

# Constraints and Opportunities; SW 105<sup>th</sup>/Blake Street/SW 108<sup>th</sup> Concepts Study; City of Tualatin

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## Purpose

This memo identifies engineering, hydraulic, and environmental constraints and opportunities, and potential regulatory requirements, for proposed transportation improvements at SW 105<sup>th</sup>/Blake Street/SW 108<sup>th</sup> Avenue in Tualatin. The City of Tualatin (City) seeks to develop lower cost alternatives to address the safety concerns along the corridor from SW Paulina Drive to the sharp curve at 108<sup>th</sup> Avenue.

## Background

The roadway within the study area is narrow, with two 11' travel lanes and no shoulders or sidewalks along this 1,200 long segment. There are two curves and the grade drops quickly as it crosses Hedges Creek through a sag vertical curve. Steep banks on both sides of the road create an environment with no margin for error and limited visibility. Pedestrians and bicyclists use this section of roadway, even though there are no facilities to accommodate them and limited sight distance makes it difficult for drivers to see these users. The sharp curve located at the 108<sup>th</sup>/Blake Street corner has been the site of at least three accidents within the past year involving vehicles running off the roadway.

SW 105<sup>th</sup> Avenue is classified as a Major Collector (Cb&t) and SW Blake Street and SW 108<sup>th</sup> Avenue are classified as Minor Collectors (Cb). The Development Code identifies the long term solution as a realignment and flattening of the two existing curves, creating a new roadway alignment and crossing of Hedges Creek. This type of full-build solution is cost prohibitive at this time and the City would like to explore a series of lower cost alternatives to improve the safety for all users of this segment of roadway.

## Methods

The study area includes property in the City of Tualatin and unincorporated Washington County, and is approximately 8.9 acres (Exhibit 1).

We reviewed existing data including land use, planning, traffic, natural resources, and community concerns. The transportation engineering review focused on available existing traffic data from the City including daily and peak traffic counts, existing geometric roadway configuration, driveway and adjacent roadway locations and accident data (past three years). We reviewed existing conditions and deficiencies with respect to sidewalk and bicycle route connectivity to, from, and within the project area; and available operations and maintenance records.

For hydraulics, we reviewed available hydraulic studies, including the Watershed 2000 study.

To identify environmental constraints and opportunities, we interpreted aerial photography and reviewed available natural resources databases and maps.

See Exhibit 2 for the general location of constraints within the study area.

## Engineering Considerations

The roadway section through the project area consists of three continuous street segments starting from south to north, SW 108<sup>th</sup> Avenue, SW Blake Street, and SW 105<sup>th</sup> Avenue. The existing roadway cross section varies. SW 108<sup>th</sup> Avenue is built out to a half street section with curb and gutter, sidewalk and a planter strip on the west side, with gravel shoulders on the eastside. Rounding a sharp curve, SW Blake Street is a narrow, 2-lane cross section with approximately 11-foot travel lanes and gravel shoulders. Guardrail is introduced along the east (south) side of the roadway near the curve to SW 105<sup>th</sup> Avenue. Rounding a larger broken back curve, SW 105<sup>th</sup> Avenue is approximately the same cross section with 2 11-foot travel lanes. Through the SW 105<sup>th</sup> Avenue segment the roadway crosses over hedges creek on an approximately 6' high embankment with 2:1 (or steeper) side slopes.

The functional classification for each roadway segment and resulting ROW width needed for each as shown in the current City of Tualatin Development Code is as follows:

Segment	Functional Class	ROW (Prop.)	ROW (Extg.)
SW 108 <sup>th</sup> Avenue	Cb	60'-64'	50'
SW Blake Street	Cb	60'-64'	40'
SW 105 <sup>th</sup> Avenue	Cb&t	74'-78'	60'

The existing roadway curvature between SW 108<sup>th</sup> Avenue and SW Blake Street is sharp, approximately 50' radius at centerline. This corresponds with a design speed of 15MPH. The posted speed is 35mph within the study area. An advisory speed of 15mph is posted in advance of the corner to the south, and in advance of the SW 105<sup>th</sup> Avenue and SW Blake Street corner to the north.

Crash history was obtained from the Transportation System Plan update currently under way. The reporting period was from January 2008 through December 2011. During that time there was only one crash reported near the project, between a bicycle and vehicle at SW 105<sup>th</sup> Avenue and SW Moratoc Street. No other crashes were reported, but unofficially, the sharp curve located at the 108<sup>th</sup>/Blake Street corner has been the site of at least three accidents within the past year involving vehicles running off the roadway.

Existing pavement shows distress and deterioration, especially in the NB (EB) lanes of SW Blake Street. The conditions appear to be the result of the roadside ditch and culvert being filled, resulting in surface water saturating the pavement subgrade.

### Constraints

The current roadway segments are located within a constrained ROW environment. From south to north the ROW width varies from 40' to 60' in width. The Development Code classification standard width ranges from 60-74' so the standard roadway section cannot be constructed without impacts to adjacent properties.

SW 105<sup>th</sup> Avenue approaching SW Blake Street from the north crosses over Hedges creek. The roadway is constructed on fill and is approximately 6 feet above the creek at the low point. The creek passes under the roadway in a 42 inch diameter corrugated metal culvert. Fill slopes are 2' horizontal to 1' vertical (2:1) or steeper. Widening the roadway to either side will result in culvert extension(s) and impacts to sensitive areas adjacent to Hedges Creek.

At the inside corner of SW 108<sup>th</sup> Avenue and SW Blake Street a modular block wall has been constructed inside the right-of-way.

At the inside corner of SW 105<sup>th</sup> Avenue and SW Blake Street, the cut slope is near vertical and within approximately 2' from the edge of traveled way. This slope provides a sight obstruction through the curve as well as an obstacle for vehicles that leave the traveled way.

## Opportunities

There is sufficient distance between the existing edge of traveled way and the right-of-way line at the inside curve between SW 105<sup>th</sup> Avenue and SW Blake Street to cut back the slope to improve sight distance, grade a shoulder and reconstruct a swale/ditch.

There may be sufficient distance behind the guardrail along the northbound lane of SW Blake Street and SW 105<sup>th</sup> Avenue to grade and construct a shared use path for two-way pedestrian and bicycle traffic and keep improvements within the right-of-way. Regulatory agency permitting may be required to address impacts to wetlands and Hedges Creek.

Through minor widening along the edge of pavement in both directions adjacent to and through the curve between SW 108<sup>th</sup> Avenue and SW Blake Street, sight distance and driver comfort can be improved. This will provide a more consistent lane width, shoulder space in case vehicles track outside the lane, better refuge for pedestrians and cyclists, and potentially a higher design/operating speed.

## Hydraulic Considerations

This hydraulic analysis is based on information in from the Watershed 2000 model of Hedges Creek. The HEC-RAS model was obtained from Clean Water Services website.

### Constraints

Current Watershed 2000 Modeling indicates that the 105th Avenue culvert is hydraulically inadequate to pass the 2-year flow without overtopping 105th Avenue. Hedges Creek is carried under 105th by a 36-inch CMP culvert. The top of culvert is about 4 ½ feet below the top of roadway. The hydraulic inadequacy is the result of both the 105th culvert being undersized, in addition to the 108th Avenue culvert being undersized. The model indicates backwater from the 108th culvert inundates 105th Avenue.

The culvert presents a fish passage barrier on Hedges Creek. The culvert does not have a natural channel bottom and experiences pressure flows during the 2-year event.

### Opportunities

We performed an initial analysis of the requirements for to provide both fish passage and hydraulic capacity. Adequate hydraulic capacity was based on Clean Water Services D&C Standards (§5.07.6(b)), which requires culverts to pass the 25-year flow with a H/D of < 1.5 and a headwater at least 1-foot below the roadway. Regardless of the size of the 105th Avenue culvert, 105th is inundated from backwater from 108th Avenue. For the purposes of this analysis the 108th Avenue culvert was removed to reduce tailwater to channel conditions. It was also assumed that the roadway would not be raised at the crossing. Culvert hydraulics were analyzed using HY8 with flows and tailwater conditions based on the Watershed 2000 Future Flow model.

Upper Hedges Creek at 105th Avenue is identified as a native migratory fish stream by ODFW. Fish passage rules apply to all major culvert replacement and construction require fish passage be incorporated into the design. In order to provide fish passage a culvert that provided “streambed simulation” was opted for. SLOPES IV standards require an unobstructed opening at least 1.5 times the active channel width. We have not done detailed field studies to determine an accurate active channel width; however, the HEC-RAS channel cross sections indicate active channel width could be up to 16-feet. Therefore a natural bottomed 24-foot wide culvert was chosen. As a result of the limited height of the roadway above the creek only an embedded RCB, a three-sided concrete structure, or a bridge would fit. Multiplate and other arch type structures require too great a rise to construct without raising the roadway.

A 24-foot wide structure will provide both fish passage and hydraulic capacity, based on removal of the hydraulic constraints from 108th. The actual structure type and roadway and headwall modifications would need to be based on more detailed design.

# Environmental Considerations

## Air Quality

### Constraints

The study area is not a DEQ air quality non-attainment area. There are no known air quality constraints.

### Opportunities

Improvements to vehicle traffic flow probably would reduce combustion emissions and slightly improve air quality.

### Regulations

Not applicable.

## Archaeology

### Constraints

An archaeological investigation was not conducted for this project. However, several accounts describe the cultural history of the Hedges Creek wetlands.<sup>1</sup> Native people who inhabited the area called themselves, Atfalati. They were hunter and gatherers, who subsisted on camas, tarweed, berries, wild onions, acorns, hazelnuts, deer, fish, and insects. There are some known prehistoric sites in the area that have been well investigated. Settlement in the vicinity began as early as the 1850s. Donation land claims probably were the principal lure. There are no known archaeological constraints.

### Opportunities

None identified.

### Regulations

Not applicable.

## Ecological Connectivity

### Constraints

Forest resources in the study area were identified in the City of Tualatin's *Composite Natural Resource Inventory and Local Wetlands Inventory* as Forest F-27 (between Blake Street and Wetland W-26) and Forest F-28 (east of 105<sup>th</sup> and buffering Wetland W-27) (Map 72-1 *Natural Resources Protection Overlay District (NRPO) and Greenway Locations*).

### Opportunities

Predominant ecological flows associated with the Hedges Creek riparian corridor could be maintained or enhanced through native species revegetation and by providing normative fluvial processes.

### Regulations

Tualatin Development Code.

## Energy

### Constraints

Substandard roadway conditions contribute to excess vehicle braking and acceleration while traversing steep vertical and sharp horizontal curves.

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<sup>1</sup> Martinazzi, A. 1976. *Early Tualatin History*. In: V.E. Moore (ed.). *Land of Tualaty Vol. 2*. Washington County Historical Society, Hillsboro, OR.; Jenkins, P.C. and D.L. Soper. 1988. *A Cultural Resource Inventory of the Tualatin Wetlands Protection District*. Coastal Magnetic Search & Survey, Troutdale, OR. CMS&S Report No. 33.; Fishman Environmental Services. 1993. *Technical Appendix 1, Hedges Creek Marsh History and Regulatory Environment*. In: Fishman Environmental Services. ZIAN, Inc. Property Wetland Protection Area Resource Management Plan. Fishman Environmental Services, Portland, OR. FES 478.

## **Opportunities**

Opportunities to reduce energy use would occur through improvements in traffic patterns or volumes, or changes in speed zones.

## **Regulations**

Not applicable.

## **Fish Passage**

### **Constraints**

Upper Hedges Creek at 105th Avenue is identified as a native migratory fish stream by ODFW. Fish passage rules apply to all major culvert replacement construction and structural modifications that increase storage or diversion capacity, or actions that result in a fundamental change in permit status. This includes: (1) extending a culvert, wingwall or apron, (2) excavating  $\geq 50$  percent of the material directly above the culvert, (3) replacing any part of a culvert, (4) slip-lining, or (5) building a bridge.

### **Opportunities**

Fish passage designs for native migratory fish should be prepared based on ODFW *Guidelines and Criteria for Stream-Road Crossings* ([http://www.dfw.state.or.us/ODFWhtml/InfoCntrFish/Management/stream\\_road.htm](http://www.dfw.state.or.us/ODFWhtml/InfoCntrFish/Management/stream_road.htm)).

### **Regulations**

Oregon Fish Passage Law, when triggered, requires installation of a fish-passable structure—either a “clear-span” of the active channel width (“stream simulation”), or the “hydraulic design” method (based on known or assumed fish swimming abilities).

## **Geology and Soil**

### **Constraints**

Surface soils throughout are silty or clayey, and considered fair to poor for subgrade. Soil associated with Hedges Creek (i.e., Wapato silty clay loam) is classified as hydric, meaning it was formed under prolonged saturation, flooding, or ponding, and might be associated with wetland conditions. Soil qualities might have been locally influenced by historical embankment construction and water course manipulation.

Surface Soils in the Study Area					
Map Unit Symbol	Map Unit Name	Acres	Percent	Hydric Rating	AASHTO Group Classification (Surface)
1	Aloha silt loam	0.0	0.5%	Partially hydric	A-4—silty soil, fair to poor for subgrade
21A	Hillsboro loam, 0 to 3% slopes	5.5	62.0%	Not hydric	A-4—silty soil, fair to poor for subgrade
21C	Hillsboro loam, 7 to 12% slopes	0.9	9.6%	Not hydric	A-4—silty soil, fair to poor for subgrade
43	Wapato silty clay loam	2.5	27.8%	All hydric	A-6—clayey soil, fair to poor for subgrade
Totals for Study Area		8.9	100.0%		

The study area does not contain a landslide or debris flow hazard areas (Map 5.2 *Washington County Landslide and Debris Flow Hazard*). The closest earthquake fault line is the Molalla-Canby Fault, which generally runs east-west and crosses I-5 near Bridgeport Road; in the event of earthquake, the study area would be subject to severe shaking with only slight damage to specially designed structures (DOGAMI *Earthquake Scenario Ground Shaking Map for the Portland Oregon Metropolitan Area*).

**Opportunities**

None identified.

**Regulations**

Not applicable.

**Hazardous Materials**

**Constraints**

A search of the *Oregon DEQ Location Finder 1.4* did not reveal the presence of known hazmat sites in the study area. There are no known former gas stations, repair facilities, industrial sites, landfills, oil tanks, or hazmat storage facilities in the study area.

**Opportunities**

None identified.

**Regulations**

Not applicable.

**Historical**

**Constraints**

An historic resource survey was not conducted for this project. There are no known historic resource constraints.

**Opportunities**

None identified.

**Regulations**

Not applicable.

**Land Use/Planning**

**Constraints**

Transportation improvements are subject to the Tualatin Development Code. Within unincorporated Washington County, transportation improvements are subject to the Washington County Community Development Code.

The *Local Street Plan* shows continuing future utility of the corridor, with realignment. The corridor is shown as a Road with Bike Lanes with connection to Multi-Use Paths on the Tualatin Bicycle Plan. It is shown as a Road Network with connection to Multi-Use Paths on the Tualatin Pedestrian Plan. The study area includes a Greenway that is protected in the Natural Resources Protection Overlay District (NRPO). Widening of a roadway that encroaches into a Greenway requires a positive vote of the people within the City of Tualatin.

### **Opportunities**

Facilitate greenway connections—Ibach, Indian Meadows, and Hedges Creek Greenways (Map 72-2 *Greenway Development Plan Pedestrian and Bike Path Locations*; Ibach Greenway Master Plan; Blake Street Pathway Master Plan).

### **Regulations**

Tualatin Development Code and Washington County Community Development Code.

### **Noise**

#### **Constraints**

There are eleven residential noise receptors within 200 feet of the existing centerline. They are unlikely to be negatively impacted by operational noise because the corridor currently is a major and minor collector street, and the proposed project does not intend to increase traffic volume.

During construction, excavation, demolition, alteration or repair of a roadway other shall be between the hours of 7 am and 6 pm, except by special permit granted by the City.

#### **Opportunities**

Operational noise could be reduced by reducing steep vertical and sharp horizontal curves, pavement restoration, and other design improvements aimed at noise reduction. Practice construction noise mitigation.

#### **Regulations**

Tualatin Municipal Code.

### **Parks**

#### **Constraints**

An extension of Ibach Park (including a segment of the Hedges Creek Greenway) runs along the eastern side of 105<sup>th</sup> Avenue between SW Blake Street and Coquille Drive greenway (Map: *Tualatin's Parks, Greenways, Recreation, Community Centers, And Library*).

#### **Opportunities**

Extend greenway trails in Ibach Park north to Coquille Drive.

#### **Regulations**

Tualatin Development Code.

### **Threatened and Endangered Species**

#### **Constraints**

The US Fish and Wildlife Service (USFWS) lists the bald eagle (*Haliaeetus leucocephalus*) and winter steelhead, four threatened plant species (golden Indian paintbrush (*Castilleja levisecta*), howellia (*Howellia aquatilis*), Kincaid's lupine (*Lupinus sulphureus* var. *kincaidii*), and Nelson's checker-mallow (*Sidalcea nelsoniana*)), and two endangered plant species (Willamette daisy (*Erigeron decumbens* var. *decumbens*) and Bradshaw's lomatium (*Lomatium bradshawii*)) as potentially occurring in the project area (USFWS, 2004). However, none of these are known to occur in the study area.

A search of the Oregon Natural Heritage Information Center database of threatened and endangered species performed in 2004 for the City of Tualatin Hedges Creek Outfall Project did not identify known species occurrences in the project vicinity. Bald eagle occur in the vicinity, but not within one mile of the study area.

Upper Willamette River steelhead are known to occur in the Tualatin River and its tributaries, but the presence of steelhead in Hedges Creek should be considered undocumented but as having a potential of being present.

### **Opportunities**

With the exception of the possibility of UWR steelhead trout, no known threatened or endangered species occur in the study area. Therefore, opportunities to contribute to the recovery of threatened or endangered species are unlikely, except that stream habitat and water quality improvements might contribute to the recovery of UWR steelhead trout.

### **Regulations**

Federal Endangered Species Act, including biological assessment and biological opinion. The SLOPES IV programmatic biological opinion probably will not apply unless the culvert crossing is replaced with a “single span structure that maintains a clear, unobstructed opening above the general scour elevation that is at least as wide as 1.5 times the active channel width, and meets NMFS’ fish passage criteria.” ODOT assumes that treated stormwater discharge from roadways requires ESA consultation, even if listed fish only occur downstream.

### **Visual**

#### **Constraints**

No scenic routes, views, or features are identified in the study area on the Washington County *Rural/Natural Resource Plan*.

#### **Opportunities**

Retain rural/urban character of roadway. The study area falls within Zone 1 of the City’s *Street Tree Planting plan (Map 74-1 Street Tree Plantings)*.

#### **Regulations**

Not applicable.

### **Waterways/Water Quality**

#### **Constraints**

Hedges Creek flows through the study area in a northwesterly direction, crossing SW 105<sup>th</sup> Avenue. The associated drainage is identified as a Drainage Hazard Area (i.e., a 25-year floodplain) (Map 4.2 *Washington County Drainage Hazard Area*). The drainage is not identified as a 100-year floodplain (Map 4.1 *Washington County 100-Year Floodplain*).

Clean Water Services requires that all development complies with regulations for the protection of “Water Quality Sensitive Areas,” which includes Hedges Creek. Protection includes maintenance or restoration of “Vegetated Corridors” (buffers) around sensitive areas. The Vegetated Corridor along Hedges Creek extends 50 feet from the ordinary high water line(OHWL), or 35 feet beyond the break in a slope that exceeds 25% (up to 200 feet from OHWL). Road, pedestrian or bike path crossings are allowed uses of Vegetated Corridor (subject to mitigation). Paths up to 12-14 feet wide are allowed in the outermost 40% of the Vegetated Corridor.

#### **Opportunities**

All fill below flood surface elevation (i.e., in the Drainage Hazard Area) should be accompanied by an equal or greater amount of cut on the project site. Fluviomorphological conditions of Hedges Creek could be restored to their historical alignment and function, by providing a single span crossing structure that maintains a clear, unobstructed opening above the general scour elevation that is at least as wide as 1.5 times the active channel width (or a “multiple-span structure that maintains a clear, unobstructed opening above the general scour elevation, except for piers or interior bents, that is at least as wide as 2.2 times the active channel width”). Clean Water Services contends that the application of their landscape standards to Vegetated Corridors, sensitive areas, and stormwater facilities will improve water quality and preserve aquatic species.

#### **Regulations**

Drainage Hazard Area development is regulated under the Washington County Community Development Code, Section 421 (*Flood Plain and Drainage Hazard Area Development*).

Clean Water Services' District Resolution and Order No. 07-20 (Design and Construction Standards) require review and authorization for work in Vegetated Corridors. (Clean Water Services defers to the Corps and DSL for regulation of water quality sensitive areas). Conditions of authorization for temporary or permanent impacts to Vegetated Corridors include the preparation of a Natural Resource Assessment and mitigation requirements, i.e., protection and/or restoration of Vegetated Corridors per Clean Water Services landscape specifications. The Vegetated Corridor within the ROW or permanent easement must be enhanced to "good" condition, and impacted Vegetated Corridor replaced. Mitigation could entail onsite improvements, or payment-to-provide (\$2,500 + \$2.22 per square foot of mitigated area over 1,000 ft<sup>2</sup>).

Clean Water Act Section 404 (federal nexus for ESA consultation), and Oregon Removal-Fill Law (nexus for stormwater management plan review by DEQ and fish passage plan review by ODFW).

## **Wetlands**

### **Constraints**

Wetlands in the study area were identified in the City of Tualatin's *Composite Natural Resource Inventory and Local Wetlands Inventory* as Wetland W-26 (west of 105<sup>th</sup>) and Wetland W-27 (east of 105<sup>th</sup>) (Map 72-3 *Significant Natural Resources*). The wetlands generally are associated with Hedges Creek, except for a ditch-like wetland extending along the eastern side of 105<sup>th</sup> from Hedges Creek to Coquille Drive. A project specific wetland delineation would be necessary to more accurately define the limits of the wetlands in the study area.

### **Opportunities**

Wetland impacts should be avoided, minimized, or mitigated. Wetlands associated with Hedges Creek could be restored to their historical alignment and function.

### **Regulations**

Clean Water Act Section 404 (federal nexus for ESA consultation), and Oregon Removal-Fill Law (nexus for stormwater management plan review by DEQ and fish passage plan review by ODFW).

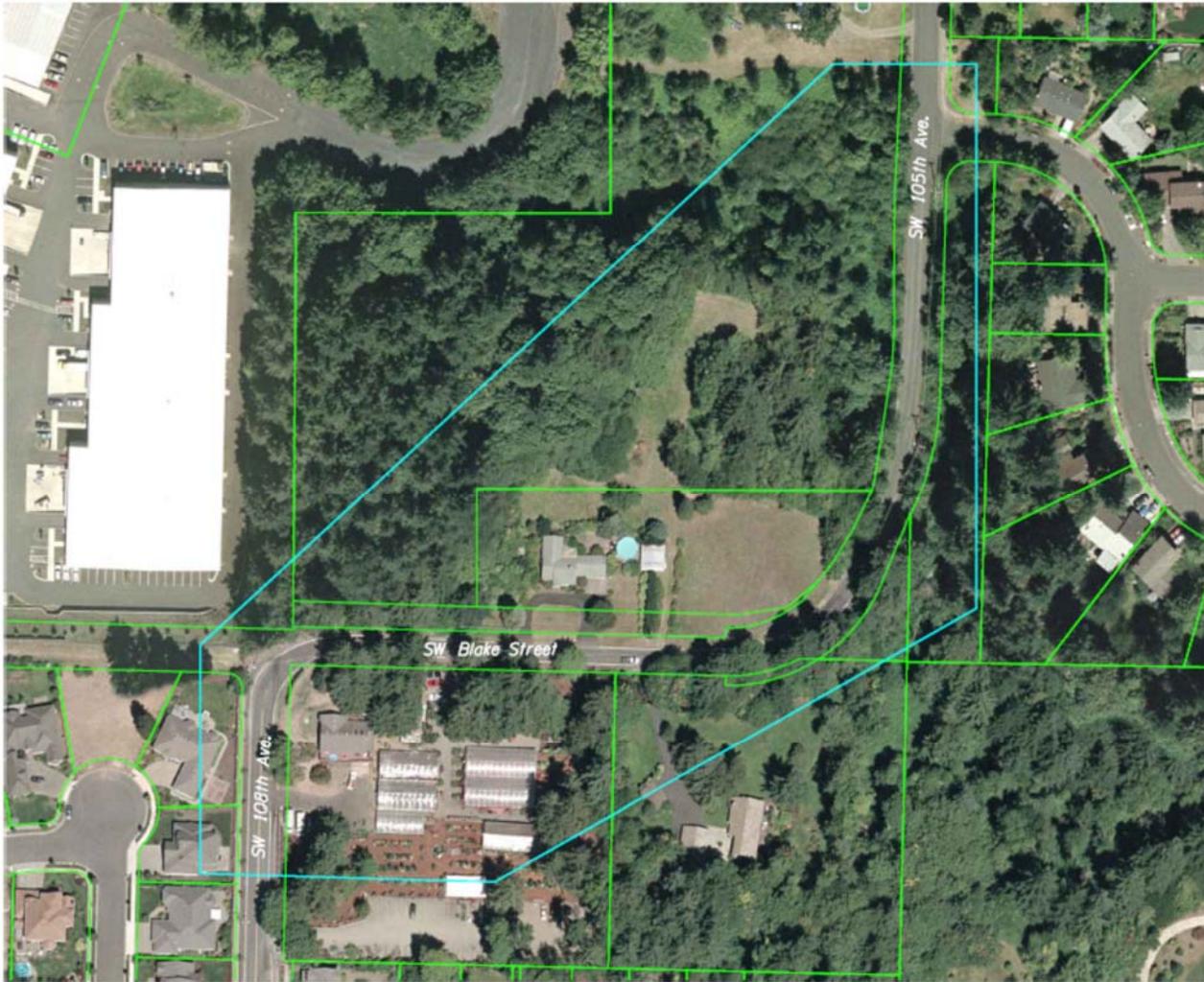
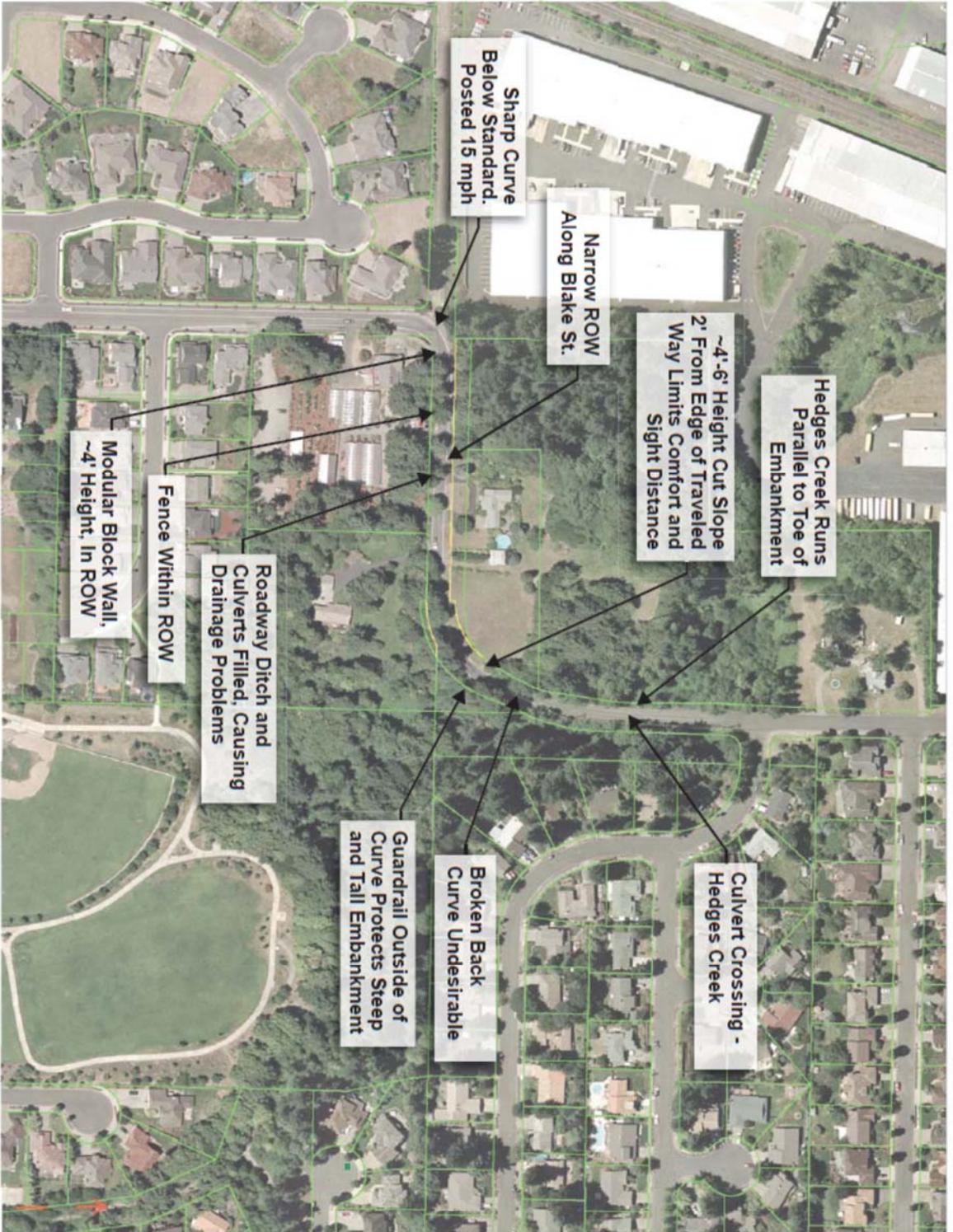


Exhibit 1. Study area for Constraints and Opportunities; SW 105<sup>th</sup>/Blake Street/SW 108<sup>th</sup> Concepts Study; City of Tualatin



**EXHIBIT 2**  
**Constraints Map**  
SW Blake Street Improvements  
City of Tualatin

**CH2MHILL.**