as otherwise provided in this Declaration. No Owner may place or cause to be placed on the Common Areas any trash, structure, equipment, furniture, package, or object of any kind. Nothing in this Declaration prevents the placing of a sign or signs upon the Common Areas by Declarant or the Association identifying the Property or identifying pathways or items of interest, signs restricting certain uses, or warning, traffic or directional signs, provided that such signs are approved by the Architectural Review Committee and comply with any applicable sign ordinances. The Board of Directors has authority to abate any trespass or encroachment upon the Common Areas at any time, by any reasonable means and with or without having to bring legal proceedings. A declaration annexing Additional Property may provide that the Owners of such Additional Property do not have the right to use a particular Common Area or facility located on such Common Area, in which event such Common Area will automatically become a “Limited Common Area” assigned to the Lots that have access thereto.

(d) **Alienation of the Common Areas.** The Association may not by act or omission seek to abandon, partition, subdivide, encumber as security for a debt, sell, transfer or convey the Common Areas owned directly or indirectly by the Association for the benefit of the Lots unless the holders of at least 80 percent of the Class A voting rights and the Class B Member (as defined in Section 8.3), if any, have given their prior written approval and unless approved by Clackamas County. Such approvals will not be required for dedications under Section 2.5. The Association, upon approval in writing of at least two-thirds of the Class A voting rights and the Class B Member, if any, and if approved by order or resolution of Clackamas County, may dedicate or convey any portion of the Common Areas to a park district or other public body. Any sale, transfer, conveyance or encumbrance permitted by this Declaration may provide that the Common Area may be released from any restrictions imposed by this Declaration if the request for approval of the action also includes approval of the release.

(e) **Leases, Easements, Rights-of-Way, Licenses and Similar Interests and Vacations of Roadways**. Notwithstanding the provisions of Section 4.3(d), the Association may execute, acknowledge and deliver leases, easements, rights-of-way, licenses and other similar interests affecting the Common Areas and consent to vacation of roadways within and adjacent to the Common Areas, subject to such approvals as are required by ORS 94.665(4) and (5).

(f) **Limitations on Use.** Use of the Common Areas is subject to the following:

(1) The provisions of this Declaration and any applicable supplemental declaration;

(2) Any restrictions or limitations contained in any deed or other instrument conveying such property to the Association;

(3) Easements reserved or granted in this Declaration or any supplemental declaration;

(4) The Common Areas may not be used for the construction of residential structures at any time.

(5) The Board's right to:

(A) adopt Rules and Regulations regulating use and enjoyment of the Common Areas, including rules limiting the number of guests who may use the Common Areas;

(B) suspend the right of an Owner to use the Common Areas as provided in this Declaration;

(C) dedicate or transfer all or any part of the Common Areas, subject to such approval requirements as may be set forth in this Declaration;

(D) impose reasonable membership requirements and charge reasonable admission or other use fees for the use of any recreational facility situated upon the Common Areas;

(E) permit use of any recreational facilities situated on the Common Areas by Persons other than Owners, their families, lessees and guests with or without payment of use fees established by the Board;

(F) designate areas and facilities of Common Areas as Public Areas; and

(G) provide certain Owners the rights to the exclusive use of those portions of the Common Areas designated as Limited Common Areas.

4.4 **Delegation of Use.** Any Owner may extend the Owner's right of use and enjoyment of the Common Areas to the members of the Owner's family, lessees and social invitees, as applicable, subject to reasonable regulation by the Board of Directors. An Owner who leases the Owner's Living Unit will be deemed to have assigned all such rights to the lessee of such Living Unit for the period of the lease.

4.5 **Easements Reserved by Declarant.** So long as Declarant owns any Lot, Declarant reserves an easement for itself and its successor and assigns (including any builder who purchased more than one Lot from Declarant for purposes of development), over, under and across the Common Areas to carry out sales and rental activities necessary or convenient for the sale or rental of Lots, including, without limitation, advertising and "For Sale" signs. Declarant, for itself and its successors and assigns, hereby retains a right and easement of ingress and egress over, in, upon, under and across the Common Areas and the right to store materials thereon and to make such other use thereof as may be reasonably necessary or incident to the construction of the Improvements on the Property or other real property owned by Declarant; provided, however, that no such rights may be exercised by Declarant in such a way as to unreasonably interfere with the occupancy of, use of, enjoyment of or access to an Owner's Lot by the Owner or the Owner's family, tenants, employees, guests, or invitees.

4.6 **Easement to Serve Other Property.** Declarant reserves for itself and its duly authorized agents, successors, assigns and Mortgagees, and the developers of Improvements in all future phases of Stafford Meadows, a perpetual easement over the Common Areas for the purposes of enjoyment, use, access and development of the property, even if such property is never made subject to this Declaration. This easement includes, but is not limited to, a right of ingress and egress over the Common Areas for construction, utilities, water and sanitary sewer lines, communication lines, drainage facilities, irrigation systems and signs, and ingress and egress for the benefit of other portions of Stafford Meadows and any Additional Property that becomes subject to this Declaration or any property in the vicinity of the Property or Additional Property that is then owned by Declarant or an affiliate thereof. Declarant agrees that such users are responsible for any damage caused to the Common Areas resulting from their actions in connection with development of such property. If the easement is exercised for permanent use by such property and such property or any portion thereof benefiting from such easement is not made subject to this Declaration, Declarant, its successors or assigns will enter a reasonable agreement with the Association to share the cost of any maintenance of such facilities. The allocation of costs in any such agreement will be based on the relative extent of use of such facilities.

4.7 **Limited Common Areas.** If any Limited Common Areas are included in an annexation declaration, the respective Limited Common Areas will be subject to a reciprocal access easement for the use by the Owners of the benefited Lots for vehicular access and utilities and communication lines serving such Lots. Such areas will be operated, maintained, replaced, and improved by the Association, but the entire cost thereof, including reserves for future maintenance, repairs, and replacements, will be assessed on an equal basis as Limited Common Area Assessments to the Owners of Lots to which such Limited Common Areas pertain.

Article 5

PROPERTY RIGHTS IN LOTS

5.1 **Use and Occupancy.** The Owner of a Lot in the Property is entitled to the exclusive use and benefit of such Lot, except as otherwise expressly provided in this Declaration, but the Lot is bound by, and each Owner and Declarant must comply with, the restrictions contained in Article 6, all other provisions of this Declaration and the provisions of any supplement or amendment to this Declaration.

5.2 **Easements Reserved.** In addition to any utility and drainage easements shown on any recorded plat, Declarant hereby reserves the following easements for the benefit of Declarant and the Association:

(a) **Adjacent Common Maintenance Area.** The Owner of any Lot that includes a Common Maintenance Area, or adjoins or blends together visually with any Common Maintenance Area must, as the Association so requires, permit the Association to enter upon the Lot to perform the maintenance of such Common Maintenance Area. The Owner and Occupant of each Lot is responsible for controlling such Owner's or Occupant's pets so as to not harm or otherwise disturb Persons performing such maintenance on behalf of the Association.

(b) **Utility Easements.** Easements for installation and maintenance of utilities and drainage facilities may be reserved over portions of certain Lots, as shown on any recorded plat. Within the easements, the Architectural Review Committee will not permit any structure, planting or other material to be placed or permitted to remain on the easement area if such structure, planting or other material may damage or interfere with the installation or maintenance of utilities, change the direction of flow of drainage systems or drainage infiltration facilities in the easements, or obstruct or retard the flow of water through drainage channels in the easements. The easement area of each Lot and all Improvements in it will be maintained continuously by the Owner of the Lot, except for those Improvements for which a public authority or utility company is responsible, and except Common Maintenance Areas, which are maintained by the Association.

(c) **Construction on Adjoining Lot.** Declarant hereby reserves for the benefit of Declarant and its assigns a temporary easement over each Lot for access to the adjoining Lot for construction purposes, including temporary placement of ladders or scaffolding. Declarant will restore the Lot to its condition as it existed prior to such access and will be responsible for any damage to the Lot.

(d) **Utility Inspection and Repairs.** Each utility and communication service provider and its agents or employees has authority to access all Lots, but not Improvements constructed thereon, and the Common Areas on which communication, power, gas, drainage, sewage or water facilities may be located for the purpose of installing, operating, maintaining, improving or constructing such facilities; reading meters; inspecting the condition of pipes, lines and facilities; and completing repairs. The Owner of any such Lot will be given advance notice if possible. In the case of an emergency, as determined solely by the utility or communication service provider, no prior notice will be required.

(e) **Easements for Encroachments.** Declarant grants reciprocal appurtenant easements of encroachment, and for maintenance and use of any permitted encroachment, between each Lot and any adjacent Common Areas and between adjacent Lots due to the unintentional placement or settling or shifting of the Improvements constructed, reconstructed or altered thereon (in accordance with the terms of this Declaration and the Design Guidelines) to a distance of not more than three feet, as measured from any point on the common boundary along a line perpendicular to such boundary. However, in no event will an easement for encroachment exist if such encroachment occurred due to willful and knowing conduct on the part of, or with the knowledge and consent of, the Person claiming the benefit of such easement.

(f) **Easements for Maintenance, Emergency and Enforcement.** Upon request given to the Owner and any Occupant, any Person authorized by the Association may enter a Lot to perform necessary maintenance, repair, or replacement of any property for which the Association has maintenance, repair or replacement responsibility under this Declaration, to make emergency repairs to a Lot that are necessary for the public safety or to prevent damage to Common Areas or to another Lot, or to enforce this Declaration or the Rules and Regulations. Requests for entry must be made in advance and for a reasonable time, except in the case of any emergency, when the right of entry is immediate. An emergency entry does not constitute a trespass or otherwise create a right of action in the Owner of the Lot.

(g) **Future Easements.** Declarant reserves the nonexclusive right and power to grant and record such specific easements as may be necessary, in the sole discretion of Declarant, in connection with the development of any of the Property. The location of any such easement is subject to the written approval of the Owner of the burdened Lot, which approval will not unreasonably be withheld, delayed or conditioned.

Article 6

GENERAL USE RESTRICTIONS

6.1 **Structures Permitted.** No structures may be erected or permitted to remain on any Lot except a single Living Unit and structures normally accessory thereto that have been constructed by Declarant or have first been approved by the Architectural Review Committee pursuant to Article 7. For purposes of this limitation, "normally accessory thereto" will not include accessory dwelling units even if they are otherwise permitted by applicable law. This provision does not exclude construction of a private greenhouse or storage unit, provided that the location of such is in conformity with the applicable regulations of Clackamas County, is compatible in design and decoration with the dwelling structure constructed on such Lot, and has been approved by the Committee.

6.2 **Residential Use.** Lots must only be used for residential purposes. Except with the consent of the Board of Directors, no trade, craft, business, profession, commercial or similar activity of any kind will be conducted on any Lot, nor may any goods, equipment, vehicles, materials, or supplies used in connection with any trade, service or business be kept or stored on any such Lot. The mere parking on a Lot of a vehicle bearing the name of a business will not, in itself, constitute a violation of this provision. Nothing in this Section 6.2 will be deemed to prohibit (a) activities relating to the sale of Living Units; (b) the right of Declarant or any contractor or home builder to construct Improvements on any Lot, to store construction materials and equipment on such Lots in the normal course of construction, and to use one or more Living Units as sales offices or model homes for purposes of sales in Stafford Meadows; and (c) the right of the Owner of a Lot to maintain his or her professional personal library, keep his or her personal business or professional records or accounts, handle his or her personal business or professional telephone calls or confer with business or professional associates, clients or customers in his or her Living Unit by appointment only. The Board will not approve commercial activities otherwise prohibited by this Section 6.2 unless the Board determines that only normal residential activities would be observable outside of the Living Unit and that the activities would not be in violation of applicable law. The Board may specify acceptable activities in the Rules and Regulations.

6.3 **Offensive or Unlawful Activities.** No noxious or offensive activities may be carried out upon the Property, nor will anything be done or placed on the Property that interferes with or jeopardizes the enjoyment of the Property, or that is a source of annoyance to Owners or Occupants. Occupants will use extreme care about creating disturbances, making noises or using musical instruments, radios, televisions, amplifiers and audio equipment that may disturb other Occupants. No unlawful use may be made of the Property or any part thereof, and all valid laws, zoning ordinances and regulations of all governmental bodies having jurisdiction over the Property must be observed. Owners and other Occupants must not engage in any abusive or harassing behavior, either verbal or physical, or any form of intimidation or aggression directed at other Owners, Occupants, guests or invitees, or directed at the managing agent, its agents or employees, or vendors.

6.4 **Animals.** No animals, livestock, or poultry of any kind may be raised, bred, kept or permitted within any Lot other than seeing eye horses and a reasonable number of household pets that are not kept, bred, or raised for commercial purposes and that are reasonably controlled so as not to be a nuisance. Any unrestrained or barking dog constitutes a nuisance. Any inconvenience, damage or unpleasantness caused by such pets are the responsibility of their respective Owners. No animal is permitted to roam the Property unattended, and each dog must be kept on a leash while outside a Lot. The construction or installation of dog runs and doghouses are subject to prior review and approval by the Architectural Review Committee pursuant to Article 7. An Owner or Occupant may be required to remove a pet upon receipt of the third written notice from the Board of Directors of violations of any rule, regulation or restriction governing pets within the Property.

6.5 **Maintenance of Structures.** Each Owner must maintain the Owner's Lot and Improvements thereon, including sidewalks adjacent to the Owner's Lot, and walkways and the driveway, in a clean and attractive condition, in good repair and in such fashion as not to create a fire or other hazard. Such maintenance includes, without limitation, exterior painting or staining, repair, replacement and care for roofs, gutters, downspouts, exterior building surfaces, walks, lights, perimeter fences and other exterior Improvements and glass surfaces. All repainting or re-staining, any change in type of roof or roof color and any exterior remodeling or changes are subject to prior review and approval by the Architectural Review Committee. Damage caused by fire, flood, storm, earthquake, riot, vandalism or other causes are likewise the responsibility of each Owner and must be restored within a reasonable time. Any change in appearance must first be approved by the Committee.

6.6 **Landscape Installation.** All landscaping on a Lot must be completed within a reasonable time not to exceed six months from the date of occupancy of the Living Unit constructed on a Lot. In the event of undue hardship due to weather conditions, this provision may be extended for a reasonable length of time upon approval of the Architectural Review Committee. Landscape plans will be submitted to the Committee for approval. Landscaping in the Front Yards must not be changed by an Owner without the approval of the Committee. Notwithstanding such limitations, an Owner may utilize planting pots or other free standing, movable planters within the Front Yard of his or her Lot; provided that the planters and plants growing in the planters are properly maintained. The Board of Directors may regulate the number and type of such planters.

6.7 **Maintenance of Landscaping.** Each Owner will keep all shrubs, trees, grass and plantings of every kind on the Owner's Lot (other than the landscaping in the Front Yard that is maintained by the Association), neatly trimmed, properly cultivated and free of trash, weeds and other unsightly material, except that the Association will be responsible for installation, maintenance and irrigation of landscaping of the Front Yard of each Lot, including the irrigation equipment and controllers. No Owner or Occupant will alter, change or tamper with the irrigation equipment, controllers or settings, which settings belong to the Association.

6.8 **Boundary Fences**. The responsibility for and cost of maintenance, repair and replacement of fencing on boundary lines between Lots will be shared by the Owners on either side of the fence in accordance with ORS Chapter 96.

6.9 **Fences, Hedges and Walls.** No fence, hedge, structure, wall, or retaining wall may be constructed or exist anywhere on any Lot without prior approval of the Architectural Review Committee and in accordance with its Design Guidelines. No planting or structure obstructing vision at driveways or intersections is permissible or may be maintained. Installation and maintenance of retaining walls that are required and approved by the Committee due to topographic conditions of individual Lots (other than the walls constructed by Declarant or a builder of Living Units on Lots 1-6, in the wall maintenance area designated on the Plat) are the sole and absolute responsibility of the individual Lot Owner, are to be aesthetically incorporated into the landscaping of the Lot, and are not the responsibility of the Association.

6.10 **Pest and Weed Control.** No Owner will permit any thing or condition to exist upon any portion of the Property that will induce, breed or harbor infectious plant or animal diseases or noxious insects or vermin. Each Owner must control noxious weeds on the Owner's Lot.

6.11 **Parking.** Except as may otherwise be provided in the Rules and Regulations, parking in excess of 24 hours of boats, trailers, mobile homes, campers or other recreational vehicles or equipment, regardless of weight, are not be allowed on any part of the Property or on public streets within the Property unless within areas designated for such purposes by the Board of Directors or within the confines of an enclosed garage and approved by the Architectural Review Committee before construction or screened from view in a manner approved by the Committee. No portion of the vehicle may project beyond the screened area. If there is no rear fencing and the vehicle could be seen from outside the Lot other than from the front road, the vehicle must also be screened from view from that direction. Vehicles may not be used for storage of materials for more than 48 hours without approval from the Committee. No motor vehicle of any type may be occupied for residential purposes while located within the Property. The Rules and Regulations may restrict the amount of noise vehicles may generate. The parking of vehicles is prohibited on any public or private street within the Property if posted or marked "No Parking" or if curbs are painted to restrict parking. Blocking a Common Area, roadways or alleys is prohibited. No parking is permitted in Common Areas unless so posted.

6.12 **Vehicles in Disrepair.** No Owner will permit any vehicle that is in an extreme state of disrepair or not currently licensed to be abandoned or to remain parked on the Owner's Lot (unless screened from view) or on the Common Area or any street for a period in excess of 48 hours. A vehicle will be deemed in an "extreme state of disrepair" when the Board of Directors determines that its presence reasonably offends the Occupants of the area due to its appearance or continued inoperability. Should any Owner fail to remove such vehicle within five days following the date on which notice is mailed to him or her by the Association, the Association may have the vehicle removed from the Property and charge the expense of such removal to the Owner.

6.13 **Signs.** No signs may be erected or maintained on any Lot except that not more than one "For Sale" sign placed by the Owner, Declarant or a licensed real estate agent, not exceeding 24 inches high and 36 inches long, may be temporarily displayed within the Front Yard of any Lot or inside of a first floor, front street facing window of a Living Unit located on a Lot, and two such signs may be placed on a Lot during the course of initial construction of a dwelling on such Lot. "For Rent" and "For Lease" signs are prohibited. The restrictions contained in this paragraph do not prohibit the temporary placement of "political" signs on any Lot by the Owner, subject to reasonable regulations adopted by the Architectural Review Committee relating to size and length of display.

6.14 **Rubbish, Trash and Outside Storage.** No part of the Property may be used as a dumping ground for trash or rubbish of any kind, and no rubbish, refuse or garbage is allowed to accumulate. All garbage and other waste must be kept in appropriate sanitary containers for proper disposal and out of public view, except the night before and during garbage pickup days. Yard rakings, dirt, and other material resulting from landscaping work will not be dumped onto Lots, streets, or Common Maintenance Areas. Storage areas, and the storage of machinery and equipment are prohibited on any Lot, unless obscured from view of neighboring property and streets by an appropriate screen or enclosure approved by the Architectural Review Committee. Tarps and covers are prohibited except as otherwise provided in the Rules and Regulations and the Design Guidelines. Should any Owner or Occupant responsible for its generation fail to remove any such materials within 10 days following the date on which notice is mailed to the Owner or Occupant by the Board of Directors, the Association may have the materials removed and charge the expense of such removal to the Owner.

6.15 **Construction.** The construction of any building on any Lot, including painting and all exterior finish, must be completed within eight months from the beginning of construction so as to present a finished appearance when viewed from any angle, and the Living Unit will not be occupied until so completed. In the event of undue hardship due to weather conditions or other causes beyond the reasonable control of the Owner, this time period may be extended for a reasonable length of time upon approval from the Architectural Review Committee. The building area must be kept reasonably clean and in workmanlike order, free of litter, during the construction period with a garbage can or other garbage disposal facility on the site during such period. Debris may not be deposited on any other Lot. All construction debris, stumps, trees, etc. must be periodically removed from each Lot by the builder or Owner, and such debris will not be dumped in any area within the Property unless approved by the Committee. The Rules and Regulations may impose reasonable limitations on the hours during which construction activities may take place. If construction has not commenced upon any Lot within one year after an Owner has acquired it, other than Declarant or an affiliate of Declarant, the Owner must install the sidewalk and landscape the area within 20 feet from the curb. The Owner will irrigate and maintain this area. The Committee may waive this requirement if it determines that construction will commence within a reasonable time. In any case, all unimproved or unoccupied Lots will be kept in a neat and orderly condition, free of brush, vines, weeds and other debris, and grass thereon must be cut or mowed at sufficient intervals to prevent creation of a nuisance or fire hazard.

6.16 **Temporary Structures.** No incomplete building or structure of a temporary character, nor any trailer, basement, tent, shack, garage, barn, or other outbuilding may be used on any Lot at any time as a residence either temporarily or permanently.

6.17 **Recreational Equipment.** Unless approved by the Architectural Review Committee or permitted by the Design Guidelines, no playground, athletic or recreational equipment or structures, including without limitation, permanently installed basketball backboards, hoops and related supporting structures, will be placed, installed or utilized on any Lot in view from any street, sidewalk or Common Area within the Property. Portable basketball backboards, hoops, soccer goal nets, and related supporting structures may be used during daylight hours, so long as such equipment is stored out of view from any street, sidewalk, or Common Area within the Property.

6.18 **Service Facilities.** Service facilities (garbage containers, fuel tanks, clotheslines, etc.) will be screened such that the elements screened are not visible at any time from the street or a neighboring property. The Architectural Review Committee may develop guidelines for clotheslines that are consistent with the green sustainability objectives of Stafford Meadows. All telephone, power, natural gas, cable television and other communication lines will be placed underground, except as otherwise mandated by local jurisdictions or public utility companies.

6.19 **Antennas and Satellite Dishes.** Exterior antennas, satellite receivers, and transmission dishes and other communication devices will not be permitted to be placed upon any Lot except in accordance with rules established by the Architectural Review Committee in accordance with Section 7.3.

6.20 **Exterior Lighting or Noisemaking Devices.** Except with the consent of the Architectural Review Committee, no exterior lighting or noisemaking devices may be installed or maintained on any Lot, other than as originally installed by the builder of the home and security alarms and fire alarms. Seasonal holiday lighting and decorations are permissible if consistent with any applicable Rules and Regulations and if installed not more than 30 days before and removed within 30 days after the celebrated holiday. The Committee may regulate the shielding or hours of use of lighting in order to reduce annoyance to neighboring properties. The location of air conditioning compressors must be approved by the Committee prior to installation.

6.21 **Subdividing or Partitioning Lots.** Except as otherwise provided in this Declaration, no Lot may be subdivided or partitioned, nor may its Lot lines be adjusted, without the approval of Clackamas County and the Architectural Review Committee.

6.22 **Grades, Slopes and Drainage.** Each Owner of a Lot accepts the burden of the established drainage pattern and grades, slopes and courses related thereto over any Lot or Common Area, and will not in any manner alter, modify or interfere with such drainage pattern, grades, slopes and courses without the prior approval of the Architectural Review Committee, and then only to the extent and in the manner specifically approved. No structure, plantings or other materials may be placed or permitted to remain on or within any grades, slopes or courses, nor may any other activities be undertaken that may damage or interfere with established slope ratios, create erosion or sliding problems, or obstruct, change the direction of or retard the flow of water through drainage channels.

6.23 **Garages.** All garage doors must remain closed except to permit entrance and exit and in connection with outside activities. Garages will be used primarily for parking of vehicles, and only secondarily for storage, and must not be used as office or living space without the prior approval of the Architectural Review Committee.

6.24 **Windows, Decks, Porches and Outside Walls.** To preserve the attractive appearance of the Property, the Association may regulate the nature of items that may be placed in or on windows, decks, porches, and the outside walls so as to be visible from the street or Common Areas, including, without limitation, window air conditioners and fans. Window coverings, curtains, shutters, drapes or blinds, other than those of commercially produced quality, are not permitted to be visible from any public or private street, pathway, Common Area or adjacent property. No aluminum foil, reflective film, or similar treatment may be placed on windows or glass doors. Garments, rugs, laundry and other similar items may not be hung from windows, facades, porches or decks.

6.25 **Leasing and Rental of Living Units**. All leases of a Living Unit must be by written agreement specifying that: (i) the tenant is subject to all provisions of the Declaration, Bylaws and Rules and Regulations; and (ii) failure to comply with any provision of the Declaration, Bylaws or Rules and Regulations constitutes a default under the rental agreement. The Owner must provide each tenant a copy of the Declaration, Bylaws and Rules and Regulations. Owner is responsible for any violations by tenants and is solely responsible for either correcting or eliminating such violations or causing tenant to do the same.

6.26 **Rules and Regulations.** In addition, the Association from time to time may adopt, modify, or revoke such nondiscriminatory Rules and Regulations governing the conduct of Persons and the operation and use of the Property as it may deem necessary or appropriate to ensure the peaceful and orderly use and enjoyment of the Property. A copy of the Rules and Regulations, upon adoption, and a copy of each amendment, modification or revocation thereof, must be delivered by the Board of Directors promptly to each Owner. The Rules and Regulations may be adopted by the Board, except as may be otherwise provided in the Bylaws of the Association.

Article 7

ARCHITECTURAL REVIEW COMMITTEE

7.1 **Architectural Review.** No Improvement may be commenced, erected, placed or altered on any Lot, until the construction plans and specifications showing the nature, shape, heights, materials, colors and proposed location of the Improvement have been submitted to and approved in writing by the Architectural Review Committee, except that construction by Declarant or any affiliate of Declarant, or any builder of Living Units on multiple Lots, will be presumed to have been approved and is thereby exempt from this review. The building plans to be submitted will consist of one complete set of plans and specifications in the usual form showing insofar as appropriate, (i) size and dimensions of the Improvements; (ii) exterior design; (iii) approximate exterior color scheme; (iv) location of Improvements on the Lot, including setbacks, driveway and parking areas; and (v) location of existing trees to be removed. These plans and specifications must be left with the Committee until 60 days after notice of completion has been received by the Committee. This is for the purpose of determining whether, after inspection by the Committee, the Improvement complies substantially with the plans and specifications that were submitted and approved. The Committee is not responsible for determining compliance with structural and building codes, zoning codes, or any other governmental regulations, all of which are the responsibility of the applicant. The procedure and specific requirements for review and approval of construction may be set forth in Design Guidelines adopted from time to time by the Committee. The Committee may charge a reasonable fee to cover the cost of processing an application. In all cases in which the Committee's consent is required by this Declaration, the provisions of this Article 7 apply, except that this Article 7 does not apply to construction by Declarant or any affiliate of Declarant.

7.2 **Committee Decision.** The Architectural Review Committee will render its decision with respect to a construction proposal within 30 working days after it has received all material required by it with respect to the application. In the event the Committee fails to render its approval or disapproval within 45 working days after the Committee has received all material required by it with respect to the proposal, or if no suit to enforce this Declaration has been commenced within one year after completion thereof, approval will not be required and the related provisions of this Declaration will be deemed to have been fully complied with.

7.3 **Committee Discretion.** The Architectural Review Committee may withhold consent to any proposed work if the Committee finds the proposed work would be inappropriate for the particular Lot or incompatible with the Design Guidelines or design standards that the Committee intends for Stafford Meadows. It is the intent and purpose of this Declaration to ensure quality of workmanship and materials, to ensure harmony of external design with the existing

Improvements and with respect to topography and finished grade elevations, and to ensure compliance with the setback requirements contained in the conditions of approval of Clackamas County. Considerations such as siting, shape, size, color, design, materials, height, screening, impairment of the view from other Lots or other effect on the enjoyment of other Lots or the Common Area, disturbance of existing terrain and vegetation, and any other factors that the Committee reasonably believes to be relevant may be considered by the Committee in determining whether or not to consent to any proposed work. Regulations on siting of television antennas and satellite receiving dishes must be in conformance with any applicable Federal Communications Commission rules.

7.4 **Membership: Appointment and Removal.** The Architectural Review Committee will consist of as many Persons as Declarant may from time to time appoint. Declarant, at its discretion, may appoint a single Person to serve as the Committee and may remove any member of the Committee from office at any time and may appoint new or additional members at any time. The Association will keep on file at its principal office a list of the names and addresses of the members of the Committee. Declarant may at any time delegate to the Board of Directors of the Association the right to appoint or remove members of the Committee. In such event, or in the event Declarant fails to appoint an Architectural Review Committee, the members of the Committee will be appointed by, and serve on behalf of, the Board, or if the Board fails to appoint such members, then the Board will serve as the Committee. The term of office for each member appointed by the Board will be one year unless lengthened by the Board at the time of appointment or unless the Board serves as the Committee, in which case the terms of the members will be the same as their terms as Board members. The Board may appoint any or all of its members to the Committee and is not required to appoint non-Board members. The Board may appoint one or more members to the Committee who are not Owners, but who have special expertise regarding the matters that come before the Committee. In the sole discretion of the Board, such non-Owner members of the Committee may be paid for such services, the cost of which may be paid by the applicants or treated as a common expense, as determined by the Board.

7.5 **Majority Action.** Except as otherwise provided in this Declaration, a majority of the members of the Architectural Review Committee has the power to act on behalf of the Committee, without the necessity of a meeting and without the necessity of consulting the remaining members of the Committee. The Committee may render its decision only by written instrument setting forth the action taken by the consenting members.

7.6 **Liability.** Neither the Architectural Review Committee nor any member thereof is liable to any Owner, Occupant, builder or developer for any damage, loss or prejudice suffered or claimed on account of any action or failure to act of the Committee or a member of the Committee, and the Association will indemnify the Committee and its members therefrom, provided only that the member has, in accordance with the actual knowledge possessed by him or her, acted in good faith.

7.7 **Nonwaiver.** Consent by the Architectural Review Committee to any matter proposed to it or within its jurisdiction will not be deemed to constitute a precedent or waiver impairing its right to withhold approval as to any similar matter thereafter proposed or submitted to it for consent.

7.8 **Appeal.** At any time after Declarant has delegated appointment of the members of the Architectural Review Committee to the Board of Directors pursuant to Section 7.4, any Owner adversely affected by action of the Committee may appeal such action to the Board. Appeals must be made in writing within 10 days of the Committee's action and must contain specific objections or mitigating circumstances justifying the appeal. If the Board is already acting as the Committee, the appeal will be treated as a request for a rehearing, in which case the Board will meet and receive evidence and argument on the matter. A final, conclusive decision will be made by the Board within 15 working days after receipt of such notification.

7.9 **Effective Period of Consent.** The Architectural Review Committee's consent to any proposed work will automatically be revoked one year after issuance unless construction of the work has been substantially commenced in the judgment of the Committee and thereafter diligently pursued, or unless the Owner has applied for and received an extension of time from the Committee.

7.10 **Estoppel Certificate.** Within 20 business days after written request is delivered to the Architectural Review Committee by any Owner, and upon payment to the Committee of a reasonable fee fixed by the Committee to cover costs, the Committee will provide such Owner with an estoppel certificate executed by a member of the Committee and acknowledged, certifying with respect to any Lot owned by the Owner, that as of the date of the certificate either (a) all Improvements made or done upon or within such Lot by the Owner comply with this Declaration or (b) such Improvements do not so comply, in which event the certificate must also identify the noncomplying Improvements and set forth with particularity the nature of such noncompliance. Any purchaser from the Owner, and any Mortgagee or other encumbrancer, is entitled to rely on such certificate with respect to the matters set forth therein, such matters being conclusive as between Declarant, the Committee, the Association and all Owners, and such purchaser or Mortgagee.

7.11 **Enforcement.** If during or after the construction the Architectural Review Committee finds that the work was not performed in substantial conformance with the approval granted, or that the required approval was not obtained, the Committee will notify the Owner in writing of the noncompliance, specifying the particulars of the noncompliance. The Committee may require conforming changes to be made or that construction be stopped. The cost of any required changes will be borne by the Owner. The Committee has the power and authority to order any manner of changes or complete removal of any Improvement, alteration, or other activity for which prior written approval from the Committee is required and has not been obtained or waived in writing. If an Owner fails to comply with an order of the Committee, then, subject to the Owner's right of appeal under Section 7.8, either the Committee or the Board of Directors may enforce compliance in accordance with the procedures set forth in Section 11.1.

Article 8

ASSOCIATION

Declarant has organized, or before conveyance of the first Lot will organize, an association of all of the Owners within Stafford Meadows. Such Association, and its successors and assigns, will be organized as an Oregon nonprofit corporation under the name "**Stafford Meadows**

Homeowners Association," and will have such property, powers and obligations as are set forth in this Declaration for the benefit of the Property and all Owners of Lots located therein.

8.1 **Organization.** Declarant will, before the first Lot is conveyed to an Owner, organize the Association as a nonprofit corporation under the general nonprofit corporation laws of the State of Oregon. The Articles of Incorporation of the Association will provide for its perpetual existence, but in the event the Association is at any time dissolved, whether inadvertently or deliberately, it will automatically be succeeded by an unincorporated association of the same name. In that event, the unincorporated association will have all the property, powers and obligations of the incorporated association existing immediately prior to dissolution. To the greatest extent possible, any successor unincorporated association will be governed by the Articles of Incorporation and Bylaws of the Association as if they had been made to constitute the governing documents of the unincorporated association, and will be served by the members of the Board of Directors and the officers who served immediately prior to dissolution.

8.2 **Membership.** Every Owner of one or more Lots within the Property must, immediately upon creation of the Association and thereafter during the entire period of such Owner's ownership of one or more Lots within the Property, be a member of the Association. Such membership commences, exists, and continues simply by virtue of such ownership; expires automatically upon termination of such ownership; and need not be confirmed or evidenced by any certificate or acceptance of membership.

8.3 **Voting Rights.** The Association has two classes of voting membership:

Class A. Class A Members are all Owners with the exception of the Class B Member and are entitled to one vote for each Lot owned. When more than one Person holds an interest in any Lot, all such Persons are members. The vote for such Lot is exercised as they among themselves determine, but in no event will more than one vote be cast with respect to any Lot.

Class B. The Class B Member is Declarant, who is entitled to three votes for each Lot owned by Declarant. The Class B Membership will cease and be converted to Class A Membership on the happening of any of the following events, whichever occurs earlier:

(1) When all of the Lots in the final phase of development of Stafford Meadows have been Sold and conveyed to Owners other than a successor Declarant; or

(2) At such earlier time as Declarant may elect in writing to terminate Class B Membership.

8.4 **General Powers and Obligations.** The Association has, exercises and performs all of the following powers, duties, and obligations:

(a) The powers, duties and obligations granted to the Association by this Declaration.

(b) The powers and obligations of a nonprofit corporation pursuant to the general nonprofit corporation laws of the State of Oregon.

(c) The powers, duties and obligations of a homeowners association pursuant to the Oregon Planned Community Act.

(d) Any additional or different powers, duties and obligations necessary or desirable for the purpose of carrying out the functions of the Association pursuant to this Declaration or otherwise promoting the general benefit of the Owners within the Property.

The powers and obligations of the Association may from time to time be amended, repealed, enlarged or restricted by changes in this Declaration made in accordance with the provisions of this Declaration, accompanied by any required changes in the Articles of Incorporation or Bylaws of the Association made in accordance with such instruments and with the nonprofit corporation laws of the State of Oregon.

8.5 **Specific Powers and Duties**. The powers and duties of the Association include, without limitation, all of the following:

(a) **Maintenance and Services.** The Association will provide maintenance and services for the Property as provided in Article 9 and other provisions of this Declaration.

(b) **Insurance.** The Association obtains and maintains in force policies of insurance as determined by the Board of Directors and in accordance with any requirements in this Declaration or the Bylaws of the Association.

(c) **Rulemaking.** The Association will make, establish, promulgate, amend and repeal Rules and Regulations as provided in Section 6.25.

(d) **Assessments.** The Association will adopt budgets and impose and collect Assessments as provided in Article 10.

(e) **Enforcement.** The Association will perform such acts, whether or not expressly authorized by this Declaration, as may be reasonably necessary to enforce the provisions of this Declaration and the Rules and Regulations adopted by the Association, including, without limitation, enforcement of the decisions of the Architectural Review Committee. Nothing in this Declaration may be construed as requiring the Association to take any specific action to enforce violations.

(f) **Employment of Agents, Advisers and Contractors.** The Association, through its Board of Directors, may employ the services of any Person as manager; hire employees to manage, conduct and perform the business, obligations and duties of the Association; employ professional counsel and obtain advice from such Persons such as, but not limited to, landscape architects, architects, planners, attorneys and accountants; and contract for or otherwise provide for all services necessary or convenient for the management, maintenance and operation of the Property; provided, however, the Board may not incur or commit the Association to incur legal fees in excess of $5,000 for any specific litigation or claim matter or enter into any contingent fee contract or any claim in excess of $100,000 unless the Owners have enacted a resolution authorizing the incurring of such fees by a vote of 75 percent of the total voting rights of the Association. These limitations are not applicable to legal fees incurred in defending the Association or the Board from claims or litigation brought against them. The limitations set forth in this paragraph (f) will increase by 10 percent on each fifth anniversary of the recording of this Declaration.

(g) **Borrow Money**. The Association may borrow and repay money for the purpose of performing its duties under this Declaration and, subject to Section 4.3(d), encumber the Common Areas as security for the repayment of such borrowed money.

(h) **Acquire and Hold Title to Property**. The Association may acquire and hold title to real and personal property and interests therein, and must accept any real or personal property, leasehold or other property interests within Stafford Meadows conveyed to the Association by Declarant.

(i) **Transfers, Dedications, Encumbrances and Easements**. Except as otherwise provided in Sections 4.3(d) and 4.3(e), the Association may sell, transfer or encumber and grant easements upon all or any portion of the Common Area, or other real property to which it then holds title, to a Person, whether public or private, and dedicate or transfer all or any portion of such Common Area or property to any public agency, authority or utility for public purposes.

(j) **Create Classes of Service and Make Appropriate Charges**. The Association may, in its sole discretion, create various classes of service and make appropriate Individual Assessments or charges therefor to the users of such services, including, but not limited to, reasonable admission and other fees for the use of any and all recreational facilities situated on the Common Areas, without being required to render such services to those of its members who do not assent to such charges and to such related Rules and Regulations as the Board deems proper. In addition, the Board has the right to discontinue any service upon nonpayment of Assessments or to eliminate any service for which there is no demand or for which there are inadequate funds to maintain the same.

(k) **Restoring Damaged Improvements**. In the event of damage to or destruction of Common Areas or other property that the Association insures, the Board of Directors or its duly authorized agent must file and adjust all insurance claims and obtain reliable and detailed estimates of the cost of repairing or restoring the property to substantially the condition in which it existed prior to the damage, allowing for changes or Improvements necessitated by changes in applicable building codes. If a decision is made not to restore the damaged Improvements, and no alternative Improvements are authorized, the affected property will be cleared of all debris and ruins and thereafter will be maintained by the Association in a neat and attractive, landscaped condition. If insurance proceeds are insufficient to cover the costs of reconstruction, the Board may levy Special Assessments to cover the shortfall against those Owners responsible for the premiums for the applicable insurance coverage. Any insurance proceeds remaining after paying the costs of repair or reconstruction, or after such settlement as is necessary and appropriate, will be retained by the Association for the benefit of all or some of the Owners, as appropriate, and placed in a capital Improvements account. This is a covenant for the benefit of Mortgagees and may be enforced by the Mortgagee of any affected Lot.

(l) **Security**. The Association may, but is not obligated to, maintain or support certain activities within Stafford Meadows designed to make the Property more enjoyable or safer than it otherwise might be. **Neither the Association, Declarant nor any managing agent will**

be considered insurers or guarantors of security or safety within the Property, nor will either be held liable for any loss or damage by reason of failure to provide adequate security or ineffectiveness of security or safety measures undertaken. No representation or warranty is made that any system or measure, including any mechanism or system for limiting access to the Property, cannot be compromised or circumvented, nor that any such system or measure undertaken will in all cases prevent loss or provide the detection or protection for which it is designed or intended. Each Owner acknowledges and agrees that the Association, the Board of Directors and any managing agent are not insurers and that each Person using the Property assumes all risks for personal injury and loss or damage to property resulting from acts of third parties.

(m) **Services.** The Association may provide or contract for such services as the Board of Directors may reasonably deem to be of benefit to the Property, including, without limitation, landscape services, garbage and trash removal and security services.

(n) **Implied Rights and Obligations.** The Association may exercise any other right or privilege reasonably to be inferred from the existence of any right or privilege expressly given to the Association under this Declaration or reasonably necessary to effectuate any such right or privilege.

8.6 **Liability.** Neither a member of the Board of Directors nor an officer of the Association or member of the Architectural Review Committee or any other committee established by the Board will be liable to the Association, any Owner or any third party for any damage, loss or prejudice suffered or claimed on account of any action or failure to act in the performance of his or her duties, so long as the individual acted in good faith; believed that the conduct was in the best interests of the Association, or at least was not opposed to its best interests; and, in the case of criminal proceedings, had no reason to believe the conduct was unlawful. In the event any member of the Board or any officer or committee member of the Association is threatened with or made a party to any proceeding because the individual was or is a director, officer, or committee member of the Association, the Association will defend the individual against such claims and indemnify the individual against liability and expenses incurred to the maximum extent permitted by law.

8.7 **Interim Board; Turnover Meeting.** Declarant has the right to appoint an interim board of one to three directors, who will serve as the Board of Directors of the Association until replaced by Declarant or until their successors take office at the Turnover Meeting following termination of Class B Membership. Declarant will call a meeting of the Association for the purpose of turning over administrative responsibility for the Property to the Association not later than 90 days after termination of the Class B Membership in accordance with Section 8.3. At the Turnover Meeting the interim directors will resign and their successors will be elected by the Owners, as provided in this Declaration and in the Bylaws of the Association. If Declarant fails to call the Turnover Meeting required by this Section 8.7, any Owner or Mortgagee of a Lot may call the meeting by giving notice as provided in the Bylaws.

8.8 **Contracts Entered into by Declarant or Before Turnover Meeting.** Notwithstanding any other provision of this Declaration, any management contracts, service contracts or employment contracts entered into by Declarant or the Board of Directors on behalf of the Association before the Turnover Meeting will have a term of not more than three years. In addition, any such contract must provide that it may be terminated without cause or penalty by the Association or Board upon not less than 30 days' notice to the other party given not later than 60 days after the Turnover Meeting. The limitations contained in this Section 8.8 do not apply to those contracts referred to in ORS 94.700(2).

8.9 **Bylaws.** The Bylaws of the Association and any amendment or modification of the Bylaws will be recorded in the Deed Records of Clackamas County, Oregon. On behalf of the Association, the Declarant will adopt and record the initial Bylaws as provided in ORS 94.625.

Article 9

MAINTENANCE

9.1 **Common Maintenance Areas.** The Common Maintenance Areas include the Common Areas, Common Easement Areas, and the Front Yards of the Lots in Stafford Meadows, and the wall maintenance areas designated on the Plat, until such maintenance is assumed by the local jurisdiction, if ever.

9.2 **Maintenance and Lighting of Common Maintenance Areas.** The Association is responsible for exterior lighting, if any, in the Common Areas and will perform all maintenance upon the Common Maintenance Areas, including, but not limited to, entrance monuments, gates, fences, walls in Common Areas, signs, parking areas, pathways, bicycle paths, unless the maintenance thereof is assumed by a public body. Sidewalks, notwithstanding the public easement over them, are the Lot Owner's responsibility to maintain, repair, and replace and to keep free of leaves, ice, and snow. The Association is responsible for installation, maintenance, and irrigation of landscaping in the Front Yards and the walls constructed in the wall maintenance easement areas designated on the Plat, and for the design and any modification thereof. In the Front Yards, landscaping installed by Declarant or the Association, including related controllers, monitors, and equipment, belongs to the Association. Landscaping irrigation settings will be set by the Association and no Owner may tamper with or change such settings. The Association has right of access to each such controller, monitor, or other equipment. The Association will also maintain and irrigate the area of the street right-of-way between the curb and the sidewalk. Such areas will be maintained in attractive condition and in a good and workmanlike manner to render them fit for the purposes for which they are intended.

9.3 **Maintenance of Utilities.** The Association will perform or contract to perform maintenance of all private utilities within Common Maintenance Areas, such as sanitary sewer service lines, domestic water service lines and storm drainage lines, except to the extent such maintenance is performed by the utilities furnishing such services. The Association is not liable for any interruption or failure of such services. Each Owner is responsible for maintaining utility lines within his or her Lot other than those serving the Common Maintenance Areas.

9.4 **Owner's Responsibility.** Except as otherwise provided in this Declaration or by written agreement with the Association, all maintenance of the Lots and Improvements, including walkways and the driveway thereon as provided in Section 6.5 and 6.7 will be the sole responsibility of the Owner thereof, who will maintain such Lot in a neat and attractive condition in accordance with the community-wide standard of Stafford Meadows. Sidewalks, notwithstanding the public easement over them, are the Lot Owner's responsibility to maintain, repair, and replace and to keep free of leaves, ice, and snow. The Association may, in the discretion of the Board of Directors, assume the maintenance responsibilities of such Owner if, in the opinion of the Board, the level and quality of maintenance being provided by such Owner does not satisfy such standard. Before assuming such maintenance responsibilities, the Board will notify the Owner in writing of its intention to do so, and if such Owner has not commenced and diligently pursued remedial action within 15 days after mailing of such written notice, then the Association will proceed. The expenses of such maintenance by the Association will be reimbursed to the Association by the Owner, together with interest as provided in Section 11.3. Such charges will be an Individual Assessment and lien on the Lot as provided in Sections 10.4(d) and 11.1.

9.5 **Damage Liability.** Any damage to any Common Maintenance Area by Owners or their children, agents, visitors, friends, relatives, tenants, Occupants or service personnel, to the extent not covered by the Association's insurance (including any deductible), will be assessed to such Owners as an Individual Assessment.

9.6 **Maintenance Plan.** Declarant will initially prepare and thereafter the Board of Directors must implement, review, and update a maintenance plan (the "**Maintenance Plan**") for the maintenance, repair and replacement of all property for which the Association has maintenance, repair or replacement responsibility under this Declaration or the Bylaws or the Oregon Planned Community Act. The Maintenance Plan will describe the maintenance, repair or replacement to be conducted; include a schedule for maintenance, repair or replacement; be appropriate for the size and complexity of the maintenance, repair and replacement responsibility of the Association; and address issues that include, but are not limited to, warranties and the useful life of the items of which the Association has maintenance, repair or replacement responsibility. The Board must review and update the Maintenance Plan as necessary. Changes or updates to the Maintenance Plan will be based on advice of competent experts or consultants. For a period of 10 years following recording of the Declaration, any changes to the Maintenance Plan without the approval of the Declarant and the original general contractor may void any applicable warranty and will release them from liability for any damage resulting from such change.

Article 10

ASSESSMENTS

10.1 **Purpose of Assessments.** The Association may levy Assessments. The Assessments levied by the Association must be used exclusively to promote the recreation, health, safety and welfare of the Owners and Occupants of the Property and for the improvement, operation and maintenance of the Common Maintenance Areas.

10.2 **When Lots Become Subject to Assessment.**

(a) Upon the first sale of each Lot to a purchaser other than (i) Declarant, (ii) another developer or builder in a bulk sale of Lots, (iii) a successor declarant, or (iv) an affiliate of Declarant, the Lot Sold becomes subject to assessment and the Owner will pay General Assessments, Special Assessments, Emergency Assessments, and if any, Individual Assessments.

(b) Declarant may elect to delay collection of General Assessments against all Lots, but in such case will pay all common expenses of the Association until such Assessments commence.

10.3 **<u>Allocation of Assessments</u>.** Except as may otherwise be provided in an applicable supplemental declaration annexing Additional Property to this Declaration, all Lots subject to assessment will pay an equal share of the General Assessments, Special Assessments, and Emergency Assessments.

10.4 **<u>Type of Assessments</u>.** The Association is authorized to levy the following types of Assessments:

(a) **<u>General Assessments</u>.** The Association will levy General Assessments for the common expenses incurred by or on behalf of the Association in accordance with this Declaration. The Board of Directors will from time to time and at least annually prepare an operating budget for the Association, taking into account the current costs of maintenance and services and future needs of the Association, any previous over-assessment and any common profits of the Association. The budget must take into account the number of Lots subject to assessment as of the first day of the fiscal year for which the budget is prepared and the number of Lots reasonably anticipated to become subject to assessment during the fiscal year. The budget may be based upon a greater number of Lots than those reasonably anticipated to be subject to assessment during the fiscal year if the Declarant agrees to subsidize the Association for any shortfall in the Operations Fund. The budget will provide for such reserve or contingency funds as the Board deems necessary or as may be required by law, but not less than the reserves required by Section 10.7. General Assessments for such operating expenses and reserves will then be apportioned among the Lots as provided in Section 10.3. The Board may revise the budget and adjust the General Assessment from time to time during the year. Within 30 days after the adoption of a final budget by the Board, the Board will send a copy of the final budget to each Owner. If the Board fails to adopt a budget, the last adopted budget continues in effect. The manner of billing and collection of Assessments is as provided in the Bylaws.

(b) **<u>Special Assessments</u>.** The Board of Directors may levy during any fiscal year a Special Assessment, applicable to that year only, for the purpose of deferring all or any part of the cost of any construction or reconstruction, unexpected repair, or acquisition or replacement of a described capital Improvement, or for any other one-time expenditure not to be paid for out of General Assessments. Special Assessments for acquisition or construction of new capital Improvements or additions that in the aggregate in any fiscal year exceed an amount equal to 15 percent of the budgeted gross expenses of the Association for the fiscal year may be levied only if approved by a majority of the voting rights voting on such matter, together with the written consent of the Class B Member, if any. Prior to the Turnover Meeting, any Special Assessment for acquisition or construction of new capital Improvements or additions must be approved by not less than 50 percent of the Class A voting rights, together with the written consent of the Class B Member. Special Assessments will be apportioned as provided in Section 10.3 and may be payable in lump sum or in installments, with or without interest or discount, as determined by the Board.

(c) **<u>Emergency Assessments</u>.** If the General Assessments levied at any time are or will become inadequate to meet all expenses incurred under this Declaration for any reason, including nonpayment of any Owner's Assessments on a current basis, the Board of Directors will immediately determine the approximate amount of such inadequacy and issue a supplemental budget, noting the reason therefor, and levy an Emergency Assessment for the amount required to meet all such expenses on a current basis. Emergency Assessments will be apportioned as set forth in Section 10.3 and payable as determined by the Board.

(d) **Limited Common Area Assessments**. General Assessments, Special Assessments and Emergency Assessments relating to maintenance, upkeep, repair, replacement or improvements to Limited Common Areas will be assessed exclusively and on an equal basis to the Lots having the right to use such Limited Common Areas.

(e) **Individual Assessments.** Any common expense or any part of a common expense benefiting fewer than all of the Lots may be assessed as Individual Assessments exclusively against the Lots benefited. Individual Assessments include, without limitation, charges for services provided under Sections 8.5(j) and 9.4 and any loss or cost incurred by the Association that the Board of Directors determines is the fault of one or more Owners and not paid by insurance. Individual Assessments also include default Assessments levied against any Lot to reimburse the Association for costs incurred in bringing such Lot or its Owner into compliance with the provisions of this Declaration or the Rules and Regulations of the Association and for fines or other charges imposed pursuant to this Declaration for violation thereof. Unless otherwise provided by the Board, Individual Assessments will be due 30 days after the Board has given written notice thereof to the Owners subject to the Individual Assessments.

(f) **Working Fund Assessments.** Upon the first sale of a Lot to a purchaser other than a successor Declarant and upon any subsequent sale of such Lot, the purchaser will pay to the Association a Working Fund Assessment equal to two times the monthly General Assessment then applicable to the Lot. The Board of Directors may deposit Working Fund Assessments either in the Operations Fund or in the Reserve Fund, at the discretion of the Board.

10.5 **Assessment of Additional Property.** When Additional Properties are annexed to Stafford Meadows, the Lots included therein become subject to Assessments from the date of such annexation to the extent provided in Section 10.2. The Board of Directors, however, at its option may elect to recompute the budget based upon the additional Lots subject to Assessment and additional Common Areas and recompute General Assessments for all Lots, including the new Lots, for the balance of the fiscal year. Notwithstanding any provision of this Declaration apparently to the contrary, a declaration annexing Additional Property may provide that such Additional Property does not have the right to use a particular Common Area or facility located thereon, in which case such Additional Property will not be assessed for the costs of operating, maintaining, repairing, replacing or improving such Common Area or facility.

10.6 **Operations Fund.** The Association will keep all funds received by it as Assessments, other than reserves described in Section 10.7 or Working Fund Assessments deposited in the Reserve Fund, separate and apart from its other funds, in an Operations Fund in a bank account in the name of the Association. The Association will use such fund for the purpose of promoting the recreation, health, safety and welfare of the residents within the Property and in particular for the improvement and maintenance of properties, services and facilities devoted to this purpose and related to the use and enjoyment of the Common Maintenance Areas and the Lots, including but not limited to:

(a) Payment of the cost of operation, maintenance, utilities, services, repairs, and replacements for the Common Maintenance Areas.

(b) Payment of the cost of insurance maintained by the Association.

(c) Payment of taxes assessed against the Common Areas and any Improvements thereon.

(d) Payment of the cost of other services that the Association deems to be of general benefit to the Owners, including, but not limited to, accounting, legal, and secretarial services.

10.7 **Reserve Fund.**

(a) **Establishment of Account.** Declarant, on behalf of the Association, will conduct an initial reserve study as described in Section 10.7(c) and establish a Reserve Fund in a bank account in the name of the Association to fund major maintenance, repair or replacement of any common properties that will normally require replacement in whole or in part in more than one and less than 30 years; for exterior painting if the Common Maintenance Areas or other property to be maintained by the Association includes exterior painted surfaces; and for other items, whether or not involving Common Maintenance Areas, if the Association has responsibility to maintain the items, including items required by the Maintenance Plan established pursuant to Section 9.6. The Reserve Fund need not include those items that can reasonably be funded from the general budget or other funds of the Association or for those items for which one or more, but less than all, Owners are responsible for maintenance and replacement under the provisions of this Declaration or the Bylaws.

(b) **Funding of Reserve Fund.** The Reserve Fund will be funded by Assessments against the individual Lots assessed for maintenance of the items for which the Reserve Fund is being established, which sums will be included in the regular General Assessment for the Lot and the Limited Common Area Assessments, if applicable. The Reserve Fund also includes Working Fund Assessments to the extent so allocated by the Board of Directors pursuant to Section 10.4(f). The Reserve Fund will be established in the name of the Association. The Association is responsible for administering the Reserve Fund and making periodic payments into the account. The Board of Directors or the Owners may not vote to eliminate funding the Reserve Account unless the Board determines that the Reserve Account will be adequately funded for the following year, except that after the Turnover Meeting the Board, with the approval of all Owners, may, on an annual basis, elect not to fund the Reserve Fund for the following year.

(c) **Reserve Studies.** The reserve portion of the initial Assessment determined by Declarant will be based on a reserve study described in this paragraph (c) or other sources of information. The Board of Directors will annually conduct a reserve study, or review and update an existing study, to determine the Reserve Fund requirements, and may adjust the amount of payments as indicated by the study or update and provide other reserve items that the Board, in its discretion, may deem appropriate. The reserve study will:

(1) Identify all items for which reserves are to be established;

(2) Include the estimated remaining useful life of each item as of the date of the reserve study; and

(3) Include for each item, as applicable, an estimated cost of maintenance, repair and replacement at the end of its useful life.

(d) **Use of Reserve Fund.** If a Reserve Fund is required, the Reserve Fund will be used only for the purposes for which the reserves have been established and kept separate from other funds. After the Turnover Meeting, however, the Board of Directors may borrow funds from the Reserve Fund to meet high seasonal demands on the regular operating funds or to meet unexpected increases in expenses if the Board has adopted a resolution, which may be an annual continuing resolution, authorizing the borrowing of funds. Not later than the adoption of the budget for the following year, the Board will adopt by resolution a written payment plan providing for repayment of the borrowed funds within a reasonable period. Assessments paid into the Reserve Fund are the property of the Association and are not refundable to sellers or Owners of Lots. Sellers of the Lots, however, may treat their outstanding share of the Reserve Fund as a separate item in any sales agreement.

10.8 **Reserve Fund.** The Board of Directors may establish a Reserve Fund for major maintenance, repair or replacement of those items to be maintained by the Association, all or a part of which could not reasonably be funded from operating Assessments. Such Reserve Fund will be funded by Assessments against the Lots as a General Expense. The Reserve Fund will be established in the name of the Association and adjusted at regular intervals to recognize changes in current replacement costs over time. The Reserve Fund may be used only for replacement of common property as determined by the Board and must be kept separate from the Operations Fund. The Board, however, may borrow funds from the Reserve Fund to meet high seasonal demands on the regular operating funds or to meet other temporary expenses that will later be paid from General Assessments, Special Assessments, or Emergency Assessments. Nothing in this Section 10.8 prohibits prudent investment of the Reserve Fund. Assessments paid into the Reserve Fund are the property of the Association and are not refundable to sellers or Owners of Lots. Sellers of the Lots, however, may treat their outstanding share of the Reserve Fund as a separate item in any sales agreement.

10.9 **Declarant's Subsidy.** Declarant may, but is not be obligated to, reduce the General Assessments for any fiscal year by payment of a subsidy (in addition to any other amounts then owed by Declarant), which may be either a contribution, an advance against future Assessments due from Declarant or a loan, in Declarant's discretion. Any such subsidy will be disclosed as a line item in the income portion of the Association's budget. Payment of such subsidy in any year will not obligate Declarant to continue payment of such subsidy in future years unless otherwise provided in a written agreement between the Association and Declarant.

10.10 **Commencement of Assessment Obligation; Time of Payment.** The obligation to pay Assessments under this Declaration commences as to each Lot on the first day of the month after such Lot becomes subject to Assessment. The first annual General Assessment levied on each

Lot will be adjusted according to the number of months remaining in the fiscal year at the time Assessments commence for such Lot.

10.11 **Payment of Assessments.** Assessments must be paid in such manner and on such dates as the Board of Directors may establish. Unless the Board otherwise provides, the General Assessment is due and payable in advance on the first day of each fiscal year. If any Owner is delinquent in paying any Assessments or other charges levied on his or her Lot, the Board may require the outstanding balance on all Assessments to be paid in full immediately. Until the Turnover Meeting, any obligation of Declarant to pay Assessments may be satisfied in the form of cash or by "in kind" contributions of services or materials, or by a combination of these.

10.12 **Creation of Lien and Personal Obligation of Assessments.** Declarant, for each Lot owned by it within the Property, hereby covenants, and each Owner of any Lot by acceptance of a conveyance thereof, whether or not so expressed in any such conveyance, will be deemed to covenant to pay to the Association all Assessments or other charges as may be fixed, established and collected from time to time in the manner provided in this Declaration or the Association Bylaws. Such Assessments and charges, together with any interest, late charges, expenses or attorneys' fees imposed pursuant to Article 11, are a charge on the land and a continuing lien upon the Lot against which each such Assessment or charge is made. Such Assessments, charges, and other costs are also the personal obligation of the Person who was the Owner of such Lot at the time when the Assessment or charge fell due. Such liens and personal obligations will be enforced in the manner set forth in Article 11.

10.13 **Voluntary Conveyance.** In a voluntary conveyance of a Lot the grantee will be jointly and severally liable with the grantor for all unpaid Assessments against the grantor of the Lot up to the time of the grant or conveyance, without prejudice to the grantee's right to recover from the grantor the amounts paid by the grantee therefor. However, upon request of an Owner or Owner's agent for the benefit of a prospective purchaser, the Board of Directors will make and deliver a written statement of the unpaid Assessments against the prospective grantor of the Lot effective through a date specified in the statement, and the grantee in that case will not be liable for any unpaid Assessments against the grantor not included in the written statement.

10.14 **No Waiver.** Failure of the Board of Directors to fix Assessment amounts or rates or to deliver or mail each Owner an Assessment notice will not be deemed a waiver, modification or release of any Owner from the obligation to pay Assessments. In such event, each Owner will continue to pay Assessments on the same basis as during the last year for which an Assessment was made, if any, until a new Assessment is levied, at which time the Association may retroactively assess any shortfalls in collections.

10.15 **No Option to Exempt.** No Owner may exempt himself or herself from liability for Assessments by nonuse of Common Areas, abandonment of his or her Lot, or any other means. The obligation to pay Assessments is a separate and independent covenant on the part of each Owner. No diminution or abatement of Assessments or set-off may be claimed or allowed for any alleged failure of the Association or Board of Directors to take some action or perform some function required of it, or for inconvenience or discomfort arising from the making of repairs or Improvements, or from any other action it takes.

10.16 **Certificate.** Upon written request, the Association must furnish to any Owner liable for any type of Assessment a certificate in writing signed by an Association officer setting forth whether such Assessment has been paid. Such certificate is conclusive evidence of payment. The Association may require the advance payment of a reasonable processing fee for the issuance of such certificate.

Article 11

ENFORCEMENT

11.1 **Violation of General Protective Covenants.** In the event that any Owner constructs or permits to be constructed on his or her Lot an Improvement contrary to the provisions of this Declaration, or violates any provisions of this Declaration, the Bylaws, or the Rules and Regulations, then the Association acting through the Board of Directors will notify the Owner in writing of any such specific violations. If the Owner is unable, is unwilling, or refuses to comply with the Association's specific directives for remedy or abatement, or the Owner and the Association cannot agree to a mutually acceptable solution within the framework and intent of this Declaration, after notice and opportunity to be heard and within 14 days after issuing written notice to the Owner, then the Association acting through the Board has the right to do any or all of the following:

(a) Assess reasonable fines against such Owner, based upon a resolution adopted by the Board of Directors that is delivered to each Lot, mailed to the mailing address of each Lot or mailed to the mailing address designated by the Owner of each Lot in writing, which fines constitute Individual Assessments for purposes of this Declaration;

(b) Enter the offending Lot and remove the cause of such violation, or alter, repair or change the item that is in violation of this Declaration in such a manner as to make it conform thereto, in which case the Association may assess such Owner for the entire cost of the work done, which amount will be payable to the Operations Fund as an Individual Assessment, provided that no items of construction will be altered or demolished in the absence of judicial proceedings;

(c) Cause any vehicle parked in violation of this Declaration or of the Rules and Regulations to be towed and impounded at the Owner's expense;

(d) Suspend the voting rights, any utility services paid for out of Assessments and the right to use the Common Areas for the period that the violations remain unabated, provided that the Association does not deprive any Owner of access to and from the Owner's Lot in the absence of a lien foreclosure or court order to such effect; and

(e) Bring suit or action against the Owner on behalf of the Association and other Owners to enforce this Declaration.

11.2 **Default in Payment of Assessments; Enforcement of Lien.** If an Assessment or other charge levied under this Declaration is not paid within 30 days after its due date, such

Assessment or charge becomes delinquent and bears interest from the due date at the rate set forth below. In such event the Association may exercise any or all of the following remedies:

(a) The Association may suspend such Owner's voting rights, any utility service paid for out of Assessments and right to use the Common Areas until such amounts, plus other charges under this Declaration, are paid in full, and may declare all remaining periodic installments of any General Assessment immediately due and payable. In no event, however, will the Association deprive any Owner of access to and from the Owner's Lot in the absence of a lien foreclosure or court order to such effect.

(b) The Association has a lien in accordance with ORS 94.709 against each Lot for any Assessment levied against the Lot, including any fines or other charges imposed under this Declaration or the Bylaws against the Owner of the Lot, and may foreclose such lien in the manner provided in ORS 94.709.

(c) The Association may bring an action to recover a money judgment for unpaid Assessments under this Declaration without foreclosing or waiving the lien described in Section 11.2(b). Recovery on any such action, however, operates to satisfy the lien, or the portion thereof, for which recovery is made.

(d) The Association has any other remedy available to it by law or in equity.

11.3 **Interest, Late Charges and Expenses.** Any amount not paid to the Association when due in accordance with this Declaration bears interest from the due date until paid at a rate that is the greater of 12 percent per annum or such other rate as may be established by the Board of Directors, but not to exceed the lawful rate of interest under the laws of the state of Oregon. A late charge may be charged for each delinquent Assessment in an amount established from time to time by resolution of the Board, which resolution is delivered to each Lot, mailed to the mailing address of each Lot or mailed to the mailing address designated by the Owner in writing, together with all expenses incurred by the Association in collecting such unpaid Assessments, including attorneys' fees (even if suit is not instituted). In the event the Association files a notice of lien, the lien amount also includes the recording fees associated with filing the notice, and a fee for preparing the notice of lien, established from time to time by resolution of the Board.

11.4 **Costs and Attorneys' Fees.** In the event of any suit or action to enforce this Declaration, the Bylaws, the Rules and Regulations, or the Oregon Planned Community Act, or to collect any money due hereunder or to foreclose a lien, the prevailing party in such suit or act will be entitled to recover all costs and expenses incurred by it in connection with such suit or action, including a foreclosure title report, and will recover such amount as the court may determine to be reasonable as attorneys' fees at trial and upon any appeal or petition for review thereof or in connection with any bankruptcy proceedings or special bankruptcy remedies.

11.5 **Nonexclusiveness and Accumulation of Remedies.** An election by the Association to pursue any remedy provided for violation of this Declaration will not prevent concurrent or subsequent exercise of another remedy permitted under this Declaration. The remedies provided in this Declaration are not exclusive but are in addition to all other remedies, including actions for damages and suits for injunctions and specific performance, available under applicable law to the Association. In addition, any aggrieved Owner may bring an action against another Owner or the Association to recover damages or to enjoin, abate, or remedy any violation of this Declaration by appropriate legal proceedings.

11.6 **Enforcement by Clackamas County**. The provisions of this Declaration relating to preservation and maintenance of Common Areas will be deemed to be for the benefit of Clackamas County as well as the Association and Owners of Lots, and Clackamas County may enforce such provisions by appropriate proceedings at law or in equity, or may cause such maintenance to be performed, the costs of which will become a lien upon the Property.

Article 12

DISPUTE RESOLUTION

12.1 **Mediation**.

(a) Except as otherwise provided in this Section 12.1, before initiating litigation, arbitration, or an administrative proceeding in which the Association and an Owner have an adversarial relationship, the party that intends to initiate litigation, arbitration or an administrative proceeding will offer to use any dispute resolution program available within Clackamas County, Oregon that is in substantial compliance with the standards and guidelines adopted under ORS 36.175. The written offer must be hand-delivered or mailed by certified mail, return receipt requested, to the address, contained in the records of the Association, for the other party.

(b) If the party receiving the offer does not accept the offer within 10 days after receipt of the offer, such acceptance to be made by written notice, hand-delivered or mailed by certified mail, return receipt requested, to the address, contained in the records of the Association, for the other party, the initiating party may commence the litigation, arbitration or administrative proceeding. The notice of acceptance of the offer to participate in the program must contain the name, address, and telephone number of the body administering the dispute resolution program.

(c) If a qualified dispute resolution program exists within Clackamas County, Oregon and an offer to use the program is not made as required under Section 12.1(a), then litigation, arbitration or an administrative proceeding may be stayed for 30 days upon a motion of the noninitiating party. If the litigation, arbitration or administrative action is stayed under this Section 12.1(c), both parties must participate in the dispute resolution process.

(d) Unless a stay has been granted under Section 12.1(c), if the dispute resolution process is not completed within 30 days after receipt of the initial offer, the initiating party may commence litigation, arbitration or an administrative proceeding without regard to whether the dispute resolution is completed.

(e) Once made, the decision of the court, arbitrator or administrative body arising from litigation, arbitration or an administrative proceeding may not be set aside on the grounds that an offer to use a dispute resolution program was not made.

(f) The requirements of this Section 12.1 do not apply to circumstances in which irreparable harm to a party will occur due to delay or to litigation, arbitration, or an administrative proceeding initiated to collect Assessments, other than Assessments attributable to fines.

12.2 **Arbitration.** Any claim, controversy or dispute by or among Declarant (including members, officers, directors, shareholders and affiliates of Declarant), Association, the Architectural Review Committee, or one or more Owners, or any of them, arising out of or related to this Declaration, the Bylaws, the Rules and Regulations, or the Property will be first subject to mediation as described in Section 12.1 or otherwise, and if not timely settled by mediation will be resolved by arbitration in accordance with this Article 12. The decisions and award of the arbitrator are final, binding and nonappealable. The arbitration will be conducted in the Portland, Oregon, metropolitan area or at such other location as may be agreed upon by the parties, pursuant to the arbitration statutes of the state of Oregon, and any arbitration award may be enforced by any court with jurisdiction. Filing for arbitration will be treated the same as filing in court for purposes of meeting any applicable statute of limitations or for purposes of filing a notice of pending action ("lis pendens").

12.3 **Selection of Arbitrator.** The arbitration will be conducted by a single arbitrator selected by mutual agreement of the parties. The arbitrator selected must be neutral and unbiased, except to the extent the arbitrator's prior relationship with any party is fully disclosed and consented to by the other party or parties. If the parties are unable to agree upon the arbitrator within 10 days after a party's demand for arbitration, upon application of any party, the presiding judge of the Circuit Court of Clackamas County, Oregon will designate the arbitrator.

12.4 **Consolidated Arbitration.** Upon demand by any party, claims between or among the parties and third parties will be submitted in a single, consolidated arbitration. Notwithstanding the provisions of this Article 12, in the event any claim, controversy or dispute involves a claim by either party against a third party who is not required to and does not voluntarily agree to submit such claim to arbitration, then either party may elect to have the matter determined by a court of law in a consolidated proceeding, rather than by arbitration. In such case, the parties hereby waive trial by jury and agree that the matter will be determined by a judge sitting without a jury.

12.5 **Discovery.** The parties to the arbitration are entitled to such discovery as would be available to them in an action in Clackamas County Circuit Court. The arbitrator has all of the authority of the court incidental to such discovery, including, without limitation, authority to issue orders to produce documents or other materials, to issue orders to appear and submit to deposition, and to impose appropriate sanctions, including, without limitation, award against a party for failure to comply with any order.

12.6 **Evidence.** The parties to the arbitration may offer such evidence as they desire and will produce such additional evidence as the arbitrator may deem necessary for an understanding and determination of the dispute. The arbitrator will determine the admissibility of the evidence offered. All evidence will be taken in the presence of the arbitrator and all of the parties, except when any of the parties is absent in default or has waived its right to be present.

12.7 **Excluded Matters.** Notwithstanding the foregoing, the following matters are not subject to mediation or arbitration under this Article 12 (but are subject to the applicable provisions of Section 12.8): (a) actions relating to the collection of fees, Assessments, fines and other charges imposed or levied by the Association (other than disputes as to the validity or amount of such fees, Assessments, fines or charges, which disputes will be subject to mediation/arbitration as provided above); and (b) actions to enforce any order, decision or award rendered by arbitration pursuant to this Article 12. The filing of a lis pendens or the application to any court for the issuance of any provisional process or similar remedy described in the Oregon or Federal Rules of Civil Procedure will not constitute a waiver of the right or duty to utilize the procedures specified in this Article 12.

12.8 **Costs and Attorneys' Fees.** The fees of any mediator and the costs of mediation will be divided and paid equally by the parties. Each party will pay its own attorneys' fees and costs in connection with any mediation. The fees of any arbitrator and the costs of arbitration will be paid by the nonprevailing party or parties; if none, such fees and costs will be divided and paid equally by the parties. Should any suit, action or arbitration be commenced in connection with any dispute related to or arising out of this Declaration, the Bylaws, the Rules and Regulations, or the Oregon Planned Community Act to obtain a judicial construction of any provision of this Declaration, the Bylaws or the Rules and Regulations; to rescind this Declaration; or to enforce or collect any judgment or decree of any court or any award obtained during arbitration, the prevailing party will be entitled to recover its costs and disbursements, together with such investigation, expert witness and attorneys' fees incurred in connection with such dispute as the court or arbitrator may adjudge reasonable, at trial, in the arbitration, upon any motion for reconsideration, upon petition for review, and on any appeal of such suit, action or arbitration proceeding. The determination of who is the prevailing party and the amount of reasonable attorneys' fees to be paid to the prevailing party will be decided by the arbitrator (with respect to attorneys' fees incurred before and during the arbitration proceeding) and by the court or courts, including any appellate or review court, in which such matter is tried, heard or decided, including a court that hears a request to compel or enjoin arbitration or that hears exceptions made to an arbitration award submitted to it for confirmation as a judgment (with respect to attorneys' fees incurred in such proceedings).

12.9 **Survival.** The mediation and arbitration agreement set forth in this Article 12 will survive the transfer by any party of its interest or involvement in the Property and any Lot therein and will survive the termination of this Declaration.

Article 13

MORTGAGEES

The following provisions are for the benefit of holders, insurers and guarantors of first Mortgages on Lots. The provisions of this Article 13 apply to both this Declaration and to the Bylaws, notwithstanding any other provisions contained therein.

13.1 **Subordination of Lien to Mortgages.** The lien of the Assessments or charges provided for in this Declaration are subordinate to the lien of any Mortgage on such Lot which was made in good faith and for value and which was recorded prior to the recordation of the notice of lien. Sale or transfer of any Lot does not affect the Assessment lien, but the sale or transfer of any Lot that is subject to any Mortgage or deed of trust pursuant to a decree of foreclosure or nonjudicial sale thereunder extinguishes any lien of an Assessment, notice of which was recorded after the recording of the Mortgage. Such sale or transfer, however, does not release the Lot from liability for any Assessments or charges thereafter becoming due or from the lien of such Assessments or charges.

13.2 **Reimbursement of First Mortgagees.** First Mortgagees of Lots may, jointly or singly, pay taxes or other charges which are in default and which may or have become a charge against any Common Areas and may pay overdue premiums on hazard insurance policies or secure new hazard insurance coverage on the lapse of a policy, for such Common Area. First Mortgagees making such payments are owed immediate reimbursement therefor from the Association.

13.3 **Notification of First Mortgagee.** If a first Mortgagee has requested such notice in writing from the Association, the Board will notify such Mortgagee of any individual Lot of any default in performance of this Declaration by the Owner which is not cured within 60 days after notice of default to the Owner.

13.4 **Notice to Association.** Upon request, each Owner is obligated to furnish to the Association the name and address of the holder of any Mortgage encumbering such Owner's Lot.

Article 14

AMENDMENT AND REPEAL

14.1 **How Proposed.** Amendments to or repeal of this Declaration will be proposed by either a majority of the Board of Directors or by Owners holding 30 percent or more of the Association's voting rights. The proposed amendment or repeal must be reduced to writing and will be included in the notice of any meeting at which action is to be taken thereon or attached to any request for consent to the amendment or repeal.

14.2 **Approval Required.** This Declaration, or any provision thereof, as from time to time in effect with respect to all or any part of the Property, may be amended or repealed by the vote or written consent of Owners representing not less than 75 percent of the voting rights, without regard to any weighted vote for the Class B Member, together with the written consent of the Class B Member, if such Class B Membership has not been terminated as provided in this Declaration. In no event will an amendment under this section create, limit or diminish special Declarant rights without Declarant's written consent, or change the boundaries of any Lot or any uses to which any Lot is restricted under this Declaration or change the method of determining liability for common expenses, the method of determining the right to common profits or the method of determining voting rights of any Lot unless the Owners of the affected Lots unanimously consent to the amendment. Declarant may not amend this Declaration to increase the scope of special Declarant rights reserved in this Declaration after the sale of the first Lot unless Owners representing 75 percent of the total vote, other than Declarant, agree to the amendment. To the extent any amendment relates to the preservation or maintenance of the Common Areas or private utility lines, or the existence of an entity responsible for accomplishing the same, such amendment must be approved by the zoning administrator of Clackamas County.

14.3 **Recordation.** Any such amendment or repeal becomes effective only upon recordation in the Deed Records of Clackamas County, Oregon of a certificate of the president and secretary of the Association setting forth in full the amendment, amendments or repeal so approved and certifying that such amendment, amendments or repeal have been approved in the manner required by this Declaration and ORS 94.590, and acknowledged in the manner provided for acknowledgment of deeds.

14.4 **Regulatory Amendments.** Notwithstanding the provisions of Section 14.2, until the Turnover Meeting has occurred, Declarant has the right to amend this Declaration or the Bylaws of the Association in order to comply with the requirements of the Federal Housing Administration; the United States Department of Veterans Affairs; the Farmers Home Administration of the United States; the Federal National Mortgage Association; the Government National Mortgage Association; the Federal Home Mortgage Loan Corporation; any department, bureau, board, commission or agency of the United States or the state of Oregon; or any corporation wholly owned, directly or indirectly, by the United States or the state of Oregon that insures, guarantees or provides financing for a planned community or lots in a planned community. After the Turnover Meeting, any such amendment must be approved by the Association in accordance with the approval provisions of this Declaration or the Bylaws, as applicable.

Article 15

MISCELLANEOUS PROVISIONS

15.1 **No Implied Obligations.** Nothing in this Declaration may be construed to require Declarant or any successor Declarant to subject Additional Property to this Declaration or to improve or develop any of the Property or to do so for any particular uses.

15.2 **Right to Approve Additional Covenants.** No Person may record any declaration of covenants, conditions and restrictions, declaration of condominium or similar instrument affecting any portion of the Property without Declarant's prior written consent. Any attempted recordation without such consent will result in such instrument being void and of no force or effect unless subsequently approved in writing by Declarant.

15.3 **Notice of Sale or Transfer of Title.** Any Owner selling or otherwise transferring title to his or her Lot must give the Association written notice within seven days after the transfer of the name and address of the purchaser or transferee, the date of such transfer of title and such other information as the Association may reasonably require. The transferor continues to be jointly and severally responsible with the transferee for all obligations of the Owner of the Lot, including Assessment obligations, until the date upon which such notice is received by the Board, notwithstanding the transfer of title.

15.4 **Exclusive Rights to Use Name of Development.** No Person may use the name "Stafford Meadows" or any derivative of such name in any printed, digital (i.e., internet) or other promotional or commercial material without Declarant's prior written consent. However, an Owner may use the name "Stafford Meadows" where such term is used solely to specify that the Owner's property is located within the Property. In no event will any Owner enter into an agreement with any third party for the sale, rental, or management of the Owner's Lot if such agreement purports to grant any right to such third party to use the name "Stafford Meadows" or any derivative of such name in violation of this provision.

15.5 **Lessees and Other Invitees.** Lessees, employees, invitees, licensees, contractors, family members, guests, and other Persons entering the Property under rights derived from an Owner must comply with all of the provisions of this Declaration restricting or regulating the Owner's use, improvement or enjoyment of his or her Lot and other areas within the Property. The Owner is responsible for obtaining such compliance and will be liable for any failure of compliance by such Persons in the same manner and to the same extent as if the failure had been committed by the Owner.

15.6 **Nonwaiver.** Failure by the Association or by any Owner to enforce any covenant or restriction contained in this Declaration will in no event be deemed a waiver of the right to do so thereafter.

15.7 **Construction and Severability.** This Declaration will be liberally construed as an entire document to accomplish the purposes hereof as stated in the introductory paragraphs hereof. Nevertheless, each provision of this Declaration will be deemed independent and severable, and the invalidity or partial invalidity of any provision will not affect the validity or enforceability of the remaining part of that or any other provision.

15.8 **Terminology and Captions.** As used in this Declaration, the singular includes the plural and the plural the singular, and the masculine and neuter each include the masculine, feminine and neuter, as the context requires. All captions used in this Declaration are intended solely for convenience of reference and in no way limit any of the provisions of this Declaration.

15.9 **Notices.** All notices to the Association or to the Board of Directors will be sent care of the manager or, if there is no manager, to the principal office of the Association or to such other address as the Board may designate from time to time. All notices to any Owner will be sent to such address as may have been designated by such Owner from time to time, in writing, to the Board or, if no address has been designated, to the Owner's Lot. In the discretion of the Board, any notice, information or other written material required to be given to an Owner or director under this Declaration or the Bylaws or pursuant to the Oregon Planned Community Act, may be given by electronic mail, facsimile or other form of electronic communication acceptable to the Board, except for the following notices: failure to pay an Assessment, foreclosure of an Association lien under ORS 94.709, or an action the Association may take against an Owner. An Owner or director may decline to receive notice by electronic mail, facsimile or other form of electronic communication and may direct the Board to provide notice in any other manner permitted under this Declaration or the Bylaws or the Oregon Planned Community Act.

15.10 **Private Agreement.** This Declaration and the covenants and agreements contained herein constitute a private agreement among the Owners of Lots in Stafford Meadows. This Declaration does not restrict Clackamas County's authority to adopt or amend its development regulations. It is the duty of every Person engaged in development or remodeling of a Lot and/or Improvement in Stafford Meadows to know the requirements of this Declaration and the covenants and agreements contained herein. There may be conflicting requirements between this Declaration and regulations of Clackamas County. In the event there is a conflict between a regulation of Clackamas County and this Declaration, any question regarding which provision controls will be directed to the Architectural Review Committee. In each case, Clackamas County will limit its review of a development application to the requirements of its regulations and will not be liable for any approvals or permits that are granted in compliance with the regulations of Clackamas County, the state of Oregon or any other jurisdiction, but that are not in compliance with this Declaration. Declarant, the Committee and the Association, or any one of them, will not be liable for any approvals that are granted in compliance with this Declaration, but that are not in compliance with the regulations of Clackamas County, the state of Oregon or any other jurisdiction.

IN WITNESS WHEREOF, Declarant has executed this Declaration on the date set forth above.

__________________ **LLC**,
an Oregon limited liability company

By: WalDen Holding Corp.
an Oregon corporation, its sole member

By: ___________________________________
Name/Title: Dennis E. Sackhoff, President

By: ___________________________________
Name/Title: Walter E. Remmers, Secretary

STATE OF OREGON)
)ss.
COUNTY OF __________________)

The foregoing instrument was acknowledged before me this ______ day of ____________, 2018, by Dennis E. Sackhoff, President of WalDen Holding Corp., an Oregon corporation, sole member of __________________ LLC, an Oregon limited liability company, on its behalf.

____
Notary Public for Oregon
My commission expires:_________________

STATE OF OREGON)
)ss.
COUNTY OF ___________________)

The foregoing instrument was acknowledged before me this ______ day of ____________, 2018, by Walter E. Remmers, Secretary of WalDen Holding Corp., an Oregon corporation, sole member of ___________________ LLC, an Oregon limited liability company, on its behalf.

____
Notary Public for Oregon
My commission expires:__________________

Appendix I

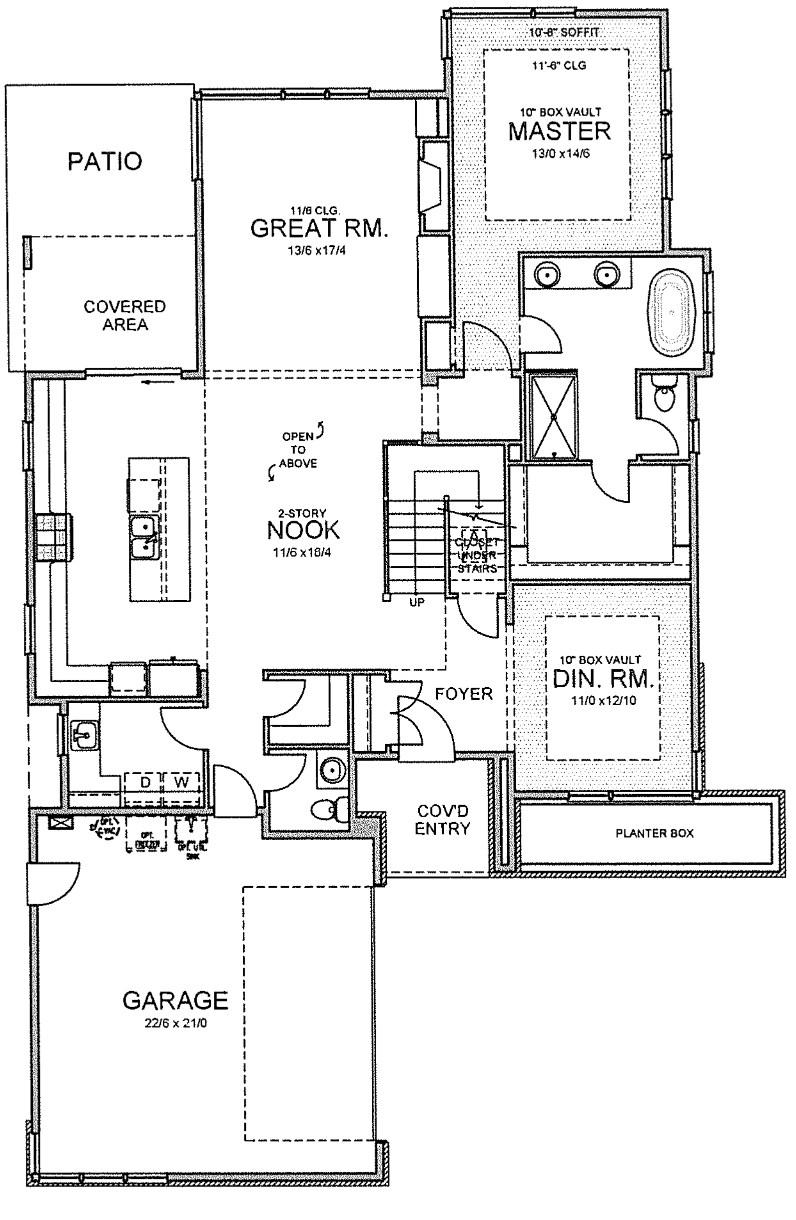
WEST HILLS
HOMES NORTHWEST

2746 BAYBERRY PRAIRIE (2-CAR)

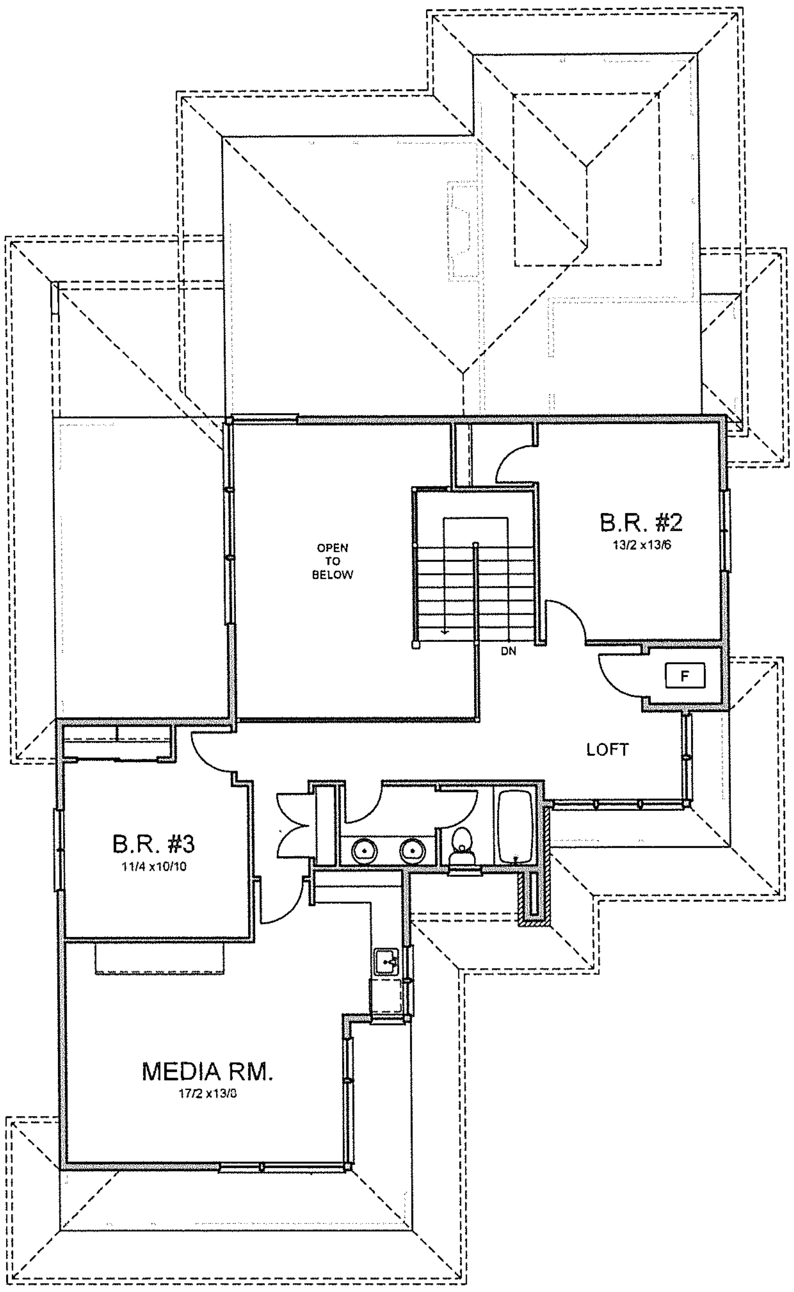
M. FLR. = 1,685 S.F.
U. FLR. = 1,061 S.F.
TOTAL = 2,746 S.F.
GARAGE = 499 S.F.

PDX ORE
EVERETT
CUSTOM HOMES

3-BEDROOMS
2.5-BATHS
MEDIA
2-CAR GARAGE

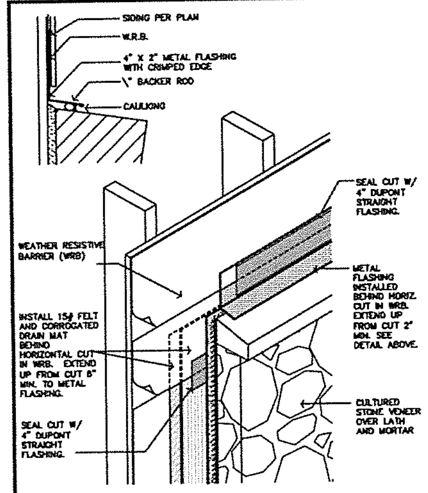


MAIN LEVEL FLOOR PLAN (9' & 11/6 CLG.)

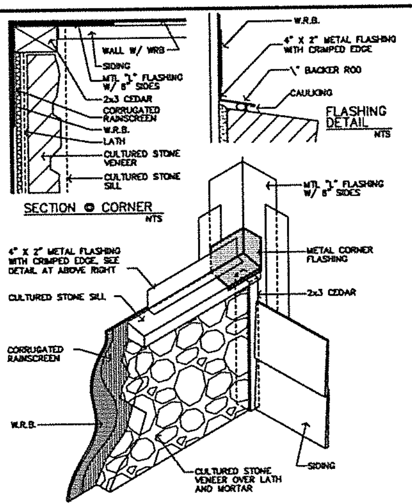


UPPER LEVEL FLOOR PLAN (8' CLG.)

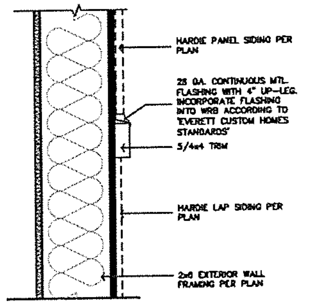
REV: 5/2/17 DDR



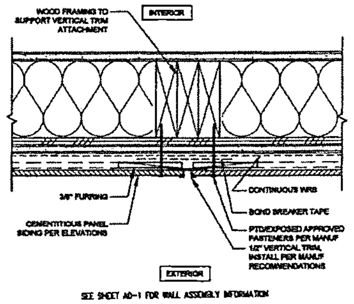
CULTURED STONE VENEER FLASHING DETAIL
1/1 SCALE: 1½" = CS-WALL-FLASHING-DET1



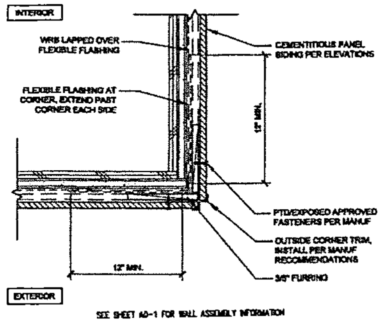
STONE VENEER AT EXTERIOR CORNER DETAIL
2/1 SCALE: 1½" = CS-COR-WALL-FLASHING-DET1



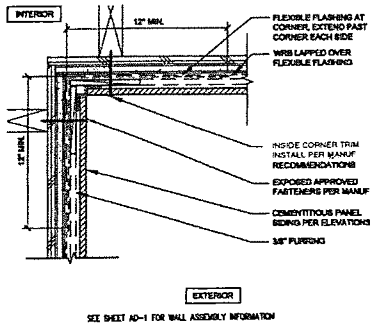
HORIZ. TRIM DETAIL AT WALL
3/1 SCALE: 3"=1'-0"



CEMENTITIOUS PANEL WITH HORIZONTAL AND VERTICAL TRIM
4/1 N.T.S.



OUTSIDE CORNER AT CEMENTITIOUS PANEL SIDING
5/1 N.T.S.



INSIDE CORNER AT CEMENTITIOUS PANEL SIDING
6/1 N.T.S.

GENERAL NOTES:

- CONSTRUCTION SHALL FULLY COMPLY WITH THE CURRENT OREGON EDITION OF THE INTERNATIONAL RESIDENTIAL CODE (IRC), ALL ADDITIONAL STATE AND LOCAL CODE REQUIREMENTS (2017 EDITION OF THE ORSC).
- WRITTEN DIMENSIONS ON THESE DRAWINGS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS. PLEASE NOTIFY THE DESIGNER OF ANY VARIATIONS FROM THESE DRAWINGS.
- ANY DEFECT DISCOVERED IN THE CONSTRUCTION DOCUMENT SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGNER BEFORE PROCEEDING WITH WORK.
- THESE DOCUMENTS ARE COPYRIGHT PROTECTED AND MAY NOT BE REUSED, REDRAWN, TRACED OR REPRODUCED WITHOUT WRITTEN PERMISSION FROM EVERETT CUSTOM HOMES.
- INSTALL APPROVED FOAM TYPE INSULATION AT FLOOR AND PLATE LINES, OPENINGS IN PLATES, CORNER STUD CAVITIES & AROUND DOOR & WINDOW ROUGH OPENING CAVITIES.
- INSTALL WATERPROOF GYPSUM BOARD IN AND ABOVE ALL SHOWER AND TUB AREAS TO MINIMUM 72" ABOVE THE FLOOR.
- EXHAUST ALL VENTS AND FANS DIRECTLY OUTSIDE VIA METAL DUCTS. BATHROOMS CONTAINING A SHOWER OR BATHTUB MUST HAVE A FAN CAPABLE OF 80 CFM CONTROLLED BY A DE-HUMIDISTAT, TIMER OR OTHER SIMILAR MEANS OF CONTROL.
- GAS FURNACE: 90% MIN. AFUE TO BE INSTALLED IN AN INSULATED, THERMALLY CONDITIONED SPACE WITH INSULATION INSTALLED IN WALL CAVITIES OF CLOSET.
- ALL HVAC DUCTING TO BE INSTALLED IN AN INSULATED, CONDITIONED SPACE.
- ALL EXTERIOR CUT SURFACES TO BE PRIMED.
- REFER TO 'EVERETT CUSTOM HOMES' ROOF AND WINDOW INSTALLATION MANUALS FOR ROOFING, FLASHING, AND INSTALLATION STANDARDS.

EVERETT CUSTOM HOMES ENVELOPE STANDARDS:

(MEETS OR EXCEEDS THE 2017 EDITION OF THE ORSC PRESCRIPTIVE ENVELOPE REQUIREMENTS)

ENVELOPE ENHANCEMENT MEASURE #5:

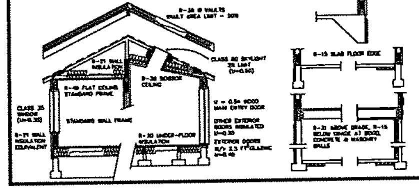
- A WHOLE BUILDING VENTILATION SYSTEM COMPLYING WITH TABLE N1101.1(3)
- DWELLING SHALL BE TESTED WITH A BLOWER DOOR AND FOUND TO EXHIBIT NO MORE THAN:
  1. 6.0 AIR CHANGES/HOUR (BUILDING TIGHTNESS TEST SHALL BE CONDUCTED WITH A BLOWER DOOR DEPRESSURIZING THE DWELLING 50 PASCAL'S FROM AMBIENT CONDITIONS. DOCUMENTATION OF BLOWER DOOR TEST SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK.)

     AND

  2. PERFORMANCE TESTED DUCT SYSTEMS. (DOCUMENTATION OF PERFORMANCE TESTED DUCTWORK SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK. THIS WORK SHALL BE PERFORMED BY A TECHNICIAN CERTIFIED BY THE 'PTCS'. DOCUMENTATION SHALL BE PROVIDED THAT THE WORK DEMONSTRATES CONFORMANCE TO 'PTCS' DUCT PERFORMANCE STDS.)

CONSERVATION MEASURE A:

- HIGH EFFICIENCY HVAC SYSTEM: 90% MIN. AFUE FURNACE



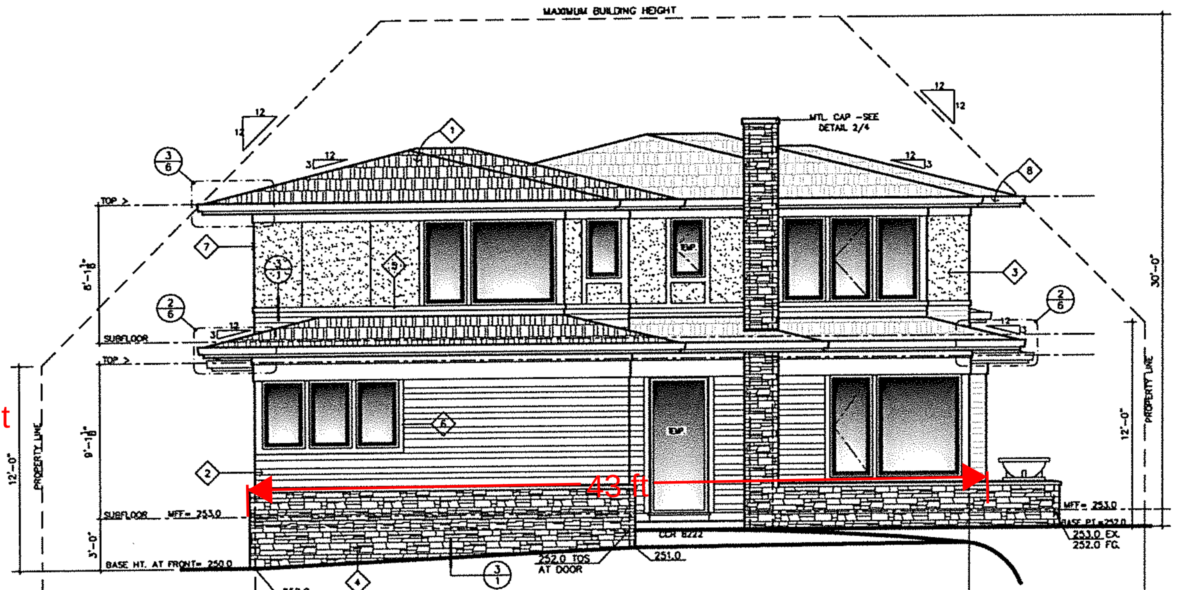
NOTES:

1. CONFIRM MAIN FINISH FLOOR AND GARAGE SLAB HEIGHTS WITH SITE PLAN AND VERIFY W/ FINAL GRADES AND OWNER. INSTALL STEPS INTO HOUSE AS NEEDED AT GARAGE, PORCH AND PATIO.
2. DOOR & WINDOW HEADER HT.: MAIN FLR. @ 8'-0" A.F.F. (U.N.O.) UPPER FLR @ 7'-0" A.F.F. (U.N.O.)
3. ~~UPPER FLR. SILL MIN. 24" A.F.F.~~

◇ ELEVATION KEYNOTES

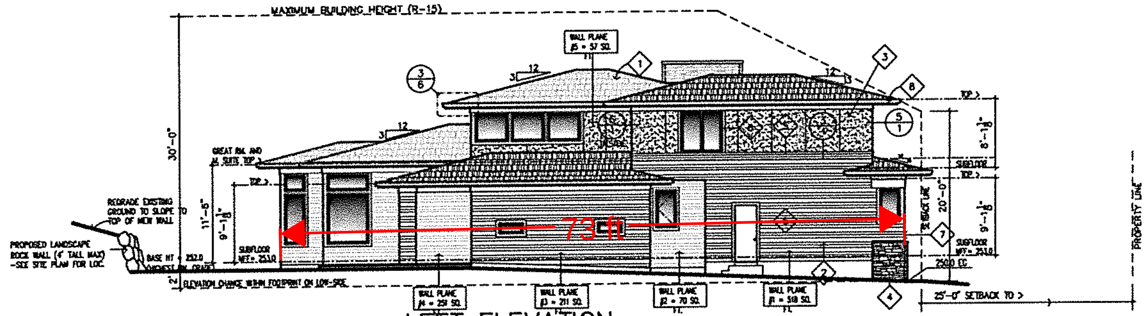
1. ROOFING (TYPICAL): COMPOSITION ROOFING ON 2-LAYERS OF APPROVED UNDERLAYMENT DUE TO ROOF SLOPE.
2. SIDING (MAIN LEVEL TYP): HORIZONTAL HARDIE LAP SIDING W/ VARIED REVEAL, AND MTL. COR'S AS LOCATED.
3. SIDING (UPPER LEVEL TYP): HARDIE CEMENTITIOUS SIDING AS LOCATED.
4. STONE VENEER (WHERE SHOWN): CULTURED STONE W/ CONC. CAP AT TOP. INSTALL PER MFR'S SPEC'S. – SEE DETAILS 1/1, 2/1, 7/2, 8/2 FOR REFERENCE.
5. HORIZONTAL TRIM: 5/4x4 TRIM – SEE DETAIL 3/1. (FLASH ABOVE ALL HORIZ. TRIM)
6. WINDOW & DOOR TRIM (WHERE SHOWN): 5/4x4 TRIM (FLASH ABOVE ALL HORIZ. TRIM)
7. CORNER TRIM (AT LAP SIDING): MTL. COR'S AT LAP SIDING AND MTL. CHANNEL AT CEMENTITIOUS PANEL SIDING.
8. GUTTERS (TYP-U.N.O.): FASCIA STYLE, 26 GA. STEEL GUTTER WITH 2"x3" ~~STEEL DOWNSPOUTS. CONNECT ALL DOWNSPOUTS TO RAIN DRAINS OR OTHER~~ APPROVED RAIN COLLECTION SYSTEM.

Lot Width 53 feet
Corner Lot Width 63 feet
Lot Depth R10 113 feet
Lot Depth R7 103 feet

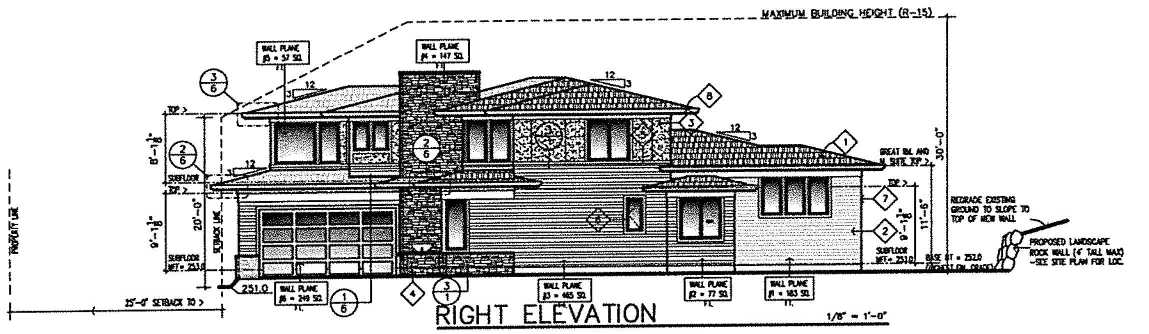


FRONT ELEVATION
1/4" = 1'-0"

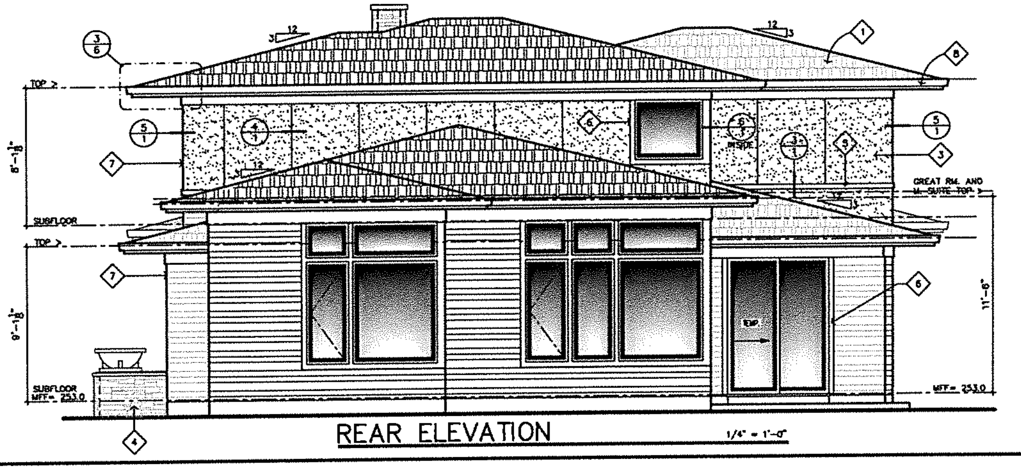
BASE ELEVATION: HIGHEST GRADE WITHIN FOOTPRINT = 252.0
BUILDING HEIGHT: BASE ELEVATION + 30' (R-10) = 282.0
MAX. RIDGE ELEVATION: = 274.25



LEFT ELEVATION
1/8" = 1'-0"



RIGHT ELEVATION
1/8" = 1'-0"



REAR ELEVATION
1/4" = 1'-0"

WEST HILLS
HOMES NORTHWEST

PDX E ORE

EVERETT
CUSTOM HOMES

3330 NW YEON AVE STE 100
PORTLAND, OREGON 97210
PHONE (503) 726-7060

3/13/17.	PRELIM. LAYOUT	DDR
4/3/17.	PRELIM. ENG. CHK.	DDR
5/2/17.	FINAL ENG. CHK.	DDR
5/2/17.	PUBLISH PLAN	DDR

PLAN 2746 BAYBERRY PRAIRIE 2-CAR GARAGE LEFT

MAIN LEVEL:	1,685 SQ FT
UPPER LEVEL:	1,061 SQ FT
GRAND TOTAL:	2,746 SQ FT
GARAGE:	499 SQ FT

SHEET#

1

JOB#

NOTE:

FOR ALL STRUCTURAL INFORMATION REFER TO THE (S) SHEETS

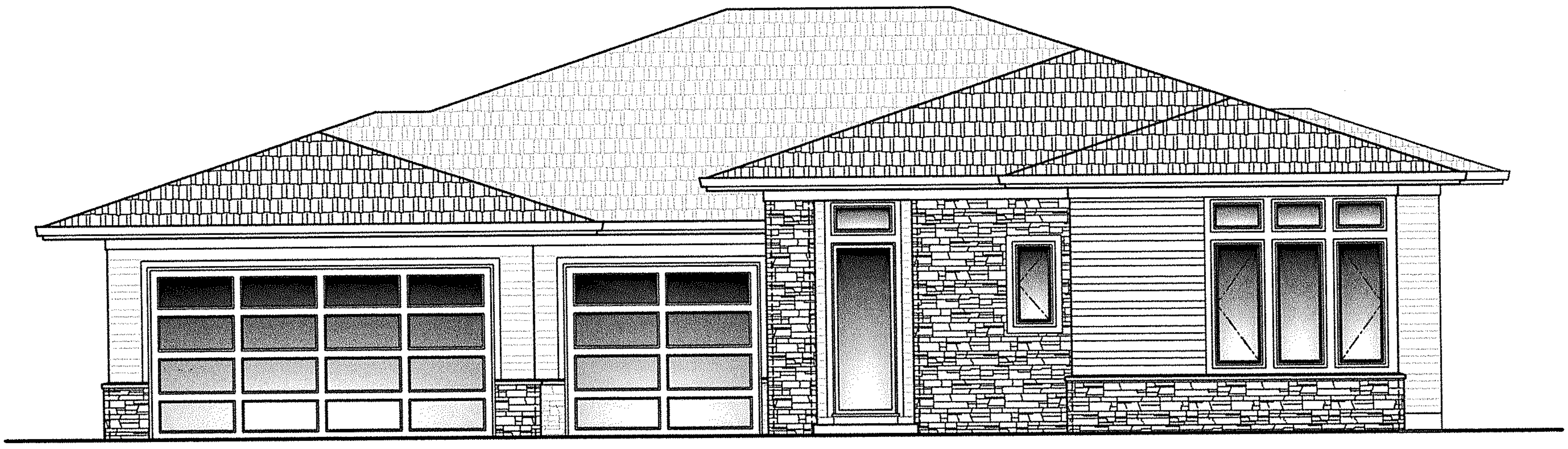
WEST HILLS
HOMES NORTHWEST

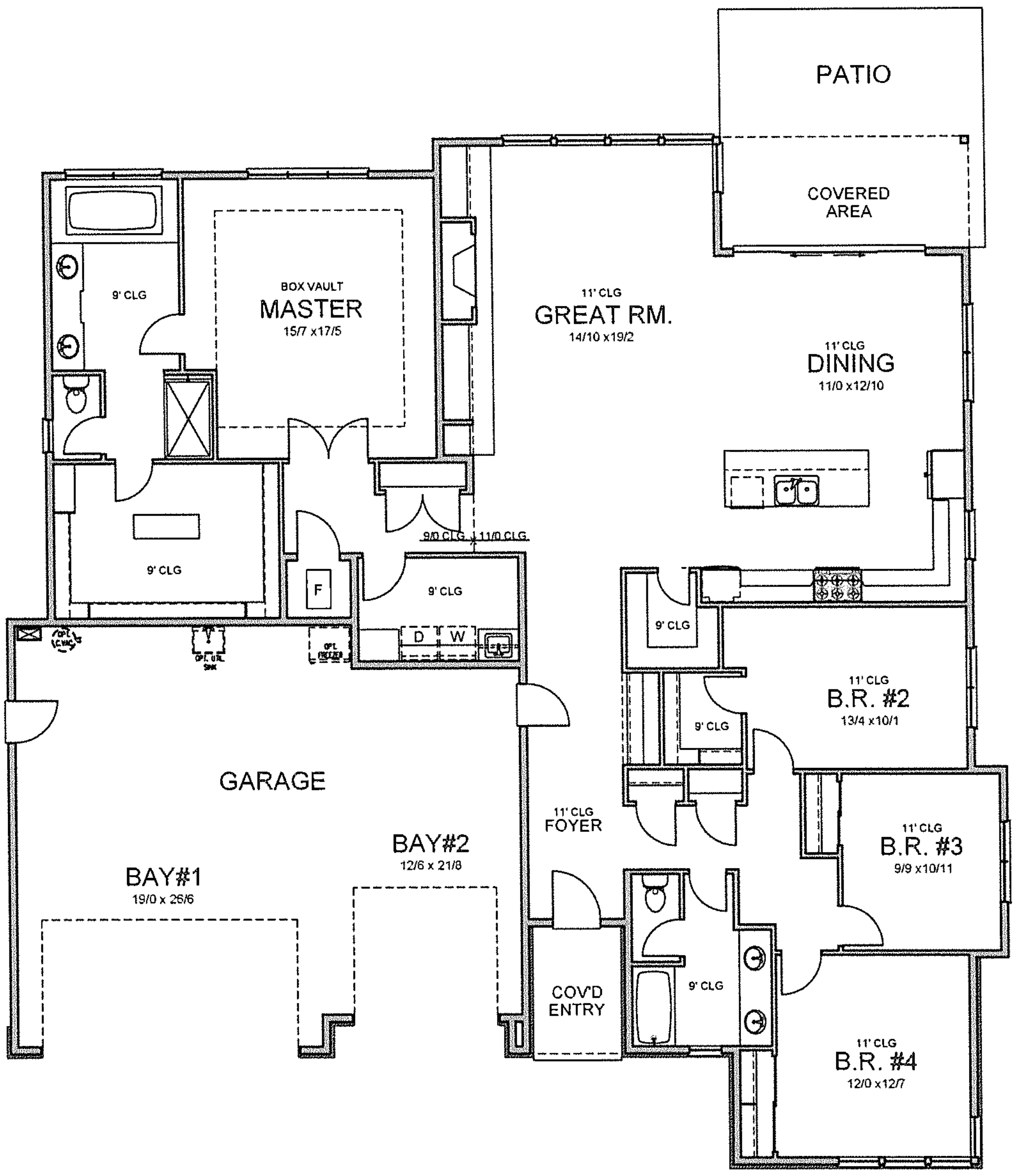
2480 ESLINGER PRAIRIE

M. FLR. = 2,480 S.F.
TOTAL = 2,480 S.F.
GARAGE = 826 S.F.

PDX ORE
EVERETT
CUSTOM HOMES

4-BEDROOMS
2-BATHS
3-CAR GARAGE

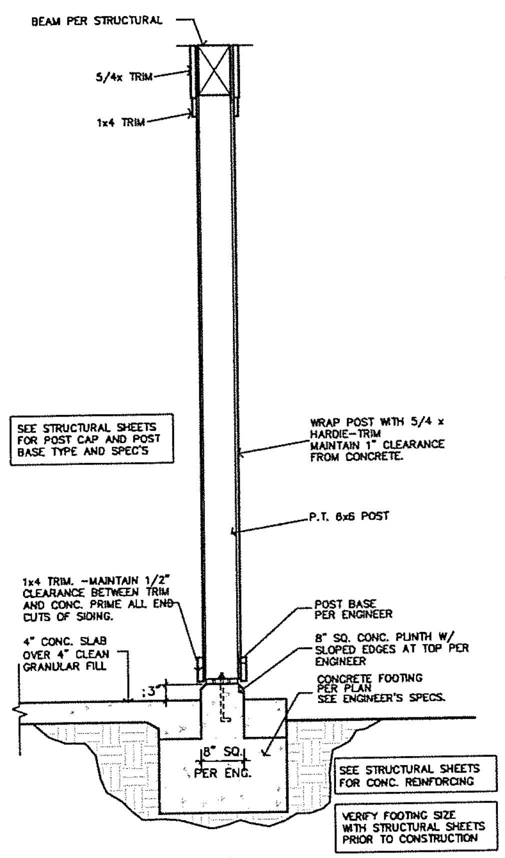




MAIN LEVEL FLOOR PLAN (9' & 11' CLG'S.)

REV: 10/20/17 DDR

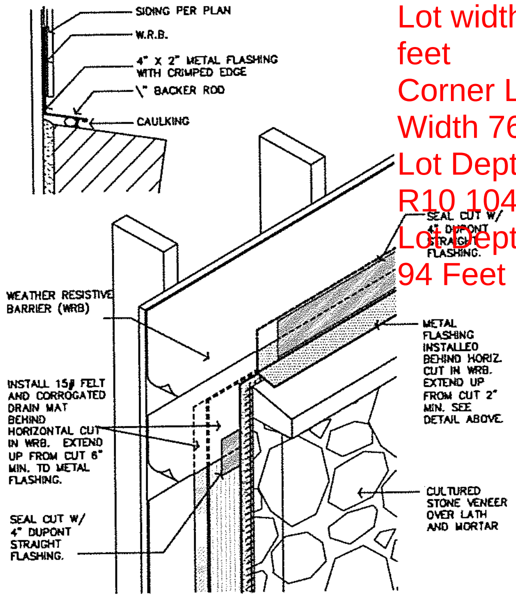
Lot width 71 feet
Corner Lot Width 76 feet
Lot Depth R10 104 feet
Lot Depth R7 94 Feet



1/1 COLUMN DETAIL

SCALE: ["=1'-0"

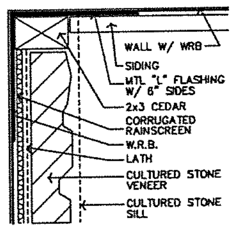
ECH-COL-1



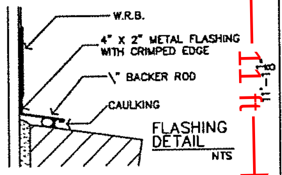
2/1 CULTURED STONE VENEER FLASHING DETAIL

SCALE: 1\" =

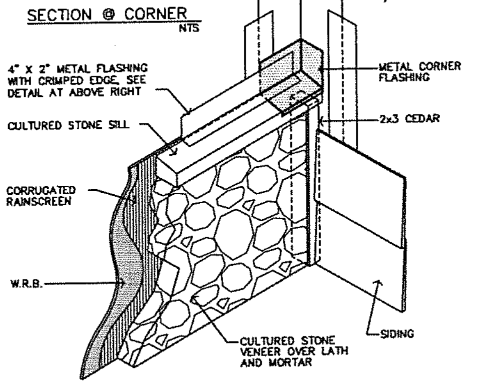
CS-WALL-FLASHING-DETI



SECTION @ CORNER
NTS



FLASHING DETAIL
NTS



3/1 STONE VENEER AT EXTERIOR CORNER DETAIL

SCALE: 1\" =

CS-COR-WALL-FLASHING-DETI

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- EXHAUST ALL VENTS AND FANS DIRECTLY OUTSIDE VIA METAL DUCTS. BATHROOMS CONTAINING A SHOWER OR BATHTUB MUST HAVE A FAN CAPABLE OF 80 CFM CONTROLLED BY A DE-HUMIDISTAT, TIMER OR OTHER SIMILAR MEANS OF CONTROL.
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EVERETT CUSTOM HOMES ENVELOPE STANDARDS:

(MEETS OR EXCEEDS THE 2017 EDITION OF THE ORSC PRESCRIPTIVE ENVELOPE REQUIREMENTS)

ENVELOPE ENHANCEMENT MEASURE #5:

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     AND

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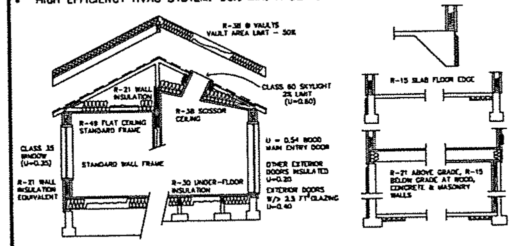
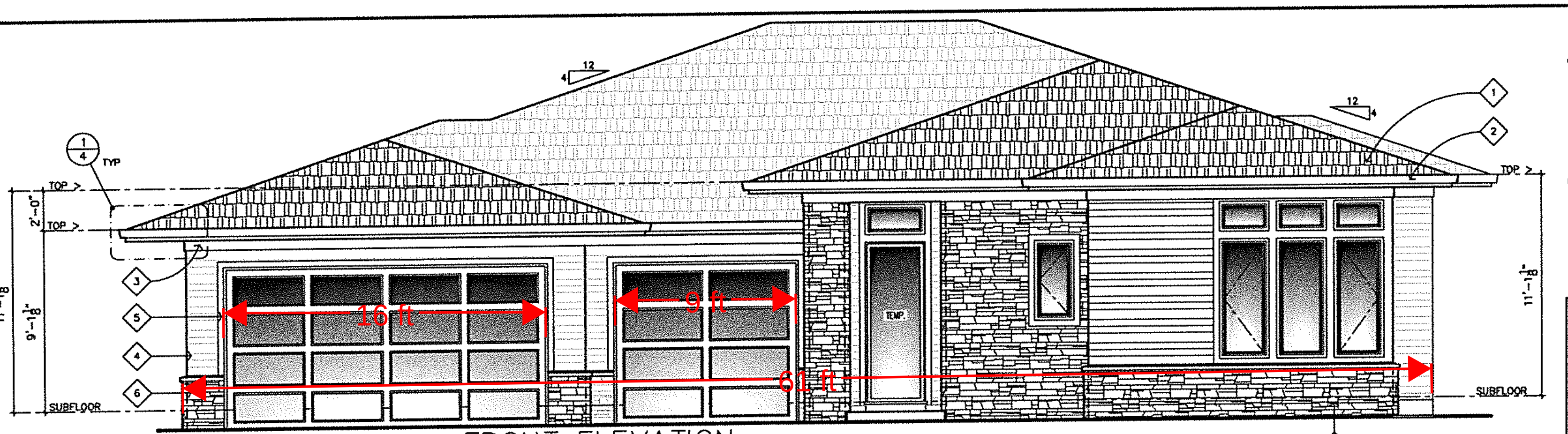
CONSERVATION MEASURE A:

- HIGH EFFICIENCY HVAC SYSTEM: 90% MIN. AFUE FURNACE



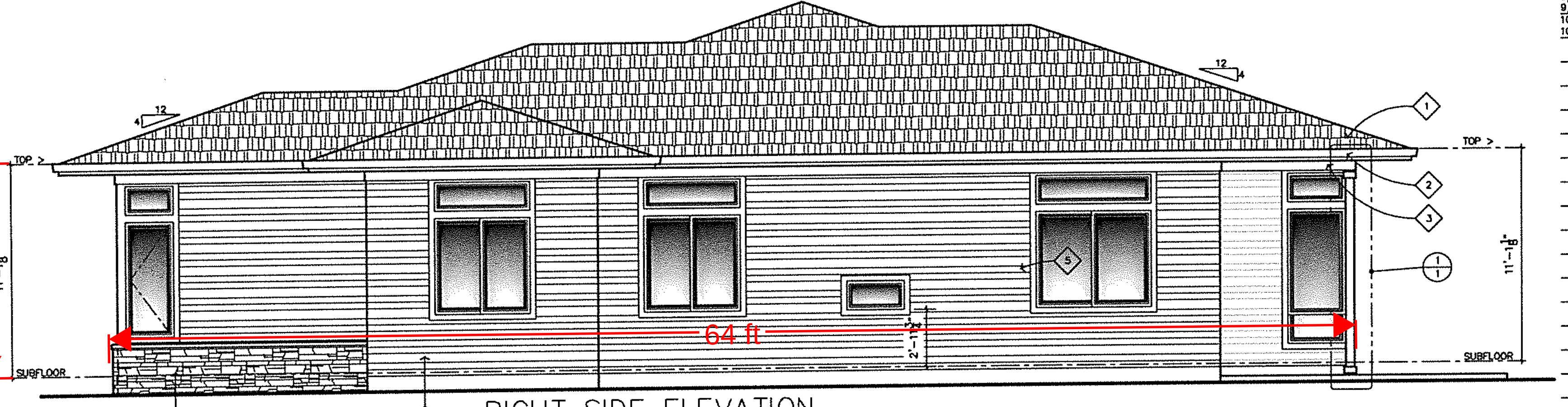
◇ ELEVATION KEYNOTES

1. ROOFING (TYPICAL): COMPOSITION ROOFING INSTALLED PER MFR'S SPEC'S.
2. GUTTERS (TYP-U.N.O.): FASCIA STYLE, 26 GA. STEEL GUTTER WITH 2"x3" STEEL DOWNSPOUTS. CONNECT ALL DOWNSPOUTS TO RAIN DRAINS OR OTHER APPROVED RAIN COLLECTION SYSTEM.
3. HORIZONTAL SOFFIT TRIM: 5/4x HARDIE TRIM
4. SIDING (TYPICAL): HORIZONTAL HARDIE LAP SIDING W/ VARIED REVEAL AND METAL COR. BDS. AS LOCATED.
5. WINDOW & DOOR TRIM (TYP): 5/4x4 TRIM (FLASH ABOVE ALL HORIZ. TRIM)
6. STONE VENEER (WHERE SHOWN): CULTURED STONE W/ SLOPED CONC. CAP. INSTALL PER MFR'S SPEC'S. - SEE DETAILS 2/1, 3/1 & 2/4 FOR REFERENCE.



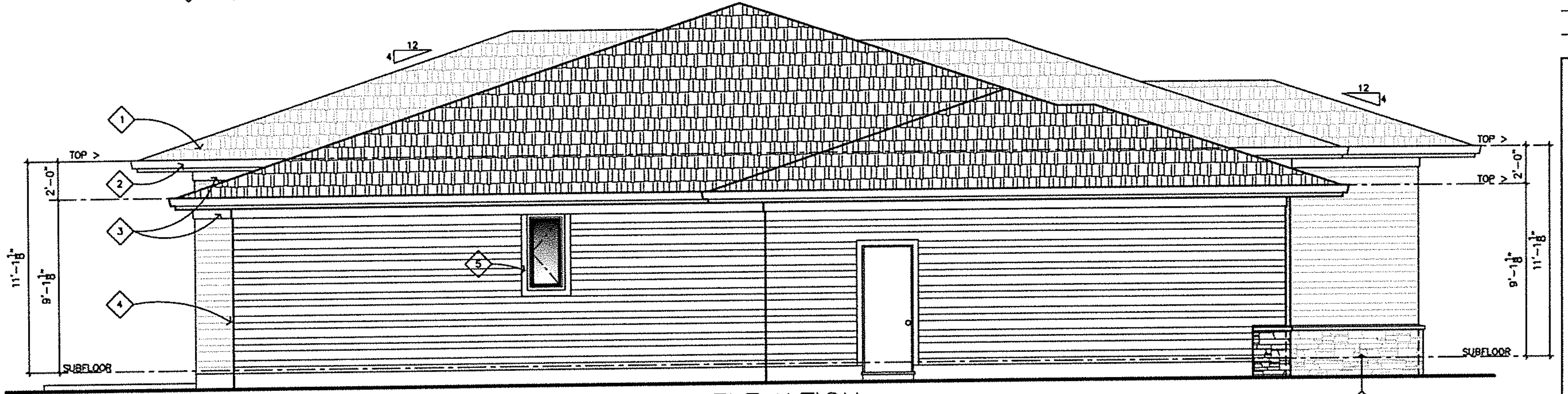
FRONT ELEVATION

SCALE: ["=1'-0"



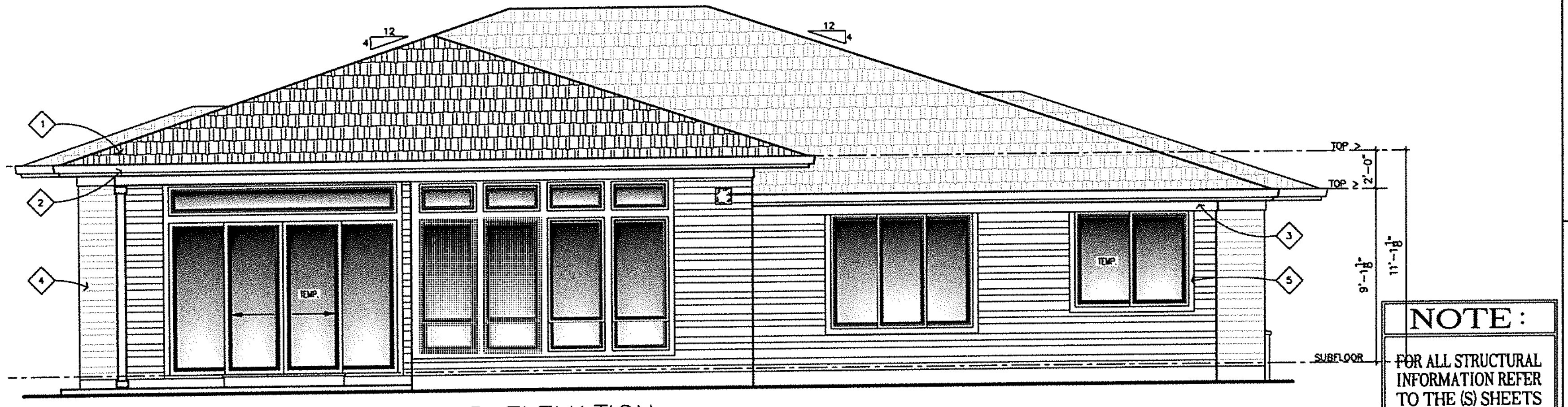
RIGHT SIDE ELEVATION

SCALE: ["=1'-0"



LEFT SIDE ELEVATION

SCALE: ["=1'-0"



REAR ELEVATION

SCALE: ["=1'-0"

WEST HILLS
HOMES NORTHWEST

FOX E OAK

EVERETT
CUSTOM HOMES

3330 NW YEON AVE STE 100
PORTLAND, OREGON 97210
PHONE (503) 726-7060

8/18/17,	PRELIM. LAYOUT	DDR
9/7/17,	PRELIM. ENG. CHK.	DDR
10/20/17,	FIN. ENG. CHK.	DDR
10/20/17,	PUBLISH PLAN	DDR

PLAN 2480 ESLINGER PRAIRIE GARAGE LEFT

MAIN LEVEL:	2,480 SQ FT
GRAND TOTAL:	2,480 SQ FT
GARAGE:	826 SQ FT

SHEET#

NOTE:
FOR ALL STRUCTURAL INFORMATION REFER TO THE (S) SHEETS

JOB#

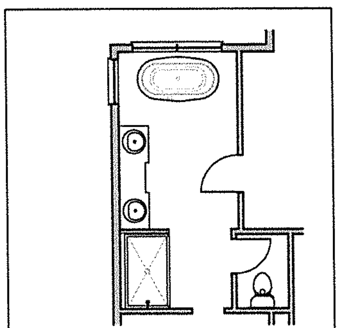
WEST HILLS
HOMES NORTHWEST

3557 DUNTHORPE
FRENCH

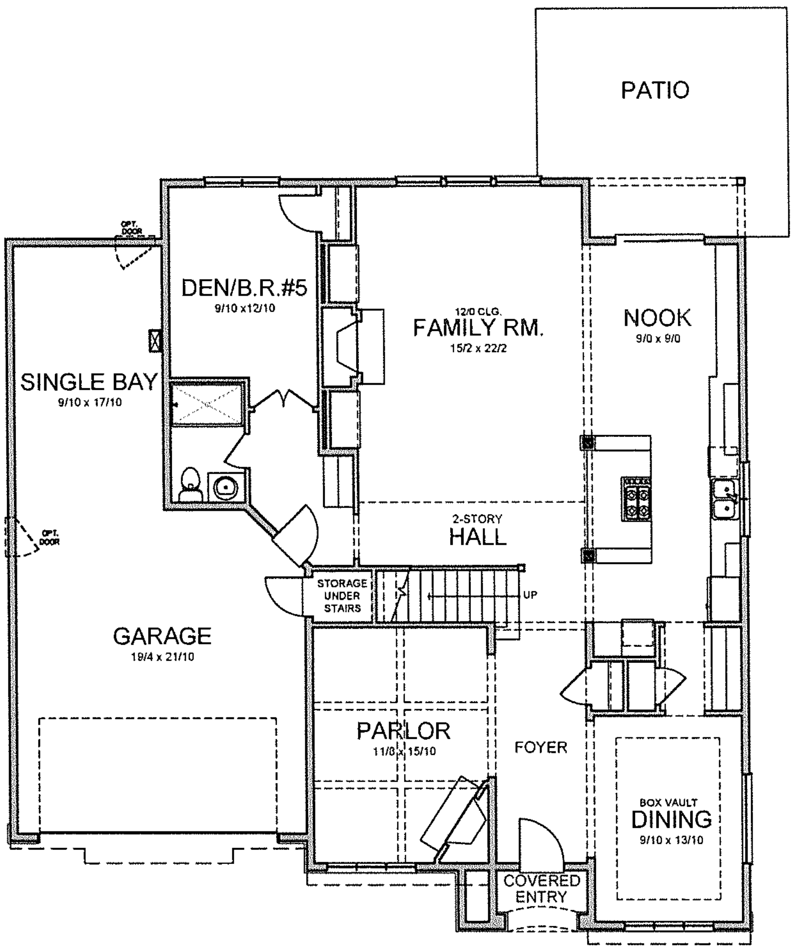
M. FLR.	=	1,605 S.F.
U. FLR.	=	1,917 S.F.
BONUS	=	451 S.F.
TOTAL	=	3,973 S.F.
GARAGE	=	636 S.F.

PDX ORE
EVERETT
CUSTOM HOMES

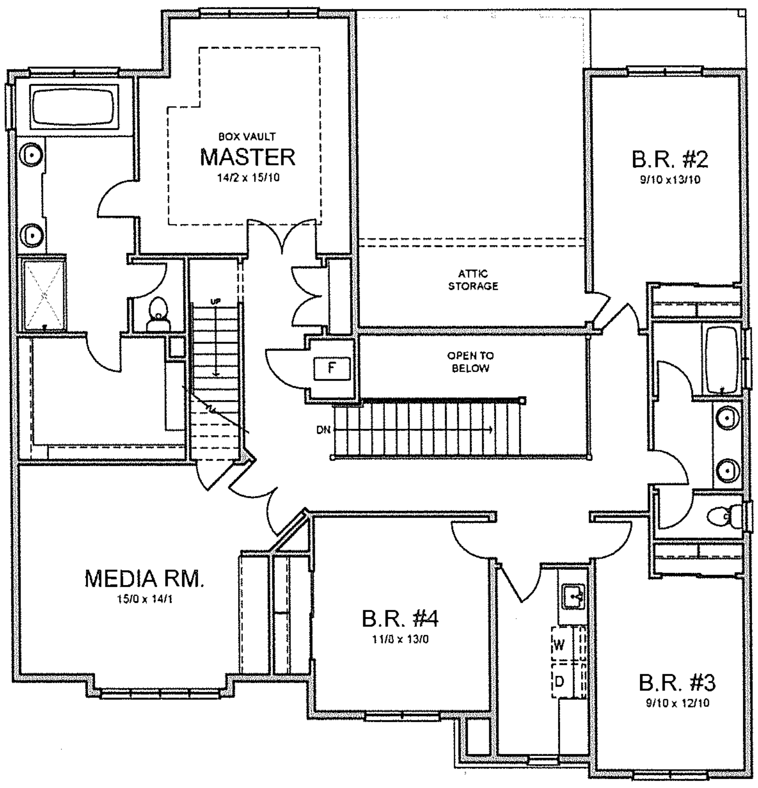
5-BEDROOMS
3-BATHS
MEDIA, BONUS
TANDEM 3-CAR GARAGE



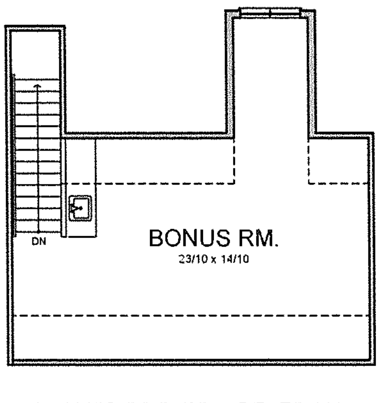
OPT. M. BATH LAYOUT



MAIN LEVEL FLOOR PLAN (9' CLG.)

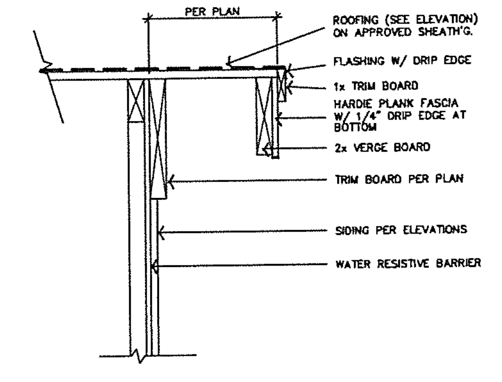


UPPER LEVEL FLOOR PLAN (8' CLG.)



BONUS LVL FLOOR PLAN

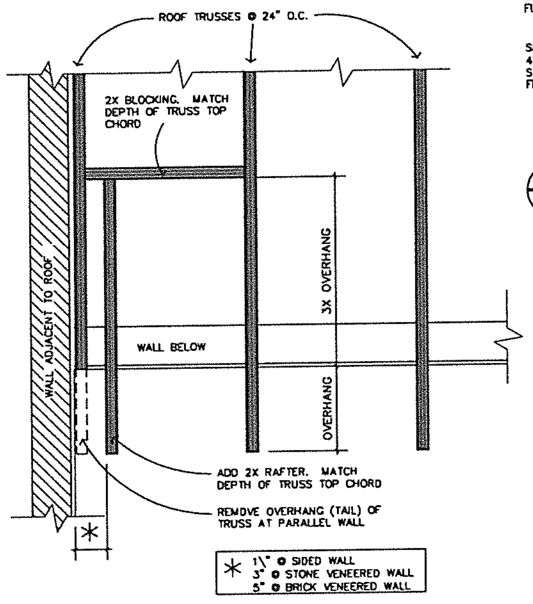
REV: 3/9/17 DDR



1/1 VERGE/RAKE DETAIL

SCALE: N.T.S.

VERGE-RAKE-DET1



2/1 ROOF FRAMING DETAIL @ ADJACENT WALL

SCALE: 1"=1'-0"

DETAILS/ ROOF FRAMING DETAIL @ ADJ. WALL

GENERAL NOTES:

- CONSTRUCTION SHALL FULLY COMPLY WITH THE CURRENT OREGON EDITION OF THE INTERNATIONAL RESIDENTIAL CODE (IRC), ALL ADDITIONAL STATE AND LOCAL CODE REQUIREMENTS (2017 EDITION OF THE ORSC).
- WRITTEN DIMENSIONS ON THESE DRAWINGS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS. PLEASE NOTIFY THE DESIGNER OF ANY VARIATIONS FROM THESE DRAWINGS.
- ANY DEFECT DISCOVERED IN THE CONSTRUCTION DOCUMENT SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGNER BEFORE PROCEEDING WITH WORK.
- THESE DOCUMENTS ARE COPYRIGHT PROTECTED AND MAY NOT BE REUSED, REDRAWN, TRACED OR REPRODUCED WITHOUT WRITTEN PERMISSION FROM EVERETT CUSTOM HOMES.
- INSTALL APPROVED FOAM TYPE INSULATION AT FLOOR AND PLATE LINES, OPENINGS IN PLATES, CORNER STUD CAVITIES & AROUND DOOR & WINDOW ROUGH OPENING CAVITIES.
- INSTALL WATERPROOF GYPSUM BOARD IN AND ABOVE ALL SHOWER AND TUB AREAS TO MINIMUM 72" ABOVE THE FLOOR.
- EXHAUST ALL VENTS AND FANS DIRECTLY OUTSIDE VIA METAL DUCTS. BATHROOMS CONTAINING A SHOWER OR BATHTUB MUST HAVE A FAN CAPABLE OF 80 CFM CONTROLLED BY A DE-HUMIDISTAT, TIMER OR OTHER SIMILAR MEANS OF CONTROL.
- GAS FURNACE: 90% MIN. AFUE TO BE INSTALLED IN AN INSULATED, THERMALLY CONDITIONED SPACE WITH INSULATION INSTALLED IN WALL CAVITIES OF CLOSET.
- ALL HVAC DUCTING TO BE INSTALLED IN AN INSULATED, CONDITIONED SPACE.
- ALL EXTERIOR CUT SURFACES TO BE PRIMED.
- REFER TO 'EVERETT CUSTOM HOMES' ROOF AND WINDOW INSTALLATION MANUALS FOR ROOFING, FLASHING, AND INSTALLATION STANDARDS.

EVERETT CUSTOM HOMES ENVELOPE STANDARDS:

(MEETS OR EXCEEDS THE 2017 EDITION OF THE ORSC PRESCRIPTIVE ENVELOPE REQUIREMENTS)

ENVELOPE ENHANCEMENT MEASURE #5:

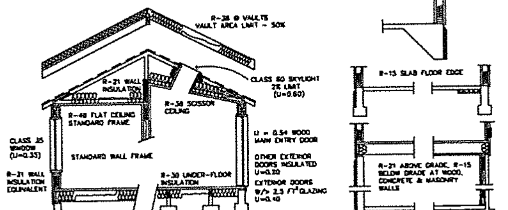
- A WHOLE BUILDING VENTILATION SYSTEM COMPLYING WITH TABLE N1101.1(3)
- DWELLING SHALL BE TESTED WITH A BLOWER DOOR AND FOUND TO EXHIBIT NO MORE THAN:
  1. 6.0 AIR CHANGES/HOUR (BUILDING TIGHTNESS TEST SHALL BE CONDUCTED WITH A BLOWER DOOR DEPRESSURIZING THE DWELLING 50 PASCAL'S FROM AMBIENT CONDITIONS. DOCUMENTATION OF BLOWER DOOR TEST SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK.)

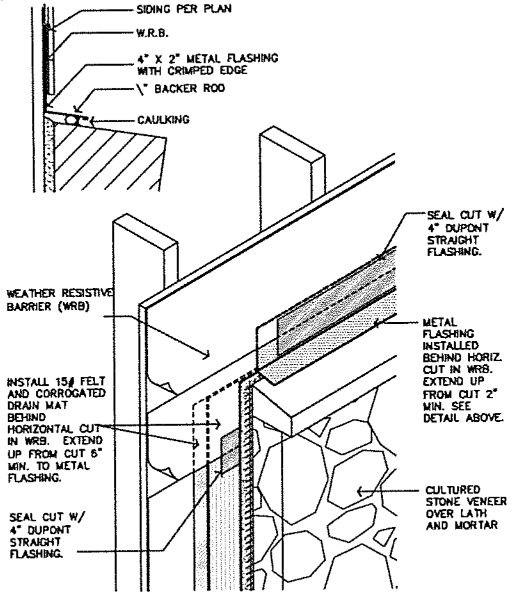
     AND

  2. PERFORMANCE TESTED DUCT SYSTEMS. (DOCUMENTATION OF PERFORMANCE TESTED DUCTWORK SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK. THIS WORK SHALL BE PERFORMED BY A TECHNICIAN CERTIFIED BY THE 'PTCS'. DOCUMENTATION SHALL BE PROVIDED THAT THE WORK DEMONSTRATES CONFORMANCE TO 'PTCS' DUCT PERFORMANCE STDS.)

CONSERVATION MEASURE A:

- HIGH EFFICIENCY HVAC SYSTEM: 90% MIN. AFUE FURNACE

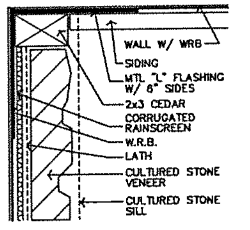




3/1 CULTURED STONE VENEER FLASHING DETAIL

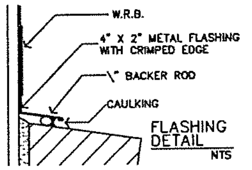
SCALE: 1\" =

CS-WALL-FLASHING-DET1



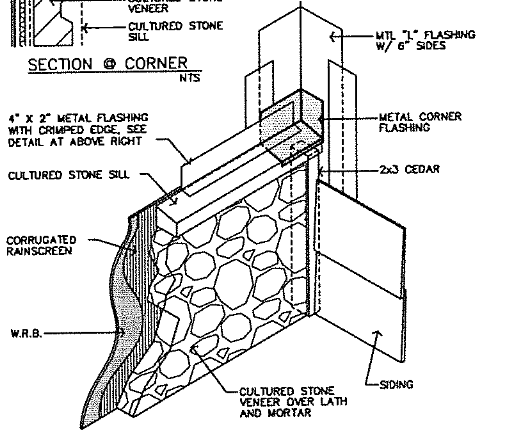
SECTION @ CORNER

NTS



FLASHING DETAIL

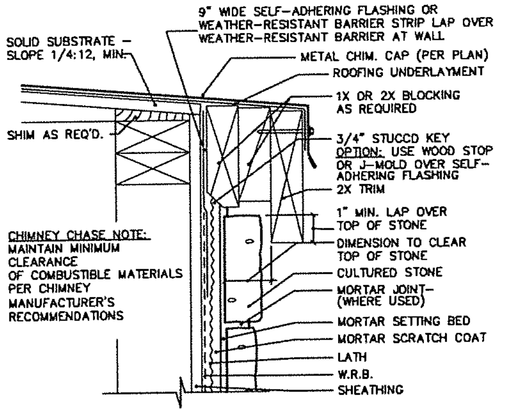
NTS



4/1 STONE VENEER AT EXTERIOR CORNER DETAIL

SCALE: 1\" =

CS-COR-WALL-FLASHING-DET1



CHIMNEY CHASE NOTE:
MAINTAIN MINIMUM CLEARANCE OF COMBUSTIBLE MATERIALS PER CHIMNEY MANUFACTURER'S RECOMMENDATIONS

5/1 CHIMNEY CHASE CAP WITH WOOD TRIM

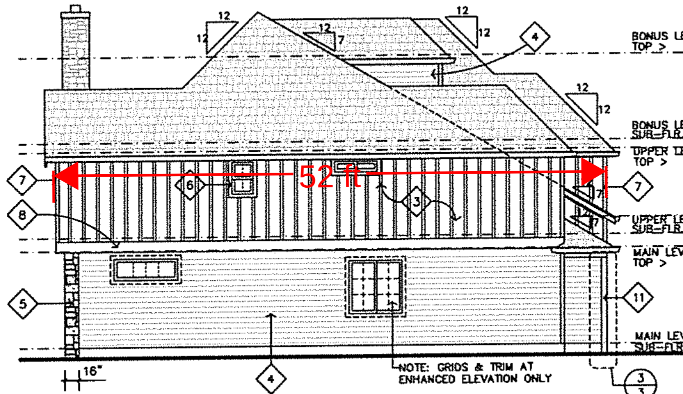
3" = 1'-0"

CS-CHASE-DET1

Lot Width 60 feet
Corner Lot Width 65 feet
Lot depth R7 82
Lot Depth R10 92

FRONT ELEVATION

1/4"=1'-0"



RIGHT SIDE ELEVATION

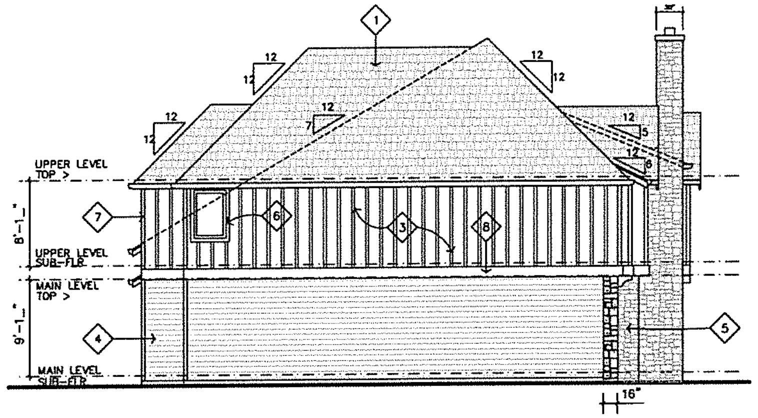
1/8"=1'-0"

REAR ELEVATION

1/8"=1'-0"

◇ ELEVATION KEYNOTES

1. ROOFING (TYPICAL): 30 YEAR HEAVY WEIGHT FIBERGLASS COMPOSITION ROOFING.
2. VERGE BOARD TYPICAL: RS 1x3 TRIM ON 2x8 VERGE BOARD. PROVIDE 5/4x8 (@ SHINGLES AND LAP SIDING) OR 1x8 (@ PANEL SIDING) TRIM BOARD FLAT ON WALL AND BUTT TO UNDERSIDE OF ROOF SHEATHING FOLLOWING GABLE END VERGE BOARD.
3. SIDING (TYPICAL): HARDIE STUCCO BRD. SIDING W/ 1 x 3 BATTENS SPACED AT 16" O.C.
4. SIDING (TYPICAL WHERE SHOWN): HARDIE-BOARD LAP SIDING.
5. CULTURED STONE (TYPICAL): INSTALL STONE, SILL & TRIM STONE WHERE SHOWN ON ELEV'S. INSTALL PER MANUFACTURER'S RECOMENDATIONS. SEE VENEER DETAILS 3/1, 4/1, 5/3 FOR INFO.
6. WINDOW TRIM: 5/4 X 4 AROUND ALL WINDOWS AND DOORS AT FRONT AND ALL WINDOWS AT PANEL AND BATTEN SIDING. NO WINDOW TRIM AT LAP SIDING UNLESS AT ENHANCED ELEVATIONS. FLASH ABOVE ALL HORIZONTAL TRIM.
7. 5/4 X 4 CORNER TRIM AT LAP SIDING, 1 X 4 CORNER TRIM AT PANEL SIDING.
8. HORIZONTAL TRIM: 5/4 X 12 W/ 26 GA. 'Z' FLASHING OVER TOP AND INTEGRATED W/ WRB.
9. GUTTERS (TYP-U.N.O.): 6" FASCIA STYLE, 26 GA. STEEL GUTTER WITH 2"x3" STEEL DOWNSPOUTS. ALL GUTTERS TO BE SPIKED A MIN. OF 24" O.C. ALL JOINTS TO BE SCREWED AND SEALED WITH 'ALOCO' GUTTER SEAL OR EQUIV. CONNECT ALL DOWNSPOUTS TO RAIN DRAINS WHERE PROVIDED.
10. 6X8 TRIMSTONE PER MFR.
11. P.T. 6x6 POST -RATED FOR BURIAL. SEE DETAIL 5/3



LEFT SIDE ELEVATION

1/8"=1'-0"

NOTE:

FOR ALL STRUCTURAL INFORMATION REFER TO THE (S) SHEETS

WEST HILLS
HOMES NORTHWEST

FOX E ONE

EVERETT
CUSTOM HOMES

3330 NW YEON AVE STE 100
PORTLAND, OREGON 97210
PHONE (503) 726-7060

10/27/16	ECH-WALK-THROUGH UPDT. FOR FUTURE SUB.	DOR
3/9/17	ECH UPDATE FH-29, FH-33	DOR
3/7/17	ECH UPDATE FH-29, FH-33	DOR
3/9/17	ECH FOLDER TRANSFER	DOR

PLAN 3557
DUNTHORPE
FRENCH
GARAGE LEFT

MAIN LEVEL:	1605 SQ FT
UPPER LEVEL:	1917 SQ FT
TOTAL:	3522 SQ FT
BONUS:	451 SQ FT
GRAND TOTAL:	3973 SQ.FT.
GARAGE:	636 SQ FT

JOB NO:

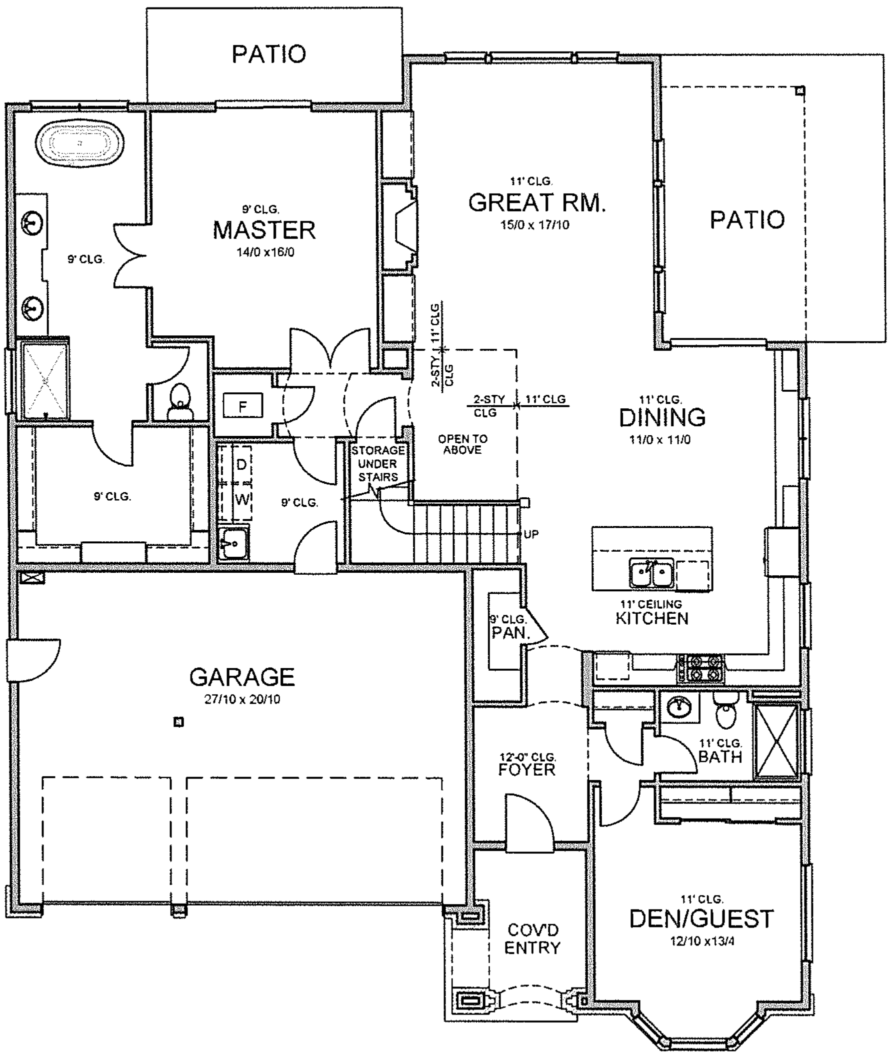
WEST HILLS
HOMES NORTHWEST

2957 WESTLAKE
ENGLISH (PH-23)

M. FLR.	=	1,877 S.F.
U. FLR.	=	1,080 S.F.
TOTAL	=	2,957 S.F.
GARAGE	=	615 S.F.

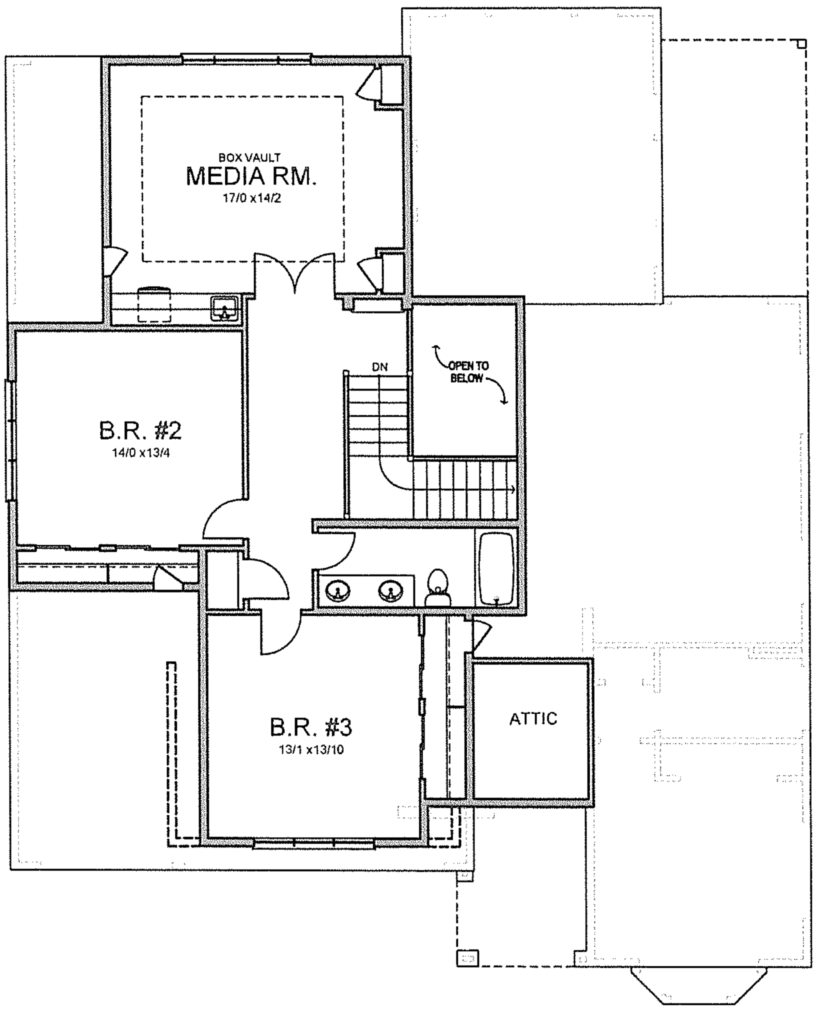
PDX E ORE
EVERETT
CUSTOM HOMES

4-BEDROOMS
3-BATHS
MEDIA
3-CAR GARAGE

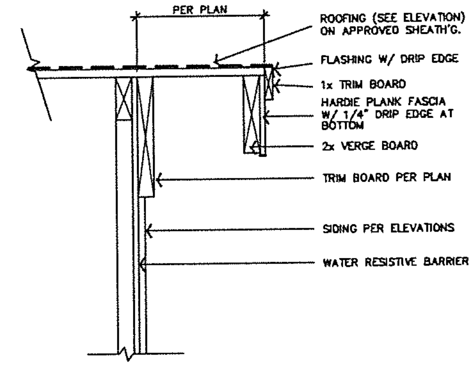


MAIN LEVEL FLOOR PLAN (9'/11'/12' CLG'S.)

REV: 9/21/17 DDR

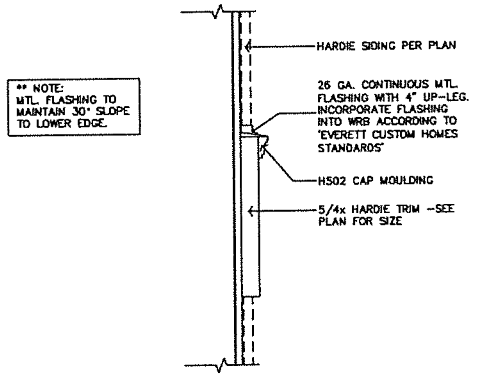


UPPER LEVEL FLOOR PLAN (8' CLG.)



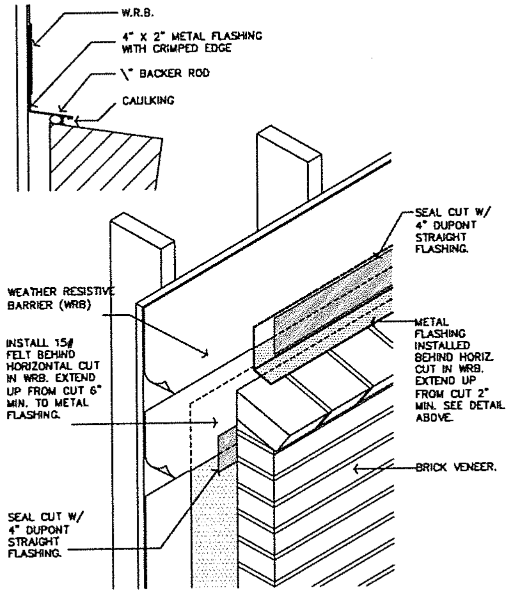
1/1 VERGE/RAKE DETAIL

SCALE: N.T.S.
VERGE-RAKE-DET1



3/1 HORIZ. TRIM DETAIL AT WALL

SCALE: 2"=1'-0"
WALL-TRIM1



2/1 BRICK VENEER FLASHING DETAIL

SCALE: 1\" =
BRICK-WALL-FLASHING-DET1

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- INSTALL WATERPROOF GYPSUM BOARD IN AND ABOVE ALL SHOWER AND TUB AREAS TO MINIMUM 72" ABOVE THE FLOOR.
- EXHAUST ALL VENTS AND FANS DIRECTLY OUTSIDE VIA METAL DUCTS. BATHROOMS CONTAINING A SHOWER OR BATHTUB MUST HAVE A FAN CAPABLE OF 80 CFM CONTROLLED BY A DE-HUMIDISTAT, TIMER OR OTHER SIMILAR MEANS OF CONTROL.
- GAS FURNACE: 90% MIN. AFUE TO BE INSTALLED IN AN INSULATED, THERMALLY CONDITIONED SPACE WITH INSULATION INSTALLED IN WALL CAVITIES OF CLOSET.
- ALL HVAC DUCTING TO BE INSTALLED IN AN INSULATED, CONDITIONED SPACE.
- ALL EXTERIOR CUT SURFACES TO BE PRIMED.
- REFER TO 'EVERETT CUSTOM HOMES' ROOF AND WINDOW INSTALLATION MANUALS FOR ROOFING, FLASHING, AND INSTALLATION STANDARDS.

EVERETT CUSTOM HOMES ENVELOPE STANDARDS:

(MEETS OR EXCEEDS THE 2017 EDITION OF THE ORSC PRESCRIPTIVE ENVELOPE REQUIREMENTS)

ENVELOPE ENHANCEMENT MEASURE #5:

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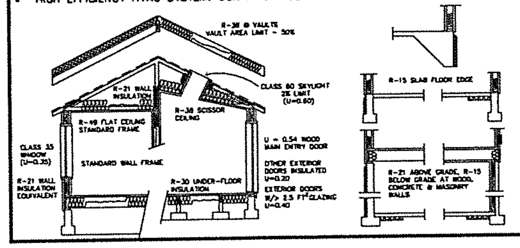
- DWELLING SHALL BE TESTED WITH A BLOWER DOOR AND FOUND TO EXHIBIT NO MORE THAN:
  1. 6.0 AIR CHANGES/HOUR (BUILDING TIGHTNESS TEST SHALL BE CONDUCTED WITH A BLOWER DOOR DEPRESSURIZING THE DWELLING 50 PASCAL'S FROM AMBIENT CONDITIONS. DOCUMENTATION OF BLOWER DOOR TEST SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK.)

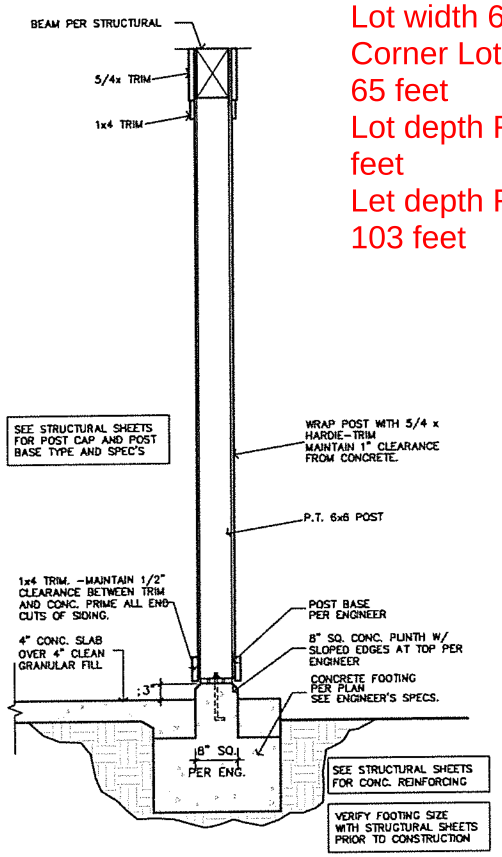
     AND

  2. PERFORMANCE TESTED DUCT SYSTEMS. (DOCUMENTATION OF PERFORMANCE TESTED DUCTWORK SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK. THIS WORK SHALL BE PERFORMED BY A TECHNICIAN CERTIFIED BY THE 'PTCS'. DOCUMENTATION SHALL BE PROVIDED THAT THE WORK DEMONSTRATES CONFORMANCE TO 'PTCS' DUCT PERFORMANCE STDS.)

CONSERVATION MEASURE 'A':

- HIGH EFFICIENCY HVAC SYSTEM: 90% MIN. AFUE FURNACE





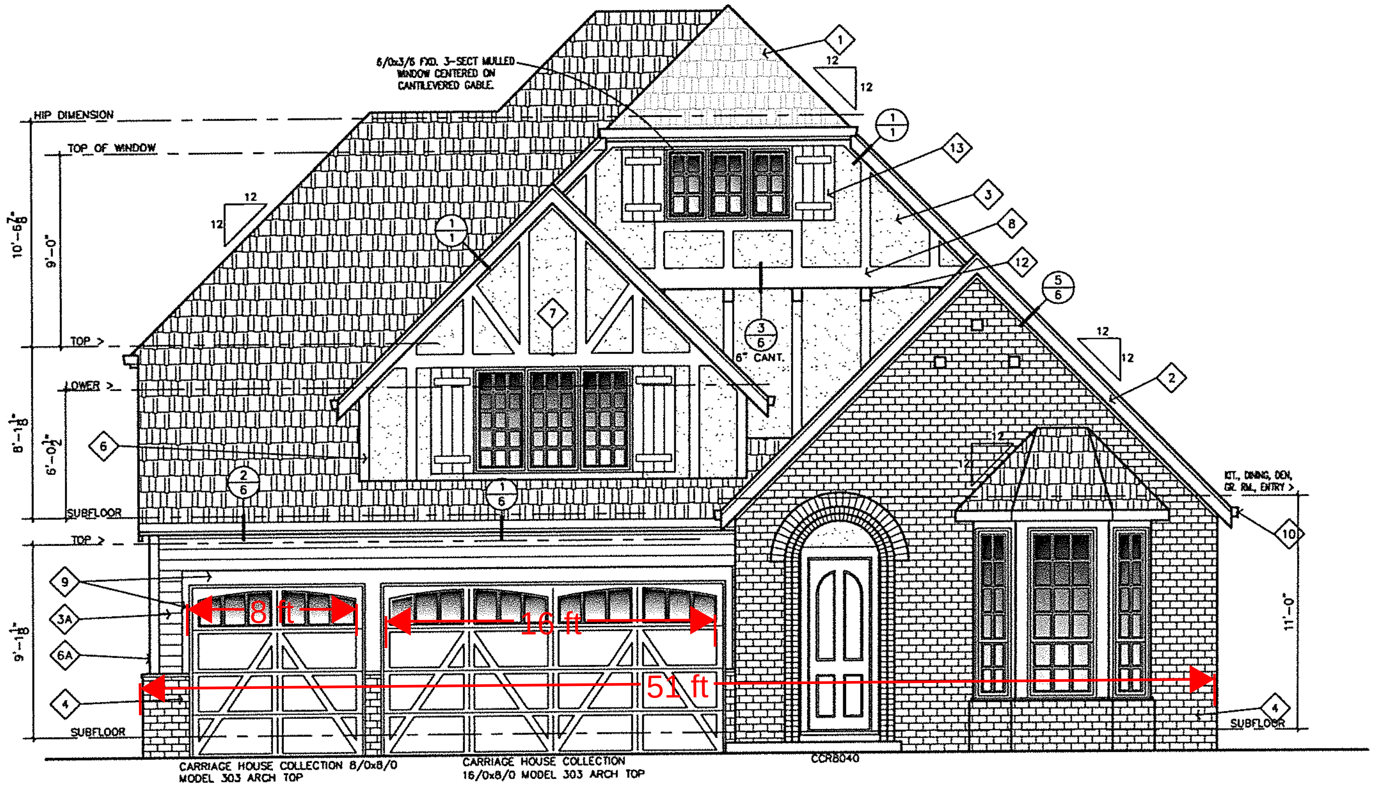
4/1 COLUMN DETAIL

SCALE: ["=1'-0"
ECH-COL-1

ELEVATION KEYNOTES

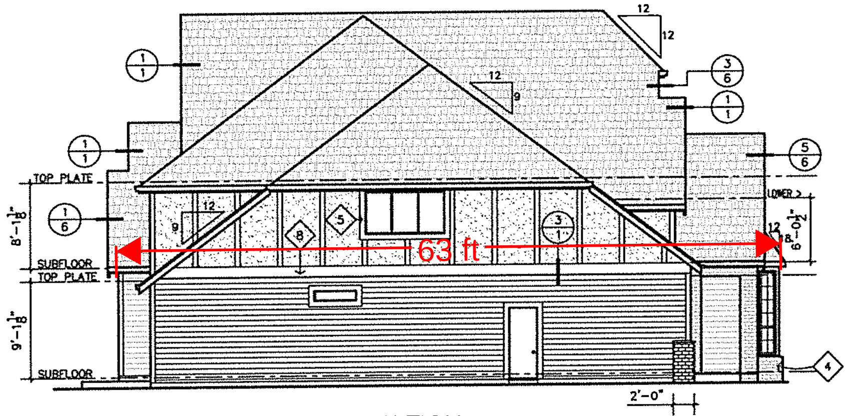
1. ROOFING (TYPICAL): COMPOSITION ROOFING.
2. VERGE BOARD (TYPICAL @ FRONT GABLES ONLY): RS 1x2 TRIM ON 2x8VERGE BOARD. PROVIDE 2x8 TRIM BOARD FLAT ON WALL AND BUTT TO UNDERSIDE OF ROOF SHEATHING FOLLOWING GABLE END VERGE BOARD.
3. SIDING (MAIN LEVEL TYP): HORIZONTAL HARDIE LAP SIDING AS LOCATED.
4. SIDING (UPPER LEVEL TYP): HARDIE STUCCO BRD. SIDING W/ 1 x 6 BATTENS SPACED AS SHOWN ON FRON ELEV. AND AT 48" O.C. AT OPEN RUNS.
5. VENEER (TYPICAL): 4" BRICK VENEER WITH MASONRY TIES AT 16" O.C. EACH WAY AND HORIZONTAL No. 9 WIRES CONTINUOUS AT 12" O.C. EXTEND VENEER UP WALL AS SHOWN. PROVIDE SLOPING ROWLOCK COURSE AT TOP.
6. WINDOW & DOOR TRIM: 5/4 X 4 AROUND ALL WINDOWS AND DOORS AT FRONT AND ALL WINDOWS AT PANEL AND BATTEN SIDING. FLASH ABOVE ALL HORIZONTAL TRIM.
7. 5/4 X 6 CORNER TRIM AT LAP SIDING, 1 X 6 CORNER TRIM AT PANEL SIDING.
8. GARAGE DOOR TRIM SURROUND: 5/4 X 8 AT TOP, 5/4 X 4 AT SIDES
9. HORIZONTAL TRIM: 5/4 X 8 W/ 26 GA. 'Z' FLASHING OVER TOP AND INTEGRATED W/ WRB.
10. HORIZONTAL TRIM: 5/4 X 12 W/ 26 GA. 'Z' FLASHING OVER TOP AND INTEGRATED W/ WRB.
11. GUTTERS (TYP-U.N.O.): FASCIA STYLE, 26 GA. STEEL GUTTER WITH 2"x3" STEEL DOWNSPOUTS. CONNECT ALL DOWNSPOUTS TO RAIN DRAINS OR OTHER APPROVED RAIN COLLECTION SYSTEM.
12. 6x8 OUTRIGGERS @ CANTILEVER AS SHOWN.
13. 24" WIDE SHUTTERS @ FRONT ONLY. MATCH WINDOW HEIGHT.
14. P.T. 6x6 POST -RATED FOR BURIAL. SEE DETAIL 4/1

Lot width 60 feet
Corner Lot width 65 feet
Lot depth R7 93 feet
Let depth R10 103 feet



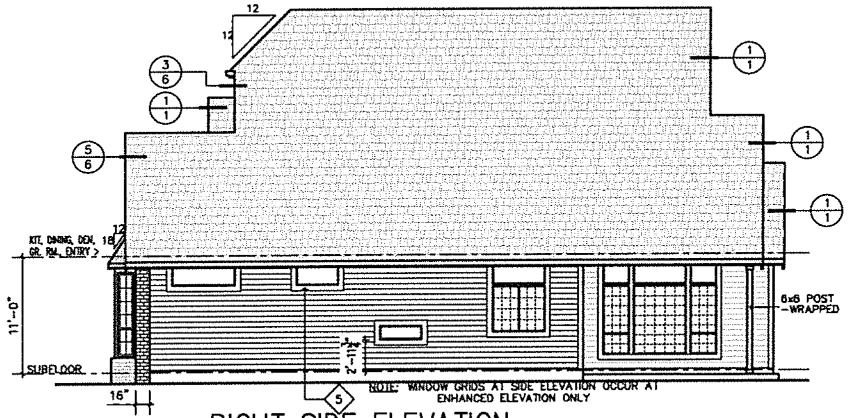
FRONT ELEVATION

1/4" = 1'-0"



LEFT SIDE ELEVATION

1/8" = 1'-0"



NOTE: WINDOW GRIDS AT SIDE ELEVATION OCCUR AT ENHANCED ELEVATION ONLY

RIGHT SIDE ELEVATION

1/8" = 1'-0"

NOTE: WINDOW GRIDS AT REAR ELEVATION TO OCCUR AT ENHANCED ELEVATION ONLY WHERE SHOWN

REAR ELEVATION

1/8" = 1'-0"

WEST HILLS
HOMES NORTHWEST

EVERETT
CUSTOM HOMES

3330 NW YEON AVE STE 100
PORTLAND, OREGON 97210
PHONE (503) 726-7060

4/11/17, ECH CONVERSION DDR
5/5/17, PRELIM ENG. CHK. DDR
6/8/17, FIN. ENG. CHK. DDR
8/8/17, PUBLISH PLAN DDR
9/22/17, PH-23 FRAME-WALK CHG. P.C. #1 IMPLEMENTED DDR

PLAN 2957 WESTLAKE ENGLISH GARAGE LEFT

MAIN LEVEL:	1,877 SQ FT
UPPER LEVEL:	1,080 SQ FT
GRAND TOTAL:	2,957 SQ FT
GARAGE:	615 SQ FT

SHEET#

NOTE:

FOR ALL STRUCTURAL INFORMATION REFER TO THE (S) SHEETS

JOB#

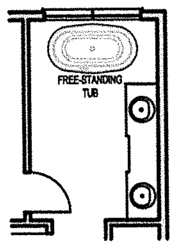
WEST HILLS
HOMES NORTHWEST

3017 BROOKLYN FRENCH

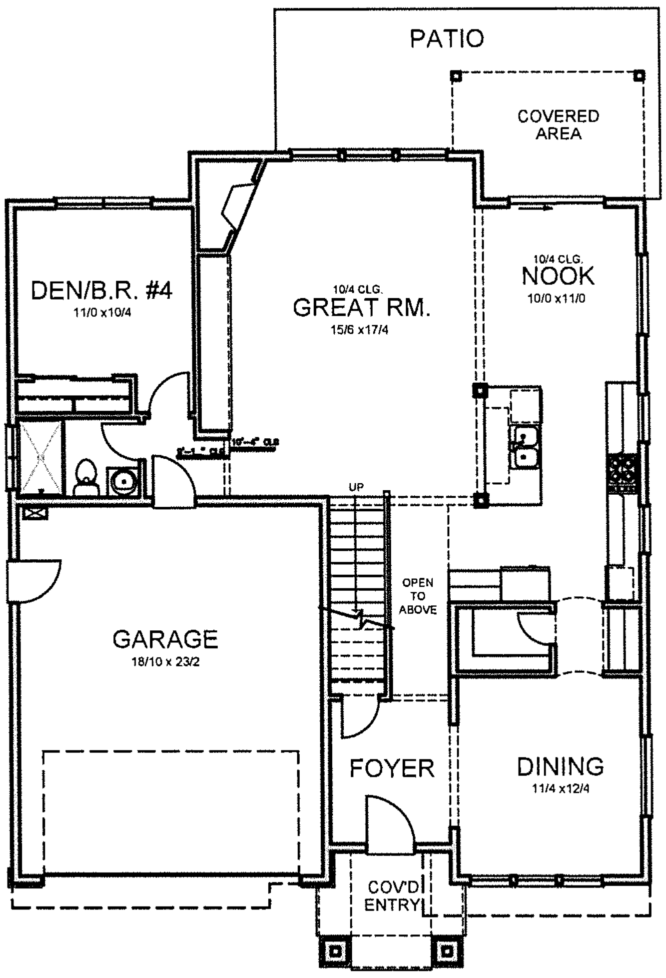
M. FLR. = 1,268 S.F.
U. FLR. = 1,772 S.F.
TOTAL = 3,040 S.F.
GARAGE = 466 S.F.

PDX ORE
EVERETT
CUSTOM HOMES

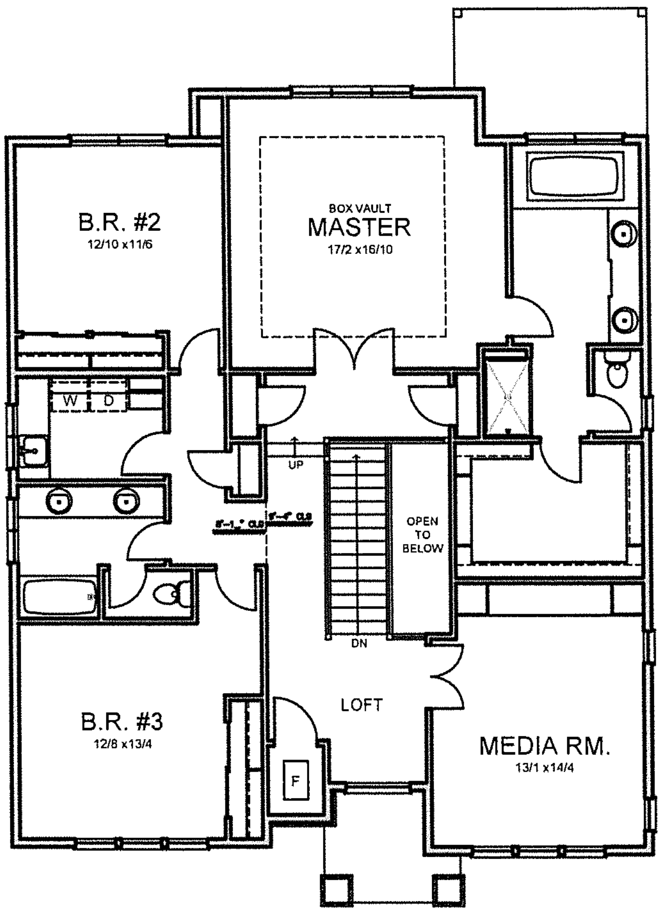
4-BEDROOMS
3-BATHS
MEDIA
2-CAR GARAGE



OPT. M. BATH LAYOUT

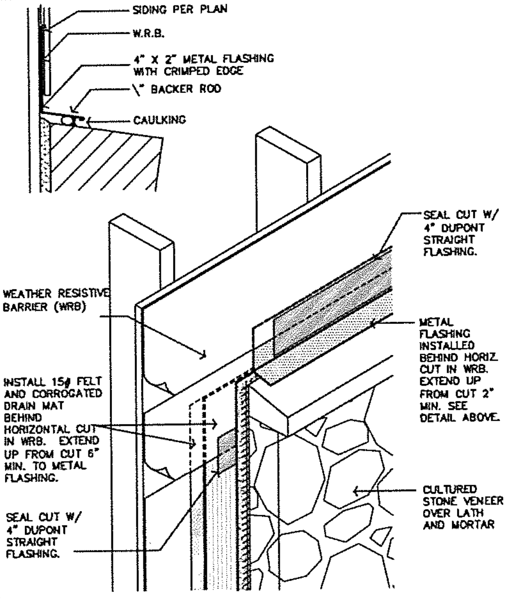


MAIN LEVEL FLOOR PLAN



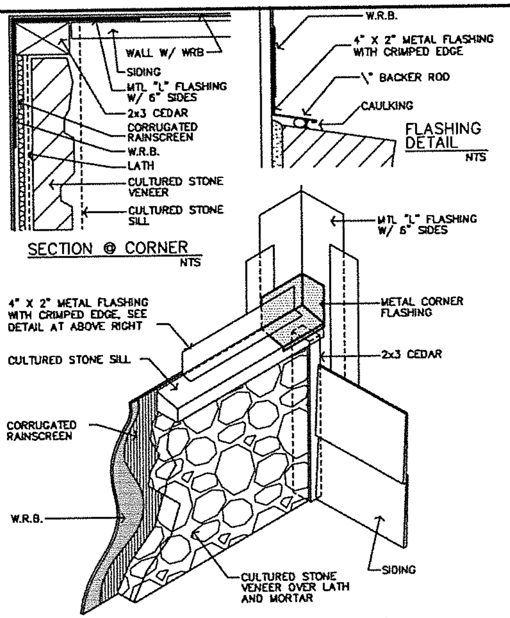
UPPER LEVEL FLOOR PLAN

REV: 11/2/17 DDR



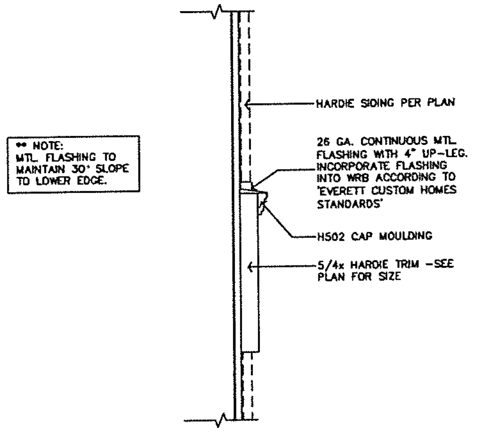
1/1 CULTURED STONE VENEER FLASHING DETAIL SCALE: 1\" =

CS-WALL-FLASHING-DET1

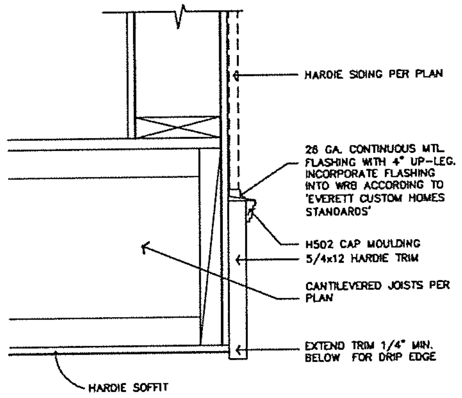


2/1 STONE VENEER AT EXTERIOR CORNER DETAIL SCALE: 1\" =

CS-COR-WALL-FLASHING-DET1



3/1 HORIZ. TRIM DETAIL AT WALL SCALE: 2"=1'-0"



4/1 HORIZ. TRIM DETAIL AT CANT'D JOISTS SCALE: 2"=1'-0"

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- INSTALL APPROVED FOAM TYPE INSULATION AT FLOOR AND PLATE LINES, OPENINGS IN PLATES, CORNER STUD CAVITIES & AROUND DOOR & WINDOW ROUGH OPENING CAVITIES.
- INSTALL WATERPROOF GYPSUM BOARD IN AND ABOVE ALL SHOWER AND TUB AREAS TO MINIMUM 72" ABOVE THE FLOOR.
- EXHAUST ALL VENTS AND FANS DIRECTLY OUTSIDE VIA METAL DUCTS. BATHROOMS CONTAINING A SHOWER OR BATHTUB MUST HAVE A FAN CAPABLE OF 80 CFM CONTROLLED BY A DE-HUMIDISTAT, TIMER OR OTHER SIMILAR MEANS OF CONTROL.
- GAS FURNACE: 90% MIN. AFUE TO BE INSTALLED IN AN INSULATED, THERMALLY CONDITIONED SPACE WITH INSULATION INSTALLED IN WALL CAVITIES OF CLOSET.
- ALL HVAC DUCTING TO BE INSTALLED IN AN INSULATED, CONDITIONED SPACE.
- ALL EXTERIOR CUT SURFACES TO BE PRIMED.
- REFER TO 'EVERETT CUSTOM HOMES' ROOF AND WINDOW INSTALLATION MANUALS FOR ROOFING, FLASHING, AND INSTALLATION STANDARDS.

EVERETT CUSTOM HOMES ENVELOPE STANDARDS:

(MEETS OR EXCEEDS THE 2017 EDITION OF THE ORSC PRESCRIPTIVE ENVELOPE REQUIREMENTS)

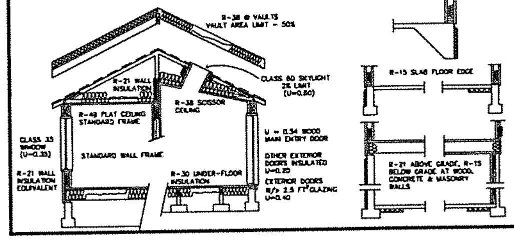
ENVELOPE ENHANCEMENT MEASURE #5:

- A WHOLE BUILDING VENTILATION SYSTEM COMPLYING WITH TABLE N1101.1(3)
- DWELLING SHALL BE TESTED WITH A BLOWER DOOR AND FOUND TO EXHIBIT NO MORE THAN:
  1. 6.0 AIR CHANGES/HOUR (BUILDING TIGHTNESS TEST SHALL BE CONDUCTED WITH A BLOWER DOOR DEPRESSURIZING THE DWELLING 50 PASCAL'S FROM AMBIENT CONDITIONS. DOCUMENTATION OF BLOWER DOOR TEST SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK.)

     AND
  2. PERFORMANCE TESTED DUCT SYSTEMS. (DOCUMENTATION OF PERFORMANCE TESTED DUCTWORK SHALL BE SUBMITTED TO THE BUILDING OFFICIAL UPON COMPLETION OF THE WORK. THIS WORK SHALL BE PERFORMED BY A TECHNICIAN CERTIFIED BY THE 'PTCS'. DOCUMENTATION SHALL BE PROVIDED THAT THE WORK DEMONSTRATES CONFORMANCE TO 'PTCS' DUCT PERFORMANCE STDS.)

CONSERVATION MEASURE 'A':

- HIGH EFFICIENCY HVAC SYSTEM: 90% MIN. AFUE FURNACE

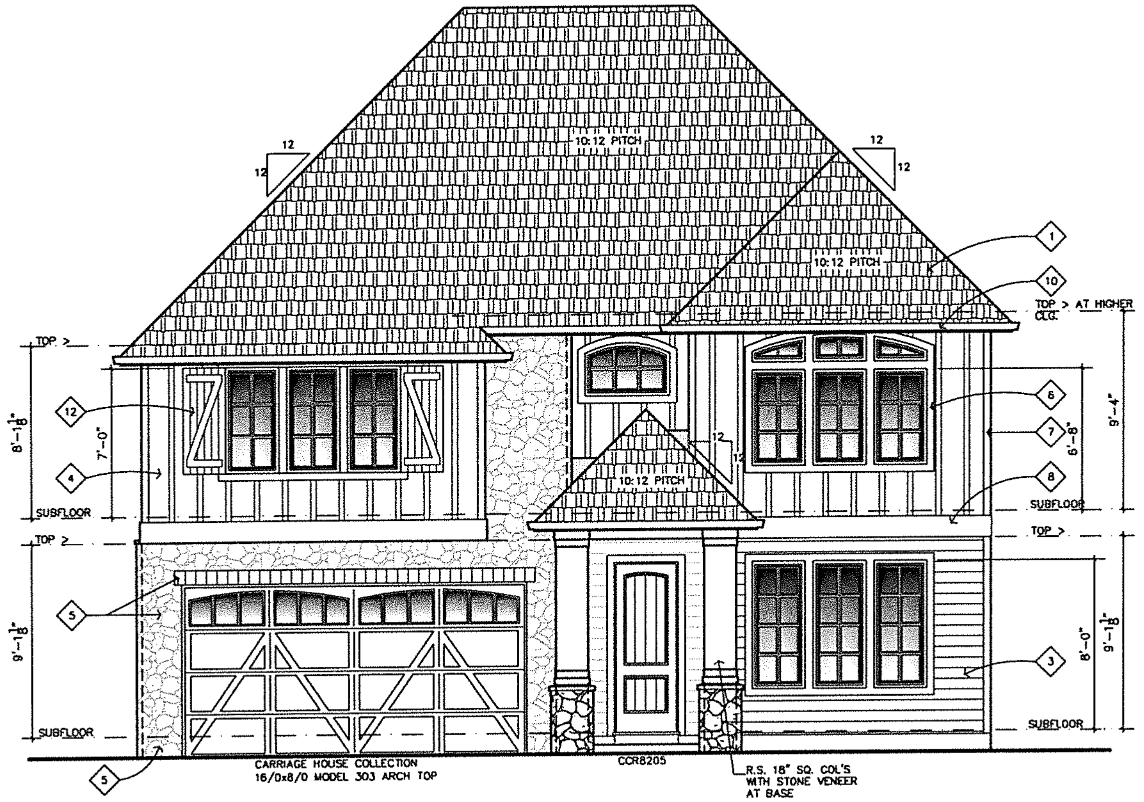


NOTES:

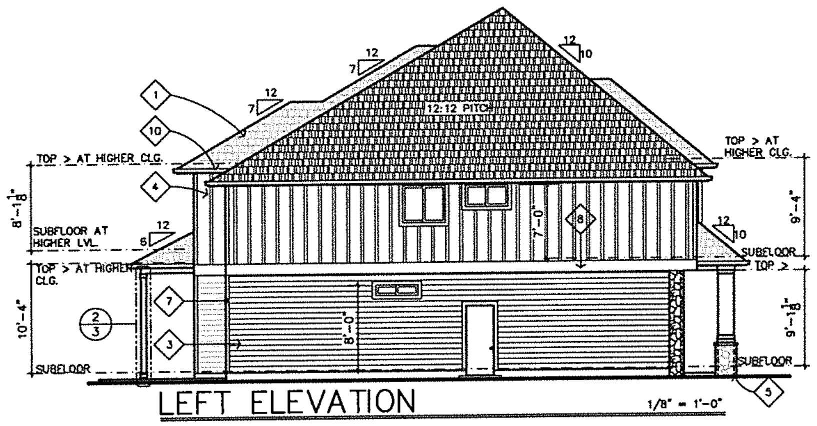
1. CONFIRM MAIN FINISH FLOOR AND GARAGE SLAB HEIGHTS WITH SITE PLAN AND VERIFY W/ FINAL GRADES AND OWNER. INSTALL STEPS INTO HOUSE AS NEEDED AT GARAGE, PORCH AND PATIO.
2. DOOR & WINDOW HEADER HT.:
   MAIN FLR. @ 8'-0" A.F.F. (U.N.O.)
   UPPER FLR @ 7'-0" A.F.F. (U.N.O.)
3. UPPER FLR. SILL MIN. 24" A.F.F.

◇ ELEVATION KEYNOTES

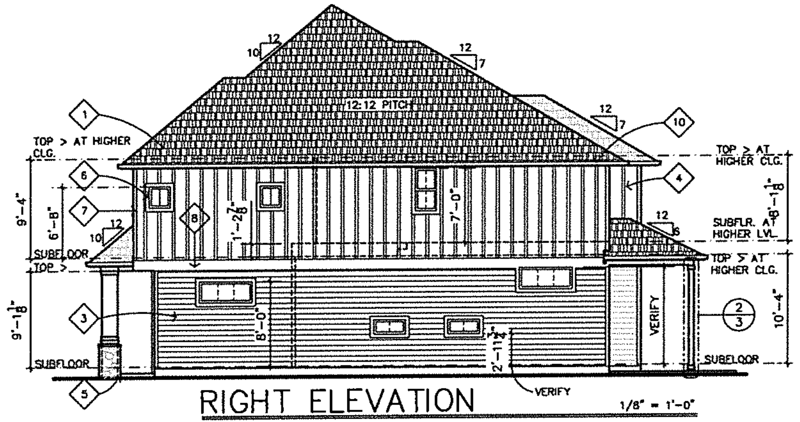
1. ROOFING (TYPICAL): COMPOSITION ROOFING.
2. NOT USED.
3. SIDING (MAIN LEVEL TYP): HORIZONTAL HARDIE LAP SIDING AS LOCATED.
4. SIDING (UPPER LEVEL TYP): HARDIE STUCCO BOARD SIDING W/ 1x6 BATTENS AS SPACED ON FRONT ELEVATION & AT 16" O.C.
5. STONE VENEER (WHERE SHOWN): CULTURED STONE W/ CONC. CAP AT TOP. USE 6x8 TRIM STONE AND SILL STONE AT ARCHED ENTRY AND AT GARAGE DOOR HEAD. TAPER FRAMING & VENEER AT VENT CHASE PER PLAN. INSTALL PER MFR'S SPEC'S.
6. WINDOW & DOOR TRIM (WHERE SHOWN): 5/4x4 TRIM (FLASH ABOVE ALL HORIZ. TRIM)
7. CORNER TRIM (TYPICAL): 5/4X4 AT LAP SIDING AND 1x4 AT PANEL SIDING.
8. HORIZONTAL TRIM: 5/4x12 HARDIE TRIM – SEE DETAIL 3/1 & 4/1.
9. NOT USED.
10. GUTTERS (TYP-U.N.O.): FASCIA STYLE, 26 GA. STEEL GUTTER WITH 2"x3" STEEL DOWNSPOUTS. CONNECT ALL DOWNSPOUTS TO RAIN DRAINS OR OTHER APPROVED RAIN COLLECTION SYSTEM.



FRONT ELEVATION 1/4" = 1'-0"



LEFT ELEVATION 1/8" = 1'-0"



RIGHT ELEVATION 1/8" = 1'-0"

GRIDS @ WINDOWS THIS SIDE AT ENHANCED ELEVATION ONLY

REAR ELEVATION 1/8" = 1'-0"

NOTE:

FOR ALL STRUCTURAL INFORMATION REFER TO THE (S) SHEETS

WEST HILLS
HOMES NORTHWEST

EVERETT
CUSTOM HOMES

3330 NW YEON AVE STE 100
PORTLAND, OREGON 97210
PHONE (503) 726-7060

4/7/16,	PRELIM. LAYOUT	DDR
4/18/16,	PRELIM. ENG CHK.	DDR
6/1/16,	FINAL ENG CHK.	DDR
6/1/16,	PUBLISH PLAN	DDR
8/30/16,	PC#1 IMPLEMENTED	DDR
12/9/16,	PC#2 IMPLEMENTED	DDR
11/2/17,	PC#3 IMPLEMENTED	DDR

PLAN 3017 BROOKLYN FRENCH GARAGE LEFT

MAIN LEVEL:	1,268 SQ FT
UPPER LEVEL:	1,772 SQ FT
GRAND TOTAL:	3,040 SQ FT
GARAGE:	466 SQ FT

SHEET#

1

JOB#