# Planned Residential Development
# Staff Report and Recommendation

Community Development Department, Planning Division

**REPORT DATE:** December 11, 2023

**CONTINUED:**
**HEARING DATE** December 18, 2023

**LAND USE REQUEST:** A consolidated four (*4*) part application review pursuant to Development Code §17.1.205, reviewed under the highest numbered procedure (Type IV), and consisting of:

- A mixed use planned development ("MUPD") preliminary plan, consisting of a 24-unit quadplex development and proposed 362-unit apartment complex and commercial space;
- A tentative plat for Partition (subordinate to the MUPD Approval);
- An Adjustment to allow buildings located *outside* the "Village Center" within the Neighborhood Mixed Use ("NMU") Zone to be constructed up to 42' in height (current maximum is 35'); and
- A development code text amendment to request higher density within the "Area 2 – Davidson" Neighborhood Mixed Use zoned area (Type IV, legislative process).

**FILE NUMBER(S):** Type III: 311-23-000022-PLNG / MUPD
Type II: 311-23-000023-PLNG / Adjustment
Type II: 311-23-000024-PLNG / Partition
Type IV: 311-23-000025-PLNG / Text Amendment

**FILE NAME:** "Brown's Farm Mixed Use Development"

**PROPERTY LOCATION:** 3081 Sunset Drive, Forest Grove Oregon 97116
Washington County Tax Lot(s) 1N331A000100 & 1N331A000600

**OWNER:** *TL 100:* Davidson, Ernest D Family Trust; Davidson, Wynona D Revocable Trust; and T&T Properties

*TL 600:* Davidson, Ernest D Family Trust (State QTIP)

**APPLICANT:** J.T. Smith Companies, LLC
5285 Meadows Road, STE 171
Lake Oswego, OR 97035

**APPLICANT'S REPRESENTATIVE:** 3J Consulting, Inc.
9600 SW Nimbus Avenue, STE 100
Beaverton, OR 97008

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| **COMPREHENSIVE PLAN MAP DESIGNATION:** | Neighborhood Mixed Use (NMU) |
| **ZONING MAP DESIGNATION:** | Neighborhood Mixed Use (NMU) |
| **APPLICABLE STANDARDS AND CRITERIA:** | **City of Forest Grove Development Code:**<br>§17.1.205 et. seq. *Consolidated Review*<br>§17.2.600 et. seq. *Development Code Text Amendment*<br>§17.2.100 et. seq. *Adjustment*<br>§17.4.300 et. seq. *Mixed Use Planned Development*<br>§17.5.140 *Protection of Register Trees*<br>§17.5.225 *Procedures for Review of Proposed Demolition or Relocation of Landmarks*<br>§17.6.045 et. seq. *Partitions*<br>§17.8.600 et. seq. *Public Improvements*<br>§17.8.900 et. seq. *Land Division Standards*<br><br>**Oregon Revised Statutes:**<br>197.307 *Needed Housing Policy – Clear and Objective Standards* |

**COMMON ABREVIATIONS/ACRONYMS USED WITHIN THIS STAFF REPORT:**

| *ABR. / ACRONYM* | *MEANING* |
|---|---|
| • TL | •Tax Lot |
| • NMU | • Neighborhood Mixed Use |
| • MUPD | • Mixed Use Planned Development |
| • FGDC | • Forest Grove Development Code |

**REVIEWING STAFF:** Kate McGuire, Senior Planner

**RECOMMENDATION:**

| | |
|---|---|
| **MUPD:** | **Approval with Conditions** |
| **Partition:** | **Approval** |
| **Text Amendment:** | **Approval** |
| **Adjustment:** | **Approval** |

# I. PROPERTY DESCRIPTION & LAND USE DESIGNATION

The subject property is comprised of two (2) parcels, currently identified as Washington County tax lot(s) 1N331A000100 (“TL 100”) & 1N331A000600 (“TL 600”) and is approximately 24.91 total combined acres.

Per the legal description provided by Allen Kohn, Oregon Registered Professional Land Surveyor (58964PLS), TL 100 is approximately 23.37 acres in size (Please see Exhibit K). It is assigned the physical site address 3081 Sunset Drive and historic aerial imagery indicates that farming has been the primary use, and Washington County Assessment

("WCA") data identifies that TL 100 is receiving farmland assessment with the exception of one (1) acre of land area. WCA data also identifies that TL 100 is currently developed with two (2) single family dwelling units; one being the "Alvin Clark Brown House", constructed in 1863 and added to the State of Oregon Historic Preservation Office ("SHPO") Historic Register Inventory in 2013. The other dwelling was constructed in 1930 and is not identified as an eligible contributing structure and is of no historical significance. TL 100 is also developed with several accessory farm structures; all existing structural development is clustered in the southwestern corner of the property and all will require removal to accommodate the current development proposal. Natural features include an approximately 1/3-acre grove of Oregon White Oak trees that are centrally located on TL 100, a singular Oregon White Oak located in the southwest corner of the property, and a swath of approximately 5+ acres of mapped wetland, and associated vegetative corridor, existing in the southeastern portion TL 100. All are preserved and incorporated into the proposed MUPD design.

Per the legal description provided by Allen Kohn, Oregon Registered Professional Land Surveyor (58964PLS), TL 600 is approximately 1.54 acres in size. TL 600 is currently vacant of development and does not have a physical address assigned. TL 600 is also receiving farming assessment and historic aerial imagery indicates that this parcel has also been actively in farm use. There are no pertinent natural features located on TL 600.

Both the comprehensive plan and zoning map designations of the subject property are, coincidentally, Neighborhood Mixed Use ("NMU").

Public notice was mailed to property owners within 300 feet of the site on September 18, 2023, published in the *News Times* on September 21, 2023 and conspicuously posted at the City Hall Auditorium, Public Library and City of Forest Grove Aquatic Center, as required by Forest Grove Development Code ("FGDC") §17.1.610 and §17.1.615. Physical signs advertising public hearing were staked by Staff in four (4) locations at the site on September 25, 2023. The hearing was subsequently continued to December 18, 2023 for review and consideration by the Planning Commission.

Copies of the application materials were provided to the City's inter-departmental Plans Review Board for review and comment. The Plans Review Board includes staff representing the Building Division, Engineering Division, and the City of Forest Grove Fire and Light, and Power Departments. The Oregon Department of Transportation ("ODOT") was also provided notice of the proposal. Standards and specifications stipulated by these departments and those provided by ODOT and CWS are provided at Exhibits C through G.

# II. ANALYSIS

## A. DESCRIPTION OF PROPOSAL:

The project is proposed through *four (4) applications*, submitted for concurrent review, pursuant to FGDC §17.1.205 – "Consolidated Review."

The Applicant is proposing a **Mixed Use Planned Development ("MUPD")**[1] (Application #1) and concurrent, subordinate, three (3) lot **Partition**(Application #2) of TL 100, pursuant to the standards of FGDC §17.4.315.

[1] Applicant's findings address all relevant standards and criteria of this section, with the exception of §17.4.315(C) and Table 4-1; both regarding residential density. The request for Text Amendment application concurrently reviewed (File

At final build out, the development would include; 24 (six (6) quadplex units) residential units on TL 600, and a 362 unit multi-family residential community comprised of studio, one, two, and three bedroom market rate apartments to be contained within fourteen (14) apartment buildings with 120 units being ground floor units to provide better accessibility to seniors and those with mobility issues; seven (7) garage buildings with storage space for tenants on the second floor of the garage buildings; a community building that would include indoor sports courts, a party room, a technology room, a work out room, rental offices, two (2) apartment units and an exterior covered picnic space, and a four (4) acre commercial lot will be created through the proposed partition, that will include "flexible" commercial development proposed within four (4) buildings and will serve as the "Village Center" of the MUPD.

The residential and commercial development is proposed to be constructed in 5 phases. The Applicant has provided the following table to summarize the phases:

| Phase | Lot | Phase Acreage | Proposed Zoning Designation | Proposed Development |
|---|---|---|---|---|
| Tax Lot: 1N331A000100 | | | | |
| R1 | Lot 3 | 6.45 acres | NMU | Residential 126 units |
| R2 | Lot 4 | 3.76 acres | NMU | Residential 108 units |
| R3 | Lot 4 | 3.96 acres | NMU | Residential 126 units |
| Resource Area | Lot 4 | 5.42 acres | NMU | None |
| C1 | Lot 2 | 3.77 acres | NMU | Commercial |
| Tax Lot: 1N331A000600 | | | | |
| R1A | Lot 1 | 1.54 acres | NMU | Residential 24 Quadplexes |

The proposed phasing plan is visually evidenced on sheet C190 ("Phasing Plan") of the submitted plans set. The timeline of phasing construction has not been presented.

*Phase "R1*" will be constructed on proposed "Lot 3" and will incorporate five (5) structures containing a total of 126 residential units/apartments, one (1) garage structure containing ten 10 parking units and 196 surface parking spaces for a total of 206 parking spaces.

*Phase "R2*" will be constructed on the southwest portion of proposed "Lot 4" and will incorporate four (4) residential structures containing 108 residential units/apartments, four (4) garage structures containing 40 parking units (10 each) and 121 surface parking spaces for a total of 161 parking spaces.

*Phase "R3*" will be constructed on the northern portion of proposed "Lot 4" and will incorporate five (5) residential structures containing 108 residential units/apartments, two (2) garage structures containing 20 parking units (10 each) and 129 surface parking spaces for a total of 149 parking spaces.

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No. 311-23-000025-PLNG), is specifically a request for increase to the density allowance in the "Area 2 – Davidson" NMU zone; the subject property. Density is separately addressed herein, where the criteria of the Text Amendment are addressed.

*Phase "R1A*" will be constructed on existing "Lot 1" and will incorporate six (6) quadplex structures containing a total of 24 residential units/apartments and have a total of 48 parking spaces.

The Applicant states that the total open space provided upon completion of all residential phases will be 482,892 square feet (approximately 11.08 acres). Proposed open space areas would preserve several existing natural features at the site, including a wetland area and vegetative corridor that is situated along the southeastern corner of the subject property, and an existing Oregon White Oak grove that is centrally located within the proposed development will be preserved and incorporated into the "Tabitha Brown Moffat Brown Pioneer Park". The Park is proposed at just under one (1) acre in size and because it is centrally located within the proposed residential development area, will operate as a primary "third space" for residents of the community, incorporating walking trails, picnic and gathering areas, play structures and athletic courts.

*Phase "C1"*, the "Village Center" will be constructed on proposed "Lot 2". At final build out, it will contain four (4) commercial buildings. The Applicant's written findings state:

> *"The proposed Village Center does not currently have tenants or proposed building footprints. At the time of development of the commercial spaces in the Village Center, the maximum building footprint proposed will not exceed 50,000 square feet"*

The Applicant has stated understanding of the 50,000 square foot limitation of commercial structures in the Village Center. Compliance with this requirement can be assured through a condition of approval.

Applicant is requesting a **Text Amendment**(Application #3) to *FGDC Table 4-1: "Residential Density",* specifically applicable to NMU Zone "Area 2 – Davidson". Applicant requests the maximum density allowance be increased from 13.80 units/net acre to "*15.50*" units/net acre to allow for a slight increase of 1.7 units/acre. Table 4-1, below, identifies the minimum, target and maximum residential densities currently provided for each of the NMU areas. The proposed amendment is applicable only to the "Area 2 – Davidson" NMU zone; which is comprised of the subject property, alone.

| **Table 4-1: Residential Density** | | | |
|---|---|---|---|
| *NMU Zoned Area* | *Minimum Density* | *Target Density* | *Maximum Density* |
| Area 1 - David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| ***Area 2 - Davidson*** | 9.60 units/net acre | 12 units/net acre | ***13.80 units/net acre*** |
| Area 3 - East David Hill Rd | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

The Text Amendment criteria of the FGDC and density analysis are subsequently addressed herein further herein.

The final component of the application is a request for an **Adjustment**(Application #4) to the height limitation of structures located outside of the "Village Center". Residential structures located *outside* of the Village Center are limited to 35' in height, while structures located within the Village Center are allowed to be a maximum of 45' in height (FGDC Table 3-9: "Commercial Zones: Dimensional Requirements"). The two height allowances currently existing within the MUPD, mirror other height allowances for residential and commercial zones. The requested adjustment to the height limitation is stated as necessary to accommodate the density increase proposed through the Text Amendment component of the application, and to allow for construction design incorporating sloped roofing.

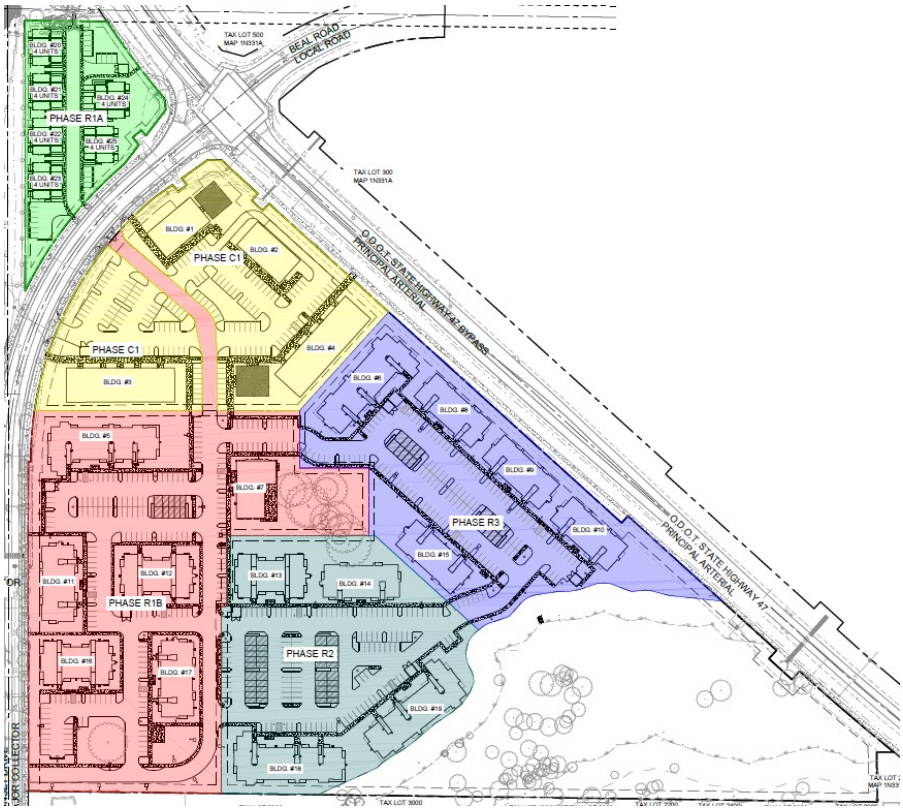
## B. SITE EXAMINATION:

The site consists of two parcels, TL 100 and TL 600 with a combined gross area of approximately 24.91 acres (See Exhibit K). TL 600 is located on the northwestern right of way ("ROW") of Sunset Drive and the southern ROW of Hwy 47. TL 100 is located on the eastern ROW of Sunset Drive and the southern ROW of Hwy 47 and is proposed for partition into three (3) parcels. TL 600 is currently vacant of structural development; TL 100 currently contains two single family dwelling units and several accessory farm structures, all located in the southwest corner of the property that would need to be relocated and/or demolished to facilitate the first phase of construction of the apartment complex. One of the existing dwellings is the "Alvin Clark Brown House", constructed in 1863 and added to the State of Oregon Historic Preservation Office ("SHPO") Historic Register Inventory in 2013. The criteria of FGDC §17.5.225 is addressed further herein. The site is relatively flat and has historically been used for agricultural purposes.

There is an Oregon White Oak grove located in the central area of TL 100 and a singular Oregon White Oak that is found on the City of Forest Grove register of significant trees that is located in the southwestern corner of the subject property. The Applicant has addressed all of the requirements of FGDC §17.5.100 et seq., and has provided an inventory of existing trees and preservation and removal plan (sheets C150, C151 & C152). Pursuant to the preservation plan, the aforementioned Oregon White Oaks will all be retained onsite.

There is a swath of wetland and associated vegetative corridor located along the southeastern portion of TL 100. Clean Water Services ("CWS") has reviewed the proposal (CWS File No. 23-000887) and provided conditions pertinent to conservation of the wetland during development (See Exhibit G, attached hereto).

## C. PRELIMINARY LOT LAYOUT / PHASING PLAN:



## D. COMPREHENSIVE PLAN DESIGNATION & ZONING OF SITE & SURROUNDING AREA:

| LOCATION | COMPREHENSIVE PLAN DESIGNATION | ZONE DISTRICT | LAND USE |
|---|---|---|---|
| Project Site | Neighborhood Mixed Use (25.05+/- acres) | Neighborhood Mixed Use (NMU) | Agriculture |
| North | Light Industrial (LI) | Light Industrial (LI) | None |
| South | B - Standard | Single-Family Residential (R-7) | Single-Family Residential |
| East | Exclusive Farm Use -EFU (Washington County) | Exclusive Farm Use -EFU (Washington County) | Highway 47 / Agricultural |
| West | A – Medium & B - Standard | Single Family Residential (R- 5 & R-7) | Single-Family Residential |

## E. NEIGHBORHOOD MIXED USE ZONE DESIGNATION and COMPLICATIONS DUE TO IMPLEMENTATION OF ORS 197.307; CLEAR AND OBJECTIVE STANDARDS FOR NEEDED HOUSING:

The City of Forest Grove established the Neighborhood Mixed Use ("NMU") zoning district through adoption of Ordinance No. 2013-03 in March of 2016, to implement the "Mixed Use" designation of the Comprehensive Plan, a designation incorporated into the Compressive Plan in 2014 (Ordinance No.'s 2014-01 & 2014-02). Per Forest Grove Development Code ("FGDC") §17.3.310:

> *"The Neighborhood Mixed Use zone is established to support the development of pedestrian-friendly mixed-use neighborhoods with a diversity in the mix of housing types and neighborhood-scale retail sales and service, office, civic or recreational uses. Most non-residential uses must be located within a "Village Center." The Village Center is intended to serve as the center of the neighborhood, providing convenient access to goods and services as well as "third places" where residents can gather. The NMU zone implements the Comprehensive Plan's Mixed-Use designation. Mixed-Use Planned Development approval is required in the NMU Zone in order to ensure that the objectives of the Comprehensive Plan are addressed."*

The subject site is one of three (3) sites that were rezoned to the NMU designation and is known as "Area - 2 Davidson". The subject property was previously zoned Light Industrial ("LI") and was incidentally, the largest of the three (3) sites that were rezoned to NMU. As identified above, development in the NMU zone district requires approval of a Mixed Use Planned Development ("MUPD").

As identified above, the NMU zone was adopted in the spirit of creating flexibility in proposals for mixed use development. In the interim, a global pandemic ensued and a major housing crisis has gripped the State of Oregon. The provisions regarding needed housing as outlined within Oregon Revised Statute 197.307, specifically subsection (4), effectively eliminate the ability to apply discretion to review regarding any residential development. In this case, the Applicant has prepared a development plan that still primarily observes the spirit and intention of the NMU zoning district and the MUPD process as identified and analyzed herein.

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# III. REQUIRED APPROVALS AND FINDINGS

## 1) MIXED USE PLANNED DEVELOPMENT:

### §17.4.300 – PURPOSE

*The purpose of the Mixed Use Planned Development is to ensure that sites zoned Neighborhood Mixed Use are developed into pedestrian-friendly mixed use neighborhoods. In order to accomplish that, Mixed Use Planned Developments shall provide:*

*A. Diversity in the mix of housing types including single-family houses, apartments, row houses, cottages, senior housing and residential units above commercial or office space;*

**FINDING:** The Applicant proposes two (2) housing types; multi-family apartment complexes and quadplexes. FGDC §17.12.210 (D11) provides dwelling related definitions and distinguishes Quadplexes from Apartments or Multiple Family Dwelling Units in that, Apartments or Multiple Family Dwelling Units are a structure containing *at least* five (5) dwelling units.

The Applicant has proposed placement of two (2) apartments within the "field house" community building above the apartment leasing office which is by definition, "office space".

*B. Pedestrian-orientation in the arrangement and placement of buildings, parking and circulation systems, land uses and utilities; and*

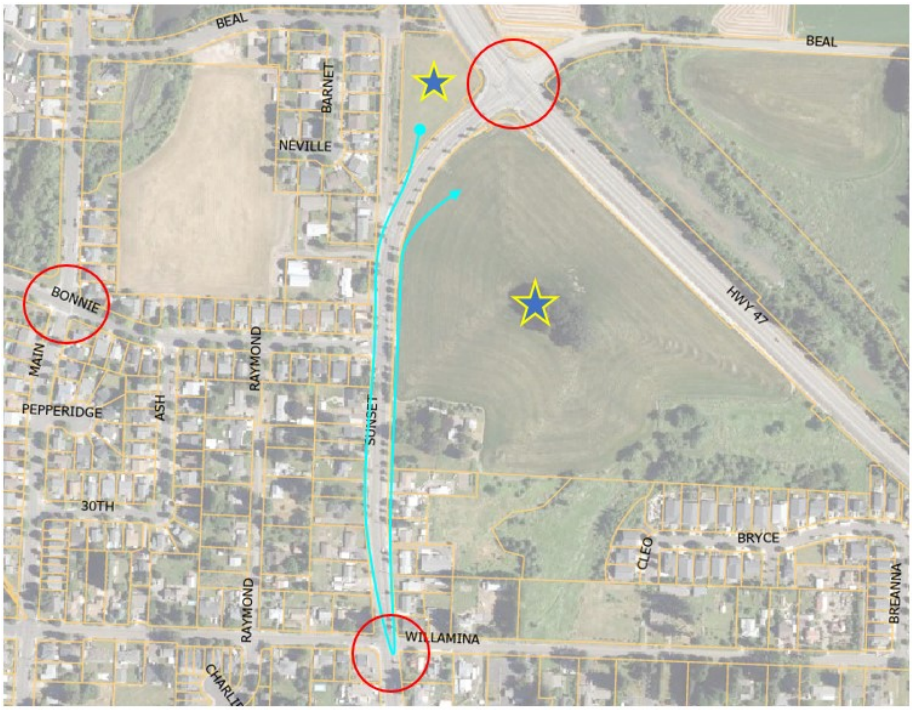
**FINDING:** The site circulation plan submitted (sheet C420) locates "CAR" and "ADA" thoroughfares, and although incorporated in the legend ("PED"), pedestrian pathways are not distinctly identified on the circulation plan. Notwithstanding the foregoing, the conclusion can be drawn that any labeled "ADA" thoroughfare can also be considered a pedestrian pathway. The Applicant has adequately addressed §17.8.140(A)(3) & (B)(3), the applicable development standards regarding the pedestrian environment, in both residential and commercial zones, and there appears to be ample network of both vehicle thoroughfare and pedestrian walkways provided within the commercial site and larger residential site all contained to TL 100. However, there is no connectivity currently provided from between proposed quadplexes on TL 600 and the commercial development proposed on the northern end of TL 100. Concerns addressing this connectivity deficiency are further addressed below where the Applicant proposes a pedestrian actuated crosswalk to be situated on Sunset Drive to provide safe crossing between the quadplexes on the island parcel to the commercial uses proposed for location on the eastern side of Sunset Drive.

*C. Pedestrian and bicycle access to, and through, the site and provide connectivity to adjacent areas for motorized and non-motorized modes of transportation;*

**FINDING:** The TIS identifies existing marked crosswalks located at the corner of Sunset Drive and Willamina Avenue (south of the development), at the intersection of Bonnie Lane and Main Street (west of the development) and an existing push button activated crossing at the intersection of Sunset Drive and Hwy. 47.

Staff has concerns regarding connectivity represented between the quadplexes located on the northwestern right of way of Sunset Drive and the proposed commercial development to be located on the southeastern right of way of Sunset Drive. A site visit

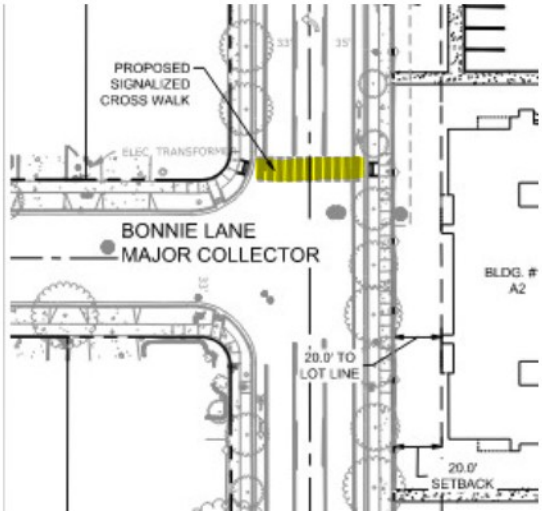
conducted by Staff on September 25, 2023 identifies that there is no marked crosswalk located at the "T" – intersection where Bonnie Lane connects to Sunset Drive. If a resident of the quadplexes utilized the marked crossing located at Willamina and Sunset to reach the commercial development located on TL 600, they would need to walk nearly half a mile just to safely get across the street:




The revised TIS, prepared by Christopher Brehmer of Kittelson and Associates states:

> *Pursuant to recommendations from City staff, JT Smith should collaborate with the City to design and construct a marked crossing at the Sunset Drive/Bonnie Lane intersection in conjunction with site development. The types of enhanced crossing treatments could include ADA accessible curb ramps, beacons and lighting.*

The Applicant initiated a discussion with the City of Forest Grove Director of Public Works on November 15, 2023 (correspondence at Exhibit H) and provided a plan for a signalized crosswalk to be located on the north side of the Sunset Drive / Bonnie Lane Intersection:



A supplement from the Applicant provided to that email identifies the type of flashing pedestrian actuated crosswalk that may be permitted in this location (See Exhibit H). The correspondence indicates that the Director of Public Works is amenable to this proposal and staff's concern regarding safe pedestrian connectivity between the two sites is no longer of issue.

Condition #51 of the attached conditions of approval for the proposed development, provided by the city engineer (See Exhibit F) states:

> *"Establishment of new pedestrian crossings at uncontrolled intersections or at mid-block locations on roadways under control of the City shall be based upon an engineering study by applicant, and reviewed and approved by the City Engineer according to evaluation process set by Washington County."*

The push button crossing at the corner of Sunset and 47 is also problematic, as there is no actual connection to TL 600:

Therefore, Staff recommends **a condition of approval** requiring the Applicant to work with ODOT (and the City of Forest Grove Public Works Department, as may be necessary or applicable in this location) to improve the intersection crosswalk located at Sunset Drive and Hwy 47 to provide adequate and actual connectivity between the commercial development to be located on the north end of TL 100 and the residential development to be located on the small parcel (TL 600).

Regarding this intersection, the TIS prepared by the Applicant's traffic engineer provides only the following recommendation:

> *"Regardless of the development, we recommend that the City work with ODOT to review and modify the signal timing plan at the OR 47/Sunset*

> *Drive intersection to optimize intersection operations and minimize queuing in light of planned/pending developments, anticipated connectivity changes, and the new roundabout being constructed to the east on OR 47 at Martin Road."*

The City of Forest Grove Engineering Division was provided notice of the proposal and along with standard construction specifications, City Engineering requires the following special condition:

> *"Provide a traffic analysis of the intersections of Bonnie Lane and Sunset Drive, and Sunset Drive and Hwy 47 Bypass. Look at current traffic movements and movements after build out for both intersections and proposed access points to determine future impact."* (See Exhibit F)

The Oregon Department of Transportation ("ODOT") was initially sent notice of the proposal when the small parcel was proposed for commercial development, prior to submittal of the revised proposal changing that portion of the development to residential use.

Upon review of the initial proposal, ODOT requested **a condition of approval** requiring the Applicant to improve a segment of the "Council Creek Regional Trail" where the subject property abuts Hwy 47. Recommended improvements include insallation of a 10 foot wide multi-use path with 2 foot shoulders on either side and has requested installation of pedestrian and bicycle pathways to and from the development, connecting to the Council Creek Trail in one or more of locations along the southwestern ROW of Hwy 47. The Applicant took this into account when preparing revisions to the initial proposal and the revised site plan demonstrates connectivity to the Council Creek Trail via one (1) pedestrian pathway, located between buildings #2 and #4 of the commercial development.

*D. Neighborhood-scale retail sales and service, office, civic or recreational uses conveniently located for neighborhood access, thereby contributing to the livability of the area by reducing the amount of vehicle miles traveled to reach goods and services;*

**FINDING:** The Applicant states that there are not yet any tenants to occupy the proposed structures within the Village Center commercial area and it is reasonable that approval of the development would be secured prior to engaging with potential tenants. FGDC Table 3-8 identifies the commercial uses allowed (outright permitted or conditional use) in the NMU zoning district. Compliance with the requirement of this section can be assured through **a condition approval** requiring any proposed commercial use comply with the use Table 3-8.

*E. Coordinated architectural styles, landscaping building forms and building relationships which help establish a cohesive sense of place;*

**FINDING:** The Applicant has provided a custom Design Guidebook. The design guidebook demonstrates cohesive and coordinate architectural styles for all components of the commercial and all components of the residential development (including detached garages and community building/field house). The Applicant states that the design elements reference "the history of the site and incorporate gambrel roof forms, stone and timber elements." The proposal incorporates a community building, adjacent to the Tabitha Moffat Brown Pioneer Park which preserves and features an Oregon White Oak grove. The Park would include walking trails, picnic and gathering areas, play structures and courts. The proposal incorporates smaller opens space and recreation

dispersed throughout the residential portion of the development as well. Plans sheet C150 provides a tree preservation and removal plan which is implemented in coordination with new landscaping provided at sheets L010 through L414. Compliance with the criteria of this section is demonstrated as feasibly met.

*F. An urban form that emphasizes the efficient use of land and compact urban form;*

**FINDING:** The Applicant has preserved existing natural physical features and open spaces and is proposing a higher density to maximize the potential to achieve a more compact urban form.

*G. The Applicant with reasonable assurance of ultimate approval before requiring detailed design and engineering, while providing the city with assurances that the project will retain the character envisioned at the time of approval; and*

**FINDING:** The Applicant has submitted detailed design and engineering renderings. If approved, **a condition of approval** will ensure that the project would remain in substantial conformance with the plans as submitted, reviewed and approved.

*H. A basis for discretionary review of an overall plan of development that can subsequently be developed in phases over time with administrative approval.*

**FINDING:** The Applicant has provided a phasing plan and there is sufficient information provided such that development can occur in phases with administrative approval.

## §17.4.315 MUPD DEVELOPMENT STANDARDS

*A. **Base zone standards.** The development standards of the base zone apply unless they are superseded by the standards of this section or an MUPD approval.*

**FINDING:** Footnote *[5]* of FGDC Table 3-9 identifies that new development in the NMU Zone requires a MUPD approval where the development standards are established through the MUPD process. This is one instance where the "spirit" of the MUPD is in conflict with state law applicable to needed housing; ORS 197.307 (4) specifically regarding clear and objective standards.

The only designated standard applicable to the NMU zone district found within FGDC Table 3-9, is pertinent to height limitation of 35' for residential buildings located *outside* the "Village Center" of a MUPD. Footnote *[6]* identifies that a maximum building of 45' is allowed only *within* a "Village Center" of an approved MUPD. The Applicant has requested a 20% adjustment to this limitation to allow structures located outside the "Village Center", specifically the apartment complex structures, to be allowed to be constructed up to 42' in height. The Adjustment review criteria of §17.2.120 are further addressed herein.

*B. **Site size.** There are no minimum or maximum size limitations for a MUPD.*

**FINDING:** By this metric, as long as a proposal can comply with the general development standards of Article 8, there is no proposal that *would not* comply with this section. In any case, the standard of this section is met.

*C. **Residential density.** The target, minimum and maximum residential density for each of the NMU zoned area is shown in Table 4-1. Dwelling units may be transferred between parcels as part of an approved MUPD provided the average density within the MUPD meets the standards in Table 4-1.*

| Table 4-1: Residential ***Density*** | | | |
|---|---|---|---|
| NMU Zoned Area | Minimum ***Density*** | Target ***Density*** | Maximum ***Density*** |
| Area 1 - David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 2 - Davidson | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 3 - East David Hill Rd | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

**FINDING:** The Applicant is proposing a higher density than the maximum allowed pursuant to FGDC table 4-1 (13.80 units/net acre) through a concurrently reviewed Text Amendment application and proposal. A density analysis is provided further herein, where the criteria of the Text Amendment (FGDC §17.2.630) request are subsequently addressed.

*D.* ***Lot sizes.*** *There are no required minimum lot sizes.*

**FINDING:** Lot 1 is existing and as proposed, lots 2, 3 and 4 (all 4 lots proposed for development) are or will be of sufficient size to accommodate the applicable general development standards of Article 8.

*E.* ***Housing types allowed.*** *All housing types are permitted. For MUPDs over three gross acres in size, a mix of housing types is required unless otherwise approved by the Planning Commission. Multi-unit buildings shall be subject to Multi-Unit Residential Focus Area standards unless standards are modified through an approved MUPD.*

**FINDING:** The proposed MUPD is well over 3-acres in size. The Applicant proposes two (2) housing types; multi-family apartment complexes and quadplexes. FGDC §17.12.210 (D11) provides dwelling related definitions and distinguishes Quadplexes from Apartments or Multiple Family Dwelling Units in that, Apartments or Multiple Family Dwelling Units are a structure containing *at least* five (5) dwelling units.

The Applicant has not proposed modification of the Multi-Unit Residential Focus Area standards, and compliance with the requirements of those standards shall be made a condition of any approval. Compliance with the requirements of this section is demonstrated as feasibly met.

*F.* ***Village center.*** *Commercial Uses and Institutional Uses (other than emergency services, basic utilities, major utilities transmission facilities, daycare, home occupations and community recreation) shall be located within a village center.*

1. *The Village Center shall provide services at a neighborhood scale within a compact, pedestrian-friendly environment. The Design and Development Standards and/or Design Guidelines applicable to the Town Center Transition (TCT) zone shall be used as a basis for development within the Village Center unless modified through an approved MUPD.*

2. *The minimum and maximum floor area of commercial or institutional uses permitted within the Village Center is shown in Table 4-2.*

3. *The total area of the Village Center shall not exceed 50% of the buildable land within the MUPD or three acres, whichever is greater. For the purposes of this calculation the area of the Village Center shall include the contiguous areas dedicated to commercial and institutional uses and related parking. Streets and open space shall not be included in the Village Center area calculations.*

4. *Only one Village Center is permitted within each of the NMU Zoned Areas.*

5. *Institutional uses shall not exceed 10% of the maximum allowed square footage within the Village Center.*

6. *Within Area 2 (Davidson), the maximum building footprint is 50,000 square feet. One tenant in Area 2 may occupy up to 50,000 square feet of gross floor area. Multiple tenants in a single building are allowed.*

| ***Table 4-2: Commercial/Institutional Uses within the*** *Village Center* | | |
|---|---|---|
| ***NMU Zoned Area*** | ***Minimum Square Footage*** | ***Maximum Square Footage*** |
| Area 1 - David Hill/Nixon | None | 15,000 SF Gross Floor Area |
| Area 2 - Davidson | 25,000 SF Gross Floor Area | 130,000 SF Gross Floor Area [1] |
| Area 3 - East David Hill Rd | 10,000 SF Gross Floor Area | 150,000 SF Gross Floor Area [2] |
| [1] Maximum building footprint is 50,000 square feet | | |
| [2] Maximum building footprint is 50,000 square feet | | |

**FINDING:** Only one Village Center is proposed. It will be situated on the northern end of TL 100, situated adjacent to, and northerly of the apartment complex and southeast of the quadplex development proposed on TL 600, located along the northern right of way of Sunset Drive.

The Applicant has addressed the Design and Development Standards and/or Design Guidelines applicable to the Town Center Transition (TCT) zone within submitted written findings and civil plans and has not requested modification through this MUPD review.

Compliance with the 50,000 square foot structural size limitation and compliance with the commercial and institutional use minimums and maximums provided within Table 4-2 can be assured through an **ongoing condition of approval**. The proposed "Village Center" areas is approximately 4 acres in size. This exceeds the 3-acre threshold however, it does not exceed 50% of the buildable land area within the MUPD.

G. ***Height.*** *The height limits of the base zone apply.*

**FINDING:** Within the NMU zone district, buildings within a "Village Center" may be constructed to a maximum of 45' in height and buildings located outside a "Village Center" are limited to construction of 35' in height. The Applicant has requested an Adjustment to the 35' height limitation of structures located outside of the "Village Center" in conjunction with this application for a MUPD for a 20% adjustment to allow residential structures to be constructed up to 42' in height. The Adjustment criteria are addressed further herein.

H. ***Building setbacks.*** *Building setbacks are established as part of the preliminary development plans approval.*

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**FINDING:** The NMU zone does not have required setbacks. The Applicant has provided a table of proposed setbacks:

| Multifamily Setbacks | |
|---|---|
| **Standard** | **Dimension** |
| Front | 20 feet |
| Corner (street side) | 20 feet |
| Interior | 10 feet |
| Rear | 15 feet |

| Quadplex Setbacks | |
|---|---|
| **Standard** | **Dimension** |
| Front | 10 feet |
| Corner (street side) | 10 feet |
| Interior | 10 feet |
| Rear | 10 feet |

Compared to setbacks required in other zoning districts, the setbacks proposed by the Applicant are adequate to accommodate the general development standards of Article 8. Further reduced front and corner yard setbacks for the quadplexes will not have an affect on any surrounding property due to being surrounded by a water quality facility to the west and no less than 40' of public right of way on all other sides.

*I.* ***Open space.*** *A MUPD shall include a minimum of 20% usable common open space, landscaped areas and/or protected natural areas.*

**FINDING:** The Applicant states that the total area of the MUPD is 1,018,081 square feet or approximately 23.37 acres. The Applicant goes on to identify 482,892 square feet or approximately 11.08 acres of usable common space are provided, including the 3.36 acre wetland and associated 1.72 acre vegetative corridor located in the southeastern corner of the development. By this calculation (25.04 x 20%) only 5 acres of open space are required and there is no maximum allowed. With 11.08 acres of open space, the proposal more than doubles the minimum requirement. As proposed, compliance with the requirement of this section is demonstrated as met.

*J.* ***Pedestrian-orientation and circulation.*** *A MUPD shall include a transportation system that emphasizes pedestrian mobility and accessibility, and demonstrates an effective and convenient system of pedestrian facilities that provides connectivity throughout the MUPD and to adjacent properties. The transportation system shall identify existing and proposed pedestrian connections and may include a combination of sidewalks, multi-use pathways and trails.*

**FINDING:** Analysis of pedestrian orientation and circulation was previously provided where § §17.4.300 (B) & (C) and subsection (F) of this section were addressed. Compliance with the standard of this section can be assured through imposition of the conditions where that section was previously addressed.

*K.* ***Parking.*** *The base zone parking requirements apply except that shared parking is encouraged within the MUPD. Where the MUPD abuts land zoned for single-family residential development, common parking and maneuvering areas must be set back at least 20 feet from the lot line. No parking or vehicular circulation areas shall be located between the building and the street. Garages and off-street parking areas for residential developments shall be accessed by alleys unless otherwise approved by the Planning Commission.*

**FINDING:** *Residential Parking (Total):* The Applicant appropriately cites Oregon Administrative Rule ("OAR") 660-012-0430(2) "Reduction of Parking Mandates for Development Types" which identifies; cities within a metropolitan area that have not adopted land use regulations without parking mandates as provided in OAR 660-12-0405 through 660-012-0415, are subject to the following provision:

> *"Cities and counties may not require more than one parking space per unit in residential developments with more than one dwelling unit on a single legally-established property."*

By this metric, 386 parking spaces would be required to accommodate the proposed 384 residential units (362 apartments and 24 quadplexes). The rule does not impose a limitation or maximum on parking spaces to be provided and the Applicant has proposed 564 parking spaces (516 within the apartment complex and 48 within the quadplex development) to serve the residential portions of the development. As proposed, the standard of the prevailing Oregon Administrative Rule ("OAR") is demonstrated as met and the Applicant has provided 178 parking spaces more than required.

L. ***Water features.*** *Water features such as streams or ponds must be left in a natural state unless altered to improve the natural values of the water feature or to improve stormwater drainage. Water features and their buffers should be kept in common ownership.*

**FINDING:** The subject property contains an existing wetland that is incorporated into the open space uses of the proposal. CWS has reviewed the proposal and provided conditions of approval, applicable to preservation of the wetland area. Compliance with the requirement of this section is demonstrated as feasibly met.

M. ***Facilities and services.*** *It is the responsibility of the Applicant to provide all service facilities necessary for the functioning of the MUPD. Service facilities such as streets, water supply facilities, sanitary sewers and stormwater detention facilities must be dedicated to the public if they are to provide service to any property not included in the MUPD. However, the review body may approve private service facilities with the consent of the appropriate service provider.*

**FINDING:** Service provider letters have been provided by CWS, Forest Grove Light and Power and Engineering divisions demonstrating that facilities are available to accommodate the proposed development. Compliance with the requirements of this section is demonstrated as feasibly met.

N. ***Underground utilities.*** *All service facilities must be placed underground except those that by their nature must be on or above ground, such as fire hydrants and open watercourses. The Applicant is responsible for making the necessary arrangements with utility companies and other appropriate entities when installing all service facilities.*

**FINDING:** Upon approval, the Applicant will be required to adhere to the conditions, standards and specifications supplied by Forest Grove Light and Power (See Exhibit D). Compliance with the requirements of this section is demonstrated as feasibly met.

O. ***Construction to standards.*** *All service facilities dedicated to the public must be constructed to city standards. All private service facilities must be designed by a qualified civil engineer to city standards or comparable design life as determined by the City Engineer.*

**FINDING:** Upon approval, the Applicant will be required to adhere to the conditions, standards and specifications supplied by the City of Forest Grove Engineer (See Exhibit F). Compliance with the requirements of this section is demonstrated as feasibly met.

**§17.4.320(C) APPROVAL CRITERIA**

*The preliminary plan will be approved if the review body finds that the applicant has shown that **all** of the following approval criteria are met:*

1. *The plan fulfills the purpose for MUPDs stated in § 17.4.300;*

2. *The plan meets the submittal requirements of § 17.4.320B.;*

3. *Adequate public services exist or can be provided to serve the proposed MUPD; and*

4. *Where a tentative subdivision plat is requested, the requirements of Article 8 are met.*

**FINDING:** The development is proposed in five (5) phases, and while a summary of development to occur within each phase is provided, the actual schedule of phasing is not provided as required by §17.4.320 (B)(7)(a). Pursuant to §17.4.320, the proposal is currently within the "preliminary" plan review stage and Staff finds that a *tentative* phasing schedule can be proposed by the Applicant through this public hearing process. Therefore, the submitted proposal can demonstrate compliance with the requirements of subsections #1, #2, #3 and #4 above.

**2) PARTITION:**

**§17.6.060 – REVIEW CRITERIA**

*Approval of a tentative partition plat will be granted if the Director finds that the Applicant has met all of the following criteria:*

A. *The tentative partition plat complies with all applicable requirements for submittal;*

B. *The tentative partition plat complies with all applicable standards and design requirements of this Code;*

C. *Any special features of the site (such as topography, floodplains, wetlands, vegetation, historic sites) have been adequately considered and addressed in the design of the tentative plat;*

D. *All parcels shall be suitable for their intended use. No parcel shall be of such size or design as to be detrimental to the health, safety or sanitary needs of the occupants of such parcel or partition;*

E. *Development of any remainder of property under the same ownership can be accomplished in accordance with this Code;*

F. *Adjoining land can be developed or is provided access that will allow its development in accordance with this Code;*

G. *The proposed street plan provides safe, convenient and direct options for pedestrian, bicycle and vehicular circulation; and*

*H. Adequate public facilities are available or can be provided by the Applicant to serve the proposed partition.*

**FINDING:** Approval of the partition request is subordinate to approval of the MUPD. §17.4.305 – "Procedures" subsection (C) provides:

> *Concurrent land division. A MUPD may be filed and processed concurrently with a partition or subdivision application;* ***however, no land division shall be approved unless it is found to be consistent with the applicable MUPD****.*

The tentative/preliminary partition plat (sheet C180) demonstrates that the proposal meets the relevant criteria of this section and the requirements of Article 6 (subsection "G" is not applicable, there are no streets proposed within the development) and the relevant standards of Article 8 (§17.8.905). If the MUPD application were able to be approved, the partition could also be approved as proposed.

## 3) ARTICLE 5: SPECIAL PROVISIONS

### §17.5.125 TREES IN NATURAL RESOURCE AREAS
### §17.5.140 PROTECTION OF REGISTER TREES

**Finding:** The Applicant has provided a CWS, service provider letter and mitigation schedule which addresses any trees located within the wetland area and vegetative corridor. If the MUPD application were able to be approved, a condition of approval would require compliance with the standards, specifications and conditions provided in the CWS letter.

The subject property contains several Oregon White Oaks. One specifically, is found on the register of significant trees adopted by Council Ordinance. The White Oak of recognized significance is located in the southwestern region of the subject property. The Applicant has provided a tree protection plan (tree preservation and removal plan at sheet C150), in compliance with the standards of §17.5.140.

### §17.5.225 PROCEDURE FOR REVIEW OF PROPOSED DEMOLITION OR RELOCATION OF LANDMARKS

**Finding:** The subject property is currently developed with the "Alvin Clark Brown House" ("the house"), constructed in 1863 and added to the State of Oregon Historic Preservation Office ("SHPO") Historic Register Inventory in 2013 (See Exhibit J, attached hereto). The house is located in the southwestern corner of the subject property and will require removal to accommodate any proposed development at the site. The Applicant has not addressed the criteria of FGDC §17.5.225 within submitted findings, however, the Applicant identifies that they are "currently working with Friends of Historic Forest Grove to preserve and relocate the house to the site of the Alvin T. Smith House on Elm Street" (see page 6 of Applicant's findings).

Pursuant to §17.5.225:

> *"Prior to the demolition or relocation, in whole or in part, of any landmark, an application and plans shall be submitted to the Community Development Department for review and action by the HLB under Type III procedures."*

While the Applicant hasn't explicitly addressed the requirements of this section, as identified above, a relocation plan is being coordinated with Friends of Historic Forest

Grove. A **condition of approval** will require submittal and completion of the Type III application procedure to relocate the house prior to commencement of Phase 1 residential development.

## 4) DEVELOPMENT CODE TEXT AMENDMENT

**Summary of Text Amendment Request:**

The Applicant is requesting an amendment to the text of the Development Code, Table 4-1: Residential Density. Specifically, the request is to change the *Maximum Density* allowance for the NMU zoned property identified in Table 4-1 as *"Area 2 – Davidson"*. Currently, the Maximum Density identified is 13.80 units/net acre and the Applicant states that the request is for a minor increase to 15.50 units/net acre, an increase of only 1.7 units/net acre. This increase would accommodate the number of residential units (386) proposed through the MUPD portion of the application.

The subject site is approximately 24.91 acres in size and the current density maximum of 13.80 units/net acre would allow for 343.62, or 344 units. The proposed density increase would allow up to 386 units, a difference of 42 additional units. Due to the wetland and associated vegetative corridor, the proposal utilizes the allowance for a density transfer between parcels as identified by §17.4.315 (C).

The Applicant's findings compare the proposed density increase to the density allowances for all zones which allow multi-family development:

| Zone: | Maximum Units/Net Acre: |
|---|---|
| RML | 12 |
| RMH | **20.28** |
| NC | 8.71 |
| CC | **30** |
| TCC | **40** |
| TCT | **40** |
| NMU (Area 2 – Davidson) | 13.80 – ***15.5*** proposed |

The density which most closely aligns with the current proposal is that of the Residential Multi-Family High ("RMH") zone. While the subject property is immediately bordered by Single Family Residential (R-7) zoned properties to the west and south and unincorporated Washington County to the east, there is a significant amount of RMH property located in near vicinity (to the west and south) of the subject property. It should also be noted that density standards in all residential development zones have been altered by implementation of HB 2001 which allows for the development of needed housing in all residential zones, and essentially removes the previously imposed density standards specified within the varied residential zone districts.

As an additional consideration; the subject site is one (1) of only three (3) sites zoned NMU within the City. One of the sites (Area 3 – East David Hill Rd.) is currently under construction of the recently approved Davis Estates Planned Development, which does not include any commercial development. While the Davis Estates Subdivision contributes to the needed housing inventory within the city, because that site is split zoned the development proposal was able to be reviewed under the Planned Development ("PD") section and standards of the development code and was not required to incorporate any mixed uses or provide any neighborhood commercial services to the development and by default, to the surrounding communities. It should also be noted that the Davis Estates Subdivision only contributes single family dwellings

(detached or attached) that are intended for owner occupancy. There is still a need for median income individuals, new workforce, and new families to have entry into safe and somewhat affordable housing that is does not require them to qualify for a mortgage loan. At the date of authoring of this staff report, FreddieMac identifies the Primary Mortgage Market Survey rate of the previous week to be between 7.03% and 6.29%, for 30-year and 15-year terms respectively.[2]

The second site, located at the northwest edge of the city (Area 1 – David Hill), is undeveloped and has several site constraints that will make future development challenging, including wetlands, steep slopes and intervening ownership which will impede utility serviceability. Because of these factors, it is unknown when or if this property will be developed.

## § 17.2.620 PROCEDURE

*Text amendments are reviewed under the Type IV legislative procedure. Text amendments are adopted by ordinance and require final action by the City Council.*

**Finding:** The request for a Development Code Text Amendment is submitted and concurrently reviewed as part of this multi-part application and review. The other components of the application request; the MUPD and subordinate Partition, and the height Adjustment, would not otherwise be required to be reviewed by the City Council. However, because the Text Amendment for increased density, a Type IV legislative procedure is incorporated into the proposal, the City Council will have final decision on issuing approval or denial of all, or parts of the entire proposal.

## § 17.2.630 REVIEW CRITERIA

A. *The text amendment is consistent with relevant goals and policies of the Forest Grove Comprehensive Plan.*

**Finding:** The Applicant has provided a detailed analysis of how the proposal is consistent with the relevant goals and policies of the Forest Grove Comprehensive Plan.

Community Sustainability Policies:

> Community Sustainability Policy #9: *Support transportation connectivity through the Transportation System Plan, Engineering Design Standards and Development Code requirements to reduce vehicle miles traveled and encourage bicycling and walking to destinations.*
>
> Community Sustainability Policy #11: *Ensure that needed housing for all segments of the population in the community is met through land use policy.*

The subject site is situated adjacent to already developed residential lands and the commercial uses incorporated into a MUPD would serve not only the residents of the dwelling units within a MUPD but also the residents of surrounding development. Those existing surrounding households will be able to utilize those commercial services incorporated into a MUPD and as a consequence, will reduce vehicle miles traveled. As well, ODOT has requested improvements to a segment of the "Council Creek Regional Trail" where the subject property abuts Hwy 47. Whether or not the current MUPD proposal is able to be approved, it is assumed that this condition would be required by ODOT at the time of any proposed development of the property. This improvement

[2] https://www.freddiemac.com/pmms December 11, 2023

would also encourage utilization of the commercial uses within a MUPD and reduction in vehicle miles traveled to and from the site.

Increased density at the subject site would promote financial community sustainability. With increased density, the site can support a compact and land efficient development that provides interconnected land uses, as is the purpose of the NMU zone and the MUPD process. A higher density allowance can serve a greater number of the population of the City of Forest Grove.

Land Use Policies:

> *"The location of housing affects many aspects of our lives. The location of housing determines how far we have to commute to work, where our children play and whether or not we can walk or bicycle to stores and services. In addition, the amount of land available for development and land use regulation impact the cost of housing. The city of Forest [sic] will adopt policies and strategies to respond to identified issues and problems affection land use."*

While the proposal and review are not for a Comprehensive Plan Text Amendment, it is important to note that the last amendment to the Comprehensive Plan occurred in 2014, prior to creation and incorporation of the NMU zone. Therefore, the dwelling capacities/densities the NMU zone might potentially contribute to needed housing, were not contemplated. The residential zone density standards were identified in the table below:

| Zoning District | Density Standard |
|---|---|
| Suburban Residential | 1.0 dwellings per net acre |
| R-10 | 4.35 dwellings per acre |
| R-7 | 6.22 dwellings per net acre |
| R-5 | 8.71 dwellings per net acre |
| RML | 12.0 dwellings per net acre |
| RMH | 20.28 dwellings per net acre |

The NMU zone is identified as a "commercial" zone. Notwithstanding the foregoing, one of the primary purposes of the NMU zone is to incorporate residential development. The NMU zone can provide needed dwelling units that support the housing inventory within the city, and this site has demonstrated through provision of service provider feasibility letters, that service infrastructure (water, sewer & transportation facilities) are available.

Because this zone did not exist during the last Comprehensive Plan text amendment, the three "areas" previously mentioned were established and density standards provided within the text of the *Development Code*. With needed housing identified as a community and statewide issue, it is reasonable to consider amendment of the the text of the Development Code to allow for higher density at this site specifically, to be more productive in meeting community sustainability and housing goals, in a compact urban form. As previously identified, one (1) of the three (3) NMU sites in the city is already under development to provide primarily owner occupied single family dwelling units and the other site is unlikely to be developed and be able to provide needed housing in the near future. Allowing higher density within the Davidson site would provide a substantial number of rental units as required by the Metro housing rules, further addressed below where the standard of subsection (B) of this section is addressed.

*B. The text amendment is consistent with relevant statewide and regional planning goals, programs and rules.*

**Finding:** Land Use Policy #9 states:

> *"The City shall take into consideration the housing rules of the State Land Conservation and Development Commission when considering plan amendments affecting future development densities or the mix of housing types."*

As previously identified, the density standards of the NMU zone are only contemplated within the text of the Development Code and Staff would note that because of this, the statewide and regional planning goals, programs and rules may, perhaps, be the most applicable and relevant issues for consideration of this Development Code text amendment.

OAR 660-007-000, the Metropolitan Housing statute identifies:

> *"The purpose of this division is to ensure opportunity for the provision of adequate numbers of needed housing units and the efficient use of land within the Metropolitan Portland (Metro) urban growth boundary, to provide greater certainty in the development process and so to reduce housing costs.*
> *OAR 660-007-0030 through 660-007-0037 are intended to establish by rule regional residential density and mix standards to measure Goal 10 Housing compliance for cities and counties within the Metro urban growth boundary, and to ensure the efficient use of residential land within the regional UGB consistent with Goal 14 Urbanization."*

If the density increase were approved, the added housing would contribute to the 50% requirement of new construction mix required by Metro Housing Rule OAR 660-007-0030:

> *(1) Jurisdictions other than small developed cities must either designate sufficient buildable land to provide the opportunity for at least 50 percent of new residential units to be attached single family housing or multiple family housing or justify an alternative percentage based on changing circumstances.*

Further, OAR 660-007-0060 provides:

> *(1) The new construction mix and minimum residential density standards of OAR 660-007-0030 through 660-007-0037 shall be applicable at each periodic review. During each periodic review local government shall prepare findings regarding the cumulative effects of all plan and zone changes affecting residential use. The jurisdiction's buildable lands inventory (updated pursuant to 660-007-0045) shall be a supporting document to the local jurisdiction's periodic review order.*
>
> *(2) For plan and land use regulation amendments which are subject to OAR 660, Division 18, the local jurisdiction shall either:*
> *(a) Demonstrate through findings that the mix and density standards in this Division are met by the amendment; or*
>
> *(b) Make a commitment through the findings associated with the amendment that the jurisdiction will comply with provisions of this Division for mix or density through subsequent plan amendments.*

Although not considered within the current BLI, the density increase at the subject site would support the City of Forest Grove in meeting the 50% "housing mix" requirements at the time of the next periodic review. As well, on their first day in office, Governor Kotek

signed Executive Order No. 23-04 (See Exhibit B, attached hereto). The Order establishes an annual housing production rate within the state of Oregon of 36,000 homes per year to be constructed during each of the next 10 years.

**5) ADJUSTMENT**

§ 17.2.100 PURPOSE

*The adjustment process provides a mechanism by which the Director may make limited modifications to yard setback, height and lot coverage standards. Adjustment reviews provide limited flexibility for unusual situations if the proposed development continues to meet the intended purpose of the regulations.*

§ 17.2.10 PROCEDURE

*A. Requests for changes of less than 10% of the setback, height or lot coverage standard shall follow the Type I process.*

*B. Requests for changes from 10% to 20% of the setback, height or lot coverage standard shall follow the Type II process.*

*C. Requests for changes to standards other than setback, height or lot coverage, or which are for more than 20% of the setback, height or lot coverage standard are processed as variances under § 17.2.700.*

**Finding:** The Applicant is requesting a 20% adjustment to the height limitation of structures within the residential portions of the MUPD. Residential buildings (buildings outside the "Village Center") are limited to 35' in height. The proposal is appropriately submitted and reviewed under the Type II procedure.

§ 17.2.120 REVIEW CRITERIA

B. *Type II Adjustment Process.*

*1. The requested adjustment is from 10% to 20% of the setback, height or lot coverage standard;*

**Finding:** The Applicant requests an Adjustment for increase to the building height allowance of residential buildings within the NMU zone (Table 3-9, footnote [6]), currently limited to 35' in height. The Applicant wishes to construct the residential apartment complex buildings up to 42' in height, a 20% adjustment. The Applicant's request is appropriately reviewed under the Type II adjustment procedure.

*2. Granting the adjustment will be consistent with the purpose of the affected zoning district or meet or exceed the purpose of the standard to be modified;*

**Finding:** The requested adjustment is to allow for the residential apartment units to be constructed up to 42' in height to accommodate pitched (rather than flat) roofs. The proposed design allows for more parking area and open space to serve the residents of the complex, because development of the apartment units can then be accommodated in fewer structures with three (3) stories than would be accommodated by two (2) story structures that would cover more land area. As identified above, one of the primary purposes of the MUPD is to generate "compact urban form". The proposal for more compact vertical development helps to satisfy the intent of the MUPD.

The property is located within the Neighborhood Mixed Use ("NMU") zone, a commercial zone, intended for both commercial and medium to high density residential use. This

zone is similar to the Community Commercial ("CC") zone which also allows for development of commercial and residential uses (both multifamily and quadplexes) in kind with the subject property, and all buildings in the CC zone (commercial or residential) are allowed to be constructed to 45' in height. As well, the NMU zone is similar to the Residential High ("RH") zone which allows for slightly higher dwelling density and also allows construction of structures to be 45' in height.

3. *If in a residential zone, the adjustment will not significantly detract from the livability or appearance of the residential area. If in a commercial or industrial zone, the adjustment will be consistent with the desired character of the area;*

**Finding:** The character of the surrounding area as a whole, is residential. However, the southern property boundary is the only boundary that directly abuts residentially zoned property, the rest of the land area is fully surrounded by public right of way. Existing residential development to the south is most densely located south of the wetland ("Cook Village") which provides a wide buffer between the proposed apartment complex structures and the entire eastern portion of the southern property boundary. The submitted site plan shows that there is only one structure (Building #18) proposed in proximity (20') of the southern property boundary. The mapped wetland extends southwesterly of Building #18 onto and across the property existing southerly, which is owned by the Cook Village HOA. Review of the Cook Village subdivision approval identifies that that land area, known as "Tract A" was preserved as a natural resource area and therefore, no development is likely to occur on that property, as well, it is landlocked with no practical or physical access available to make it eligible for development as is TL 2900 to the west of it.

4. *If more than one adjustment is requested, the cumulative effect of the adjustments shall result in a project which is consistent with the overall purpose of the zone; and*

**Finding:** Only one adjustment is proposed, the criterion of this section is not applicable.

5. *Any impacts resulting from the adjustment are mitigated to the extent practical.*

**Finding:** No impacts are anticipated however, as addressed above, mitigation is accomplished by way of the existing wetland natural area which provides ample buffering of the singular building proposed in any proximity to a shared common boundary.

## IV. SUMMARY

The Applicant has requested a four (4) part concurrent application review for a MUPD design proposal with concurrent partition review, a request to amend the text of the development code to increase the maximum density allowance in the "Area 2 - Davidson" NMU zone, and a request for a 20% adjustment to increase the maximum height allowance from 35' to 42' for structures situated outside of the "Village Center" of a MUPD.

Attributes:

1) Increased density proposed for residential development helps city to meet Metro housing requirements and Governor's 10-year housing production strategy

(avoids future external government mandate which may be imposed to meet need in coming years);
2) More parking provided than required by state law to serve residential use;
3) Addition of commercial development to provide needed services in a heavily and quickly developing residential area;
4) Proximity to existing services and businesses in Town Center Core as well as easy access to Hwy 26 for commuters;
5) Potential preservation of historically significant structure (Alvin Brown House);
6) Preservation of White Oak Grove and protected tree; and
7) Preservation of wetland and associated vegetative corridor.

Concerns:

1) Items identified by neighboring property owners (See Exhibit C, attached hereto) and staff's responses addressing concerns identified in correspondence from neighboring property owners, including but not limited to:
   i) Parking concerns;
   ii) Increased traffic;
   iii) What will happen to historic home;
   iv) Community safety; and
   v) Impact to surrounding habitat areas.

# V. RECOMMENDATION

Staff finds that the individual application proposals concurrently reviewed, have demonstrated compliance, or feasibility for compliance through imposed conditions of approval. The Planning Commission must make the penultimate recommendation to the City Council who will have the authority to approve or deny all or parts of the four (4) applications.

# VI. ALTERNATIVES

*The Planning Commission has the following alternatives:*

- Recommend APPROVAL of the MUPD and tentative partition with certain requested alterations / additional conditions.
- Recommend DENIAL of the MUPD and tentative partition as proposed, explicitly stating reasons for doing so.
- Recommend DENIAL of the Adjustment request as proposed, explicitly stating reasons for doing so.
- Recommend DENIAL of the Text Amendment request as proposed, explicitly stating reasons for doing so.
- Continue the matter to a date certain for further consideration.

# VI. PROPOSED CONDITIONS OF APPROVAL

1. The Applicant is bound to the project description and all representations made by the Applicant during the application and decision-making proceeding.
2. This preliminary plan approval is valid for a period of three (3) years from the effective approval date. The Applicant may file for an extension in accordance with the provisions of DC §17.1.135(E). No single extension of time shall exceed a one-year period. Extensions shall not exceed a total of four years from the effective date of the initial approval.

3. The Applicant shall work with the City of Forest Grove Public Works Department to determine a safe location to install a safe pedestrian crossing, to be constructed in conformance with any and all standards and specifications defined by the Public Works department.
4. The Applicant to consult with ODOT regarding the connection from TL 600 where the Quadplexes are proposed or alternatively provide documentation from ODOT that no upgrades will be required, prior to issuance of building permits for any of the proposed quadplexes on tax lot 600.
5. Install the requested connectivity to the Council Creek Trail via one (1) pedestrian pathway, located between buildings #2 and #4 of the commercial development as shown on plans sheets C190 and C200.
6. The Applicant shall complete the Type III application process to relocate or demolish the "Alvin Clark Brown House" prior to issuance of demolition permit or commencement of any construction activity which serves the proposed development.
7. A demolition permit shall be obtained from the Building Division prior to demolishing any structures on site.
8. Ongoing compliance with the 50,000 square foot structural size limitation and compliance with the commercial and institutional use minimums and maximums provided within Table 4-2.
9. Any future proposed commercial use within the Village Center shall comply with use Table 3-8.
10. Detailed plans and specifications, substantially in conformance with those submitted for preliminary review, shall be submitted and demonstrate compliance with the conditions of approval, standards and regulations adopted by the City of Forest Grove, and/or all other agencies that have jurisdiction.
11. The project shall proceed in substantial conformance but with minor modifications, with the land use and civil plans titled "Browns Farm Mixed Use", as prepared by "3J Consulting" and "Shapiro Didway" with publish date of October 20, 2023, except as may be modified by the conditions contained herein, and shall proceed in accordance with all applicable and relevant sections of the Forest Grove Development Code.
12. All plans shall be coordinated for consistency by the Applicant. Any minor change or modification to one particular plan shall require the corresponding and coordinated revisions on all other plans. All plans shall be consistent with that approved by the Community Development Department. The Applicant shall be responsible for correcting any inconsistency which may occur through error or omission during plan preparation or construction.
13. The Applicant shall continue to comply with all applicable city building and development standards, including all dimensional standards and public works specifications.
14. The development shall comply with all relevant provisions of Article 8 of the Development Code.
15. Installed landscaping shall be consistent with the proposed landscape plans and the requirements identified in the Clean Water Services ("CWS") service provider letter issued April 4, 2023 (CWS File Number 23-000887). Any modifications to the plans shall require review and approval of the Community Development Department. Any modifications to the plans within the protected area shall require review and approval and revised documentation from CWS.
16. The development shall comply with all applicable requirements of §17.5.035 – Natural Resource Area Standards.
17. All building plans submitted (residential, associated residential accessory structures; the field house and mailbox kiosk, and commercial units) shall be in

substantial conformance with the style(s) and materials presented within the design guidebook submitted and reviewed with the proposal.

18. Apartment Building Setbacks:
    i) The minimum required front yard setback shall be 20 feet;
    ii) The minimum required street side yard setback shall be 20 feet.
    iii) The minimum required interior yard setback shall be 10 feet
    iv) The minimum required rear yard setback shall be 15 feet.
19. "Quadplex" Building Setbacks:
    v) The minimum required front yard setback shall be 10 feet;
    vi) The minimum required street side yard setback shall be 10 feet.
    vii) The minimum required interior yard setback shall be 10 feet
    viii) The minimum required rear yard setback shall be 10 feet.
20. Parking areas shall maintain a minimum setback of 20 feet from the southern property boundary of proposed lots 3 and 4.
21. No building projections (roofs or foundations) shall be permitted in the front yard or street side yard public utility easement required by §17.8.905(E)(1).
22. Compliance with the attached Light & Power Department Standards and Special Conditions, dated August 15, 2023 (Exhibit D).
23. Compliance with the attached Fire Department Standards and Special Conditions, dated September 22, 2023 (Exhibit E).
24. Compliance with the attached Engineering Standards and Special Conditions, dated September 11, 2023 (Exhibit F).
25. Compliance with the attached Clean Water Services ("CWS") service provider letter dated April 4, 2023 (Exhibit G).

## VII. EXHIBITS

The following exhibits were received and entered into the record as evidence for this application at the time this staff report was written. Exhibits of evidence received after the date of this report will be marked beginning with the next consecutive letter and will be entered into the record at the time the Public Hearing is opened, prior to oral testimony.

| | |
|---|---|
| **Exhibit A** | Application Materials, prepared and submitted by the Applicant |
| **Exhibit B** | Governors Executive Order No. 23-04 |
| **Exhibit C** | Development Code Standards and Specifications |
| **Exhibit D** | Light and Power Department Standards and Special Conditions |
| **Exhibit E** | Fire Department Standards and Special Conditions |
| **Exhibit F** | Engineering Department Standards and Special Conditions |
| **Exhibit G** | Clean Water Services, service provider letter containing Standards and Special Conditions |
| **Exhibit H** | Crosswalk Correspondence and Feasibility |
| **Exhibit I** | Washington County Assessment Data |
| **Exhibit J** | Alvin Clark Brown House Historic Registry |
| **Exhibit K** | Legal Descriptions provided by Allen Kohn (#58964PLS) |
| **Exhibit L** | Comments/Concerns provided by neighbors (11/2023) |
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**GENERAL INFORMATION**

| | |
|---|---|
| Applicant: | **J.T. Smith Companies, LLC.**<br>5285 Meadows Road, Suite 171<br>Lake Oswego, OR 97035<br>Contact: Jesse Nemec<br>Phone: 503.730.8620<br>Email: jnemec@jtsmithco.com |
| Planning Consultant: | **3J Consulting, Inc.**<br>9600 SW Nimbus Avenue, Suite 100<br>Beaverton, OR 97008<br>Contact: Mercedes Serra<br>Phone: 503.946.9365 x211<br>Email: mercedes.serra@3j-consulting.com |
| Civil Engineer: | **3J Consulting, Inc.**<br>9600 SW Nimbus Avenue, Suite 100<br>Beaverton, OR 97008<br>Contact: Aaron Murphy<br>Phone: 503.946.9365 x218<br>Email: aaron.murphy@3j-consulting.com |
| Architect: | **Axis Design Group**<br>11104 SE Stark Street<br>Portland, OR 97216<br>Contact: Dean Hoque<br>Phone: 503.284.0988<br>Email: deanh@axisdesigngroup.com |
| Landscape Architect: | **Shapiro Didway**<br>1204 SE Water Ave, Suite 21<br>Portland OR 97214<br>Contact: Meetal Salunkhe<br>Phone: 503.232.0520<br>Email: meetal@shapirodidway.com |

**SITE INFORMATION**

| | |
|---|---|
| Parcel Number: | 1N331A000100 & 1N331A000600 |
| Address: | 3081 Sunset Drive |
| Gross Site Area: | 24.91 acres |
| Existing Zoning Designation: | Neighborhood Mixed Use - NMU |
| Existing Use: | Single-Family Residential/Vacant |
| Surrounding Zoning: | The properties to the south and west are located within the City of Forest Grove and are zoned Single Family R-7. The properties to the north and east are located in Unincorporated Washington County and are zoned Exclusive Farm Use (EFU). |
| Street Classification: | Sunset Drive is classified as a Collector. Highway 47 is classified as a Principal Arterial. |

## INTRODUCTION

### APPLICANT'S REQUEST

J.T. Smith Companies, LLC ("the Applicant") seeks approval of an application for a concurrent Preliminary Plan Mixed-Use Planned Unit Development ("MUPD"), Text Amendment, Type II Adjustment, and Preliminary Partition. This narrative describes the proposed development and demonstrates compliance with the relevant approval standards of Forest Grove's Title XVII Development Code ("FGDC"), "Article 2: Land Use Reviews", "Article 3: Zoning Districts", "Article 4: Overlay Districts", "Article 5: Special Provisions", "Article 6: Land Divisions", "Article 7: Miscellaneous Provisions", and 'Article 8: General Development Standards".

Text Amendments are reviewed under the Type IV Legislative process. The City Council will render the Type IV decisions after a public hearing on the application is held. Generally, Preliminary Plans for MUPDs are reviewed and approved by Planning Commission and Preliminary Partitions and Adjustments are reviewed and approved by Planning Staff; however, because these applications are being submitted concurrently, we anticipate City Council will render the decision for all four simultaneously.

### SITE DESCRIPTION/SURROUNDING LAND USE

The subject site is 24.91 acres in size and is located at 3081 Sunset Drive. The site is identified as tax lot 1N331A000100, a 23.37-acre parcel, and 1N331A000600, a 1.54-acre parcel. The property is located within the City of Forest Grove and is zoned Neighborhood Mixed Use ("NMU"). The site has sloping topography which generally slopes towards the southeastern end of the property. The site is the location of the Alvin Clark Brown House, a historic home, which is located in the southwest corner. The applicant is collaborating with Friends of Historic Forest Grove to preserve and relocate the house to the site of the Alvin T. Smith House on Elm Street.

The site fronts on Highway 47 and Sunset Drive, with access from Sunset Drive. The properties to the south and west are located within the City of Forest Grove and are zoned Single Family R-7. The properties to the north and east are in Unincorporated Washington County and are zoned Exclusive Farm Use (EFU). The site is abutted by single-family homes to the south and west. A wetland and associated vegetative corridor are in the southeast corner of tax lot 1N331A000100. A small grove of Oregon White Oak trees is located at the center of the site. An Oregon White Oak tree identified on the City's Register of Significant Trees is located at the southwest corner of the site.

## PROPOSAL

### *Preliminary Plan Mixed-Use Planned Unit Development (MUPD)*

The NMU zone is subject to Mixed-Use Planned Development (MUPD) development requirements. The Applicant is proposing a MUPD on the site that will include 4.0 acres of commercial development, and a diversity of housing types. The various housing types include studios, one-, two-, and three-bedroom apartments, with 120 ground floor units suitable for seniors and others with mobility challenges, and 242 walk-up units. In addition, 24 row houses will be constructed on the northern portion of the site. The proposed planned development preserves a 3.36-acre wetland and a 1.72-

acre vegetative corridor, and Tabitha Moffat Brown Pioneer Park, a 0.96-acre park which will feature an Oregon White Oak grove located in the center of the site. The park will also include walking trails, picnic and gathering areas, play structures and courts. Smaller open space and recreation areas will be dispersed throughout the development and will include an entry green space that will highlight a registered significant white oak tree and will include walking paths, benches, and the community mailbox. Additional on-site amenities for residents include a field house building, which will serve as a community building and will include indoor sports courts, a party room, a technology room, a workout room, rental offices, and covered picnic space. The multi-family residential parking area will have 516 parking spaces, and 48 spaces are provided for the row houses. Parking will include both surface parking and rentable garage spaces dispersed throughout the site. A total of seventy garage spaces will be available within seven two-story garage buildings. The second story of each garage building will provide rentable storage areas for tenants.

Pedestrian pathways will connect all buildings with the surrounding parking areas, open spaces and recreation areas, city sidewalks and walking paths, and will provide connection between the residential and commercial uses on site. The proposed commercial sites will include neighborhood scale commercial development consistent with the allowed uses in the NMU zone. The applicant provided a design guidebook and landscape plan for the proposed development which will coordinate the architectural styles, landscaping, building forms and building relationships to create a cohesive neighborhood.

The proposed development will be constructed in five phases. A summary of each phase is provided below.

| Phase | Lot | Phase Acreage | Proposed Zoning Designation | Proposed Development |
|---|---|---|---|---|
| Tax Lot: 1N331A000100 | | | | |
| R1 | Lot 3 | 6.45 acres | NMU | Residential 128 units |
| R2 | Lot 4 | 3.76 acres | NMU | Residential 108 units |
| R3 | Lot 4 | 3.96 acres | NMU | Residential 126 units |
| Resource Area | Lot 4 | 5.42 acres | NMU | None |
| C1 | Lot 2 | 3.77 acres | NMU | Commercial |
| Tax Lot: 1N331A000600 | | | | |
| R1A | Lot 1 | 1.54 acres | NMU | Residential 24 row houses |

Residential Phases:

**Phase R1** will be comprised of 6.45 acres of residential development in the NMU zone. The R-1 phase will include an access drive (0.23 acres) that extends across the commercial lot which will be completed as Phase C-1. A total of 126 units are proposed in five garden style apartment buildings and two units above the field house building. Phase R-1 will include the field house building, one garage buildings, both entry drives, the entry greenspace, and a portion of Tabitha Moffat Brown Pioneer Park. The total open space provided across all three residential phases will be 482,892 square feet. Phase R-1 will include 196 surface parking spaces and ten garage parking spaces, for a total of 206 spaces.

**Phase R2** will be comprised of 3.76 acres of residential development in the NMU zone. A total of 108 units are proposed in four garden style apartment buildings. Phase R-2 will include four garage buildings and a portion of Tabitha Moffat Brown Pioneer Par. The total open space provided across all three residential phases will be 482,892 square feet. Phase R-1 will include 121 surface parking spaces and forty garage parking spaces, for a total of 161 parking spaces.

**Phase R3** will be comprised of 3.96 acres of residential development in the NMU zone. A total of 108 units are proposed in five garden style apartment buildings. Phase R-2 will include two garage buildings and a portion of Tabitha Moffat Brown Pioneer Par. The total open space provided across all three residential phases will be 482,892 square feet. Phase R-3 will include 129 surface parking spaces and twenty garage parking spaces, for a total of 149 spaces.

**Phase R1A** will be comprised of 1.54 acres of residential development with 24 row houses. A total of 48 parking spaces to serve the Phase R1A residential development are proposed. The site will have approximately 21,991 square feet of landscaped open space.

Commercial Phases:

**Phase C1** will be comprised of 3.77 acres (4.0-acre parcel) of commercial development and established as the Village Center of the MUPD. The commercial phase does not include the access drive which will be constructed under Phase R-1. The site will include approximately 30,000-40,000 square feet of flexible commercial development. A total of 152 parking spaces to serve the commercial development are proposed. The commercial site will have approximately 48,280 square feet of landscaped open space.

***Text Amendment***

The Applicant is requesting that the Director initiate a text amendment to Forest Grove Development Code Section 17.4.315 Table 4-1. The maximum density for the NMU site identified as *Area 2 – Davidson* is 13.8 units/net acre. The proposed text amendment would increase the maximum density of the site to 15.50 units/ acre, an increase of 1.7 units/acre. This density calculation includes the allowable transfer of density from the natural resource area. The site has a net development area of 19.83 acres. The proposed 386 units on the site would provide a net density on site of 19.47 units/acre. The proposed text amendment would allow for 386 residential units, whereas the current text would only allow 343 units.

| Table 4-1: Residential Density | | | |
|---|---|---|---|
| NMU Zoned Area | Minimum Density | Target Density | Maximum Density |
| Area 1 – David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 2 – Davidson | 9.60 units/net acre | 12 units/net acre | ~~13.80 units/net acre~~ **15.50 units/net acre** |
| Area 3 – East David Hill Road | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

***Preliminary Partition***

The applicant is proposing a preliminary partition of Lot 100 to create three new lots identified as Lot 2, Lot 3, and Lot 4. Lot 2 will be a 4.00-acre commercial lot which will be constructed as Phase C1. Lot 3 is a 6.22-acre parcel which will be developed with 128 residential units as Phase R1. Lot 4 is a 13.15-acre parcel which will be developed with 234 residential units in two phases. Phase R2 will have 108 units. Phase R3 will have 126 units.

| Lot | Lot Size | Zoning Designation | Proposed Development | Phase |
|---|---|---|---|---|
| Tax Lot: 1N331A000100 | | | | |
| Lot 2 | 4.00 acres | NMU | Commercial | Phase C1 |
| Lot 3 | 6.22 acres | NMU | Residential 128 units | Phase R1 |
| Lot 4 | 13.15 acres | NMU | Residential 108 units<br>Residential 126 units | Phase R2<br>Phase R3 |

**APPLICABLE CRITERIA**

The following sections of Forest Grove's Development Code have been extracted as they have been

deemed to be applicable to the proposal. Following each **bold** applicable criteria or design standard, the Applicant provides a series of draft findings. The intent of providing code and detailed responses and findings is to document, with absolute certainty, that the proposed development satisfies the approval criteria for a Preliminary Plan Mixed-Use Planned Unit Development ("MUPD"), Text Amendment, Adjustment, and Preliminary Partition.

**ARTICLE 2: LAND USE REVIEWS**

**DEVELOPMENT CODE TEXT AMENDMENT**

**17.2.600 PURPOSE.**

**The Forest Grove Comprehensive Plan will be amended from time to time to keep it consistent with the changing needs and desires of the community. It may also be necessary to amend the text of this Code to implement the goals and policies of the Comprehensive Plan and to comply with regional and statewide plans and programs.**

**This subarticle provides standards and criteria for amending the text of the Development Code. The process for amending the Comprehensive Plan is different and is discussed in that document.**

**17.2.610 INITIATING A TEXT AMENDMENT.**

**Amendments to the Development Code text may be initiated by the Director, the Planning Commission or by the City Council. Any person may request that the Director or Planning Commission initiate a text amendment. Text amendments initiated by a review body are made without prejudice toward the final outcome.**

**Finding:** The Applicant is requesting that the Director initiate a text amendment to Forest Grove Development Code Section 17.4.315 Table 4-1. The maximum density for the NMU site identified as *Area 2 – Davidson* is 13.8 units/net acre. The proposed text amendment would increase the maximum density of the site to 15.50 units/net acre, an increase of 1.70 units/acre.

| Table 4-1: Residential Density | | | |
|---|---|---|---|
| NMU Zoned Area | Minimum Density | Target Density | Maximum Density |
| Area 1 – David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 2 – Davidson | 9.60 units/net acre | 12 units/net acre | ~~13.80 units/net acre~~ **15.50 units/net acre** |
| Area 3 – East David Hill Road | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

The Applicant has provided the required materials to initiate a text amendment.

**17.2.620 PROCEDURE.**

**Text amendments are reviewed under the Type IV legislative procedure. Text amendments are adopted by ordinance and require final action by the City Council.**

**Finding:** The Applicant understands that a text amendment is reviewed under the Type IV legislative procedure and that the City Council is the final decision maker.

**17.2.630 REVIEW CRITERIA.**

**A. The text amendment is consistent with relevant goals and policies of the Forest Grove Comprehensive Plan.**

**Finding:** The Forest Grove Comprehensive Plan does not provide a density requirement for the comprehensive plan designation *Neighborhood Mixed Use*. Therefore, the proposed text amendment does not require a comprehensive plan amendment. The relevant goals and policies of the Forest Grove Comprehensive Plan have been identified and addressed below.

***Community Sustainability Goals***

***3. Promote financial sustainability through a compact and land efficient development pattern intended to reduce long term costs for providing municipal services.***

**Finding:** The proposed text amendment to increase the maximum density of the Davidson Property, identified as "Area 2" in Table 4-1 of Section 17.4.315 will promote a compact and land efficient development pattern, reducing the long-term cost of providing municipal services. The proposed mixed-use development will include a 1.54-acre residential development with 24 row houses, a 4.0-acre commercial development, and a 19.34-acre multi-family residential development with 362 units. The proposed residential density will be 15.50 units/ gross acre for the entire MUPD, which includes a transfer of density from the natural resource area. The site is serviceable by existing municipal services. Required system upgrades and extensions to serve the development will be at the expense of the developer. The City's street network surrounding the site includes Highway 47, a principal arterial and Sunset Drive, a collector road. Both roads meet the City's design requirements and do not require additional improvements. The proposed development does not require new public streets.

The subject site is large enough to accommodate the proposed development and meet the City's site design requirements. The site will include 4.62 acres of open space in addition to the preservation of a 3.36-acre wetland and 1.72-acre vegetative corridor. The proposed development is a compact and land efficient development. Multi-family and row house residential uses are allowed in the RML and RMH zones and as part of a mixed-use development in the NC, NMU, CC, TCC and TCT zones. The proposed density of 15.42 units/acre is consistent with the allowed density in multi-family zones. This design promotes fiscal sustainability by maximizing the efficiency of a mixed-use project with residential, commercial and open space preservation uses, and the modest density increase will maximize the efficient use of the existing and proposed infrastructure.

| Zone | Multi-family Permitted | Max. Density (units/acre) |
|---|---|---|
| Residential Multifamily Low (RML) | P | 12.0 |
| Residential Multifamily High (RMH) | P | 20.28 |
| Neighborhood Mixed Use | P | 15.50 (proposed) |
| Neighborhood Commercial | P | 8.71 |
| Community Commercial | P | 30 |
| Town Center Core | P | 40 |
| Town Center Transition | P | 40 |

***7. Promote interconnected land uses that encourage diverse, accessible, and proximate land uses that promote active living and access to vital services including employment, education, and healthy food.***

**Finding:** The subject site is zoned NMU. The proposed mix of uses on site include multi-family residential, commercial and retail spaces, natural areas, and open space recreation spaces. The proposed text amendment will allow for an increase in residential density on the site, which will provide a greater number of residents in an area where a mix of uses to serve the residents will be available and accessible. The development will include both pedestrian and vehicular circulation systems that promote connection between residential and retail spaces on site. The on-site pedestrian and vehicular circulation systems will connect to the larger city systems which provide connection to nearby Pacific University, the Forest Grove town center and nearby residential lands.

***8. Create complete neighborhoods, through land use regulations, with housing, recreational opportunities, retail, services and employment nearby.***

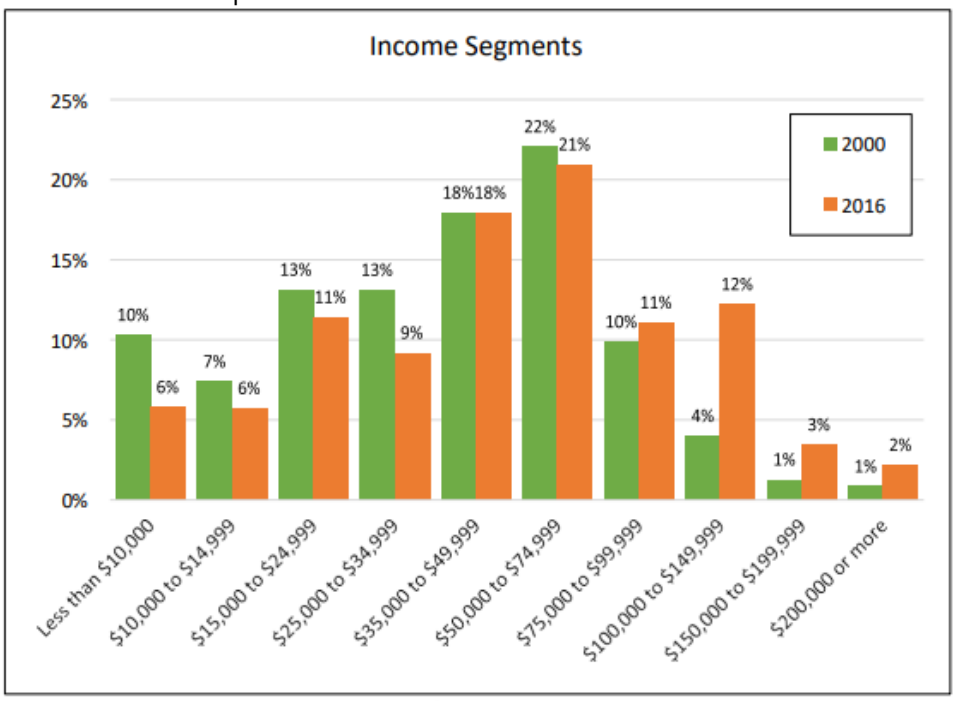
**Finding:** The proposed neighborhood is complete because it combines multi-family residential, commercial and retail spaces, natural areas, and open space recreation spaces. The proposed text amendment will allow for an increase in residential density on the site, which will allow a greater number of residents to easily access the retail services, and the open space areas. The development will include both pedestrian and vehicular circulation systems that promote connection between the on-site uses. The on-site pedestrian and vehicular circulation systems will connect to the larger city systems which provide connection to Pacific University, Forest Grove High School, Harvey Clark Elementary School, Hazel Sills Park, Lincoln Park, the Forest Grove Town Center and surrounding residential lands all located within a mile of the site.

***9. Foster the preservation, construction and maintenance of an adequate supply of healthful, affordable, resource-efficient, and inclusive housing***

**Finding:** Modern construction codes and techniques utilize materials and energy more efficiently than ever, producing homes that are better insulated and energy efficient than ever, with more attention paid to cleaner indoor air quality. The residential portion of Brown's Farm utilizes shared walls, floors, ceilings, roofing, and foundation to house families more efficiently than traditional single family detached or even townhome construction. Cost efficient construction is the first step in housing affordability.

The proposed text amendment will allow for an increase in residential density on the subject site, in order to provide a portion of the additional rental housing that meets the needs identified in the City's 2019 Housing Needs Analysis ("HNA"). The applicant is proposing 362 multi-family units on the site, with a mix of one-, two-, and three-bedroom units, as well as 24 row houses with a mix of two and three bedrooms and attached garages. According to the HNA, The current inventory of rental housing in Forest Grove primarily consists of units priced at $500 to $1,250 per month. This results in a gap in market supply for households that earn between $50,000 and $75,000 who could likely afford newer or larger rental units priced at $1,250 to $1,875/month. The proposed development would provide 386 units of renter-occupied housing that would serve this identified mid-range population. Per the 2019 HNA, the City has a rental housing vacancy rate below 5%, which is considered to be low relative to many

communities. The HNA identifies a "significant need for market rate owner and rental housing units to meet demand by households earning between 80% and 120% of the median family income". Per the City's HNA, Forest Grove is an attractive location for virtually all housing segments, ranging from off-campus housing for students, entry-level homeowners, retirees, and renters seeking good quality workforce housing. Much of this demand can be addressed with the proposed new apartments, and the proposed row houses which may be for renter or owner occupancy. Brown's Farm meets the need for housing within the Metro UGB at price ranges and rent levels that are affordable to households within Washington County with a variety of incomes. The studios will be the most affordable, and the row houses are the largest type of housing and will be the most expensive.




Source: US Census, American Community Survey, Johnson Economics

*Figure 1: Forest Grove Household Income Cohorts: 2000 and 2016*
*Forest Grove Economic Opportunities Analysis, Figure 3.8, 2018*

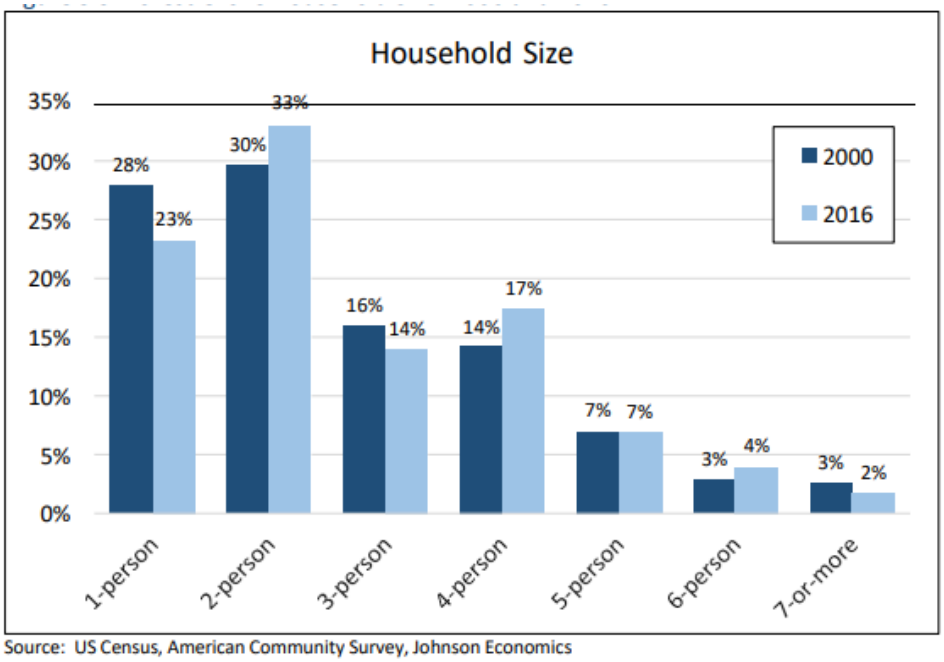



*Figure 2: Forest Grove Household Size: 2000 and 2016*
*Forest Grove Economic Opportunities Analysis, Figure 3.9, 2018*

The HNA findings indicate that Forest Grove currently has an adequate residential land supply within its UGB to accommodate the 20-year forecast for housing needs based on land use designations shown on the Forest Grove Comprehensive Plan map. It should be noted, however, not all of this land is currently available for development. Annexation of the area within the UGB north of David Hill Road is required before development occurs. The timing of annexation is controlled by individual property owners. Therefore, the timing of development is uncertain. In addition to annexation, lack of infrastructure west of Thatcher Road and north of David Hill Road is an impediment to development. Typically, extension of infrastructure occurs incrementally when land is developed. This means timing of development is largely controlled by property owners adjacent to existing infrastructure unless a property owner chooses to extend infrastructure at their expense, or the City extends infrastructure ahead of development. In addition to the considerations noted above the supply of approved subdivision lots is low limiting short term development.

Significant changes have occurred since the latest Housing Needs Analysis was updated in 2019. Through and beyond the pandemic, employees and employers both have many reasons to leave central cities for quieter and more comfortable communities in the suburbs, increasing residential demand in communities like Forest Grove. This puts pressure on housing supply, and thus the cost of housing increases. The second step in housing affordability is supply that adds competition in the market.

Forest Grove has unique demographic challenges with an aging population and growing University campus. The proximity of the proposed development to Pacific University must factor in the inherent housing draw. With a current student body of over 4,000 students, and an on-campus housing supply of 409 units that includes 886

beds, only 22 percent of the student body is physically capable of living on campus, providing additional competition for rental housing elsewhere in the community.

With housing costs rising with inflation as well as interest rates, downsizing is a growing trend, especially among seniors as fixed incomes become less sustainable. Brown's Farm proposes 120 ground-floor units, containing 208 bedrooms, which are either ADA accessible or adaptable. This provides more housing options for individuals desiring or needing to eliminate stairs, steps and reach challenges.

In 2021, the median household income in Forest Grove was $73,499 per year. A common metric for determining housing affordability of a community is to look at housing costing no more than 30 percent of 80 percent of the median household income, meaning that a family making only 80% of the median income in Forest Grove should spend no more than $1,500 per month on rent or home ownership. With mortgage rates currently around seven percent, that monthly budget for mortgage, property tax and homeowner's insurance would allow a family to afford a home purchase of $234,000, provided that they have a 20 percent down payment of $46,800. At the time of this finding, there are zero habitable homes listed for sale in Forest Grove less than $234,000 that would qualify for a conventional mortgage. There are, however, a few vacant lots available in a slightly higher price range of up to $250,00. Therefore, the only housing option would be an apartment or home rental. The applicant has found there are currently five rental units available in the City at or below $1,469 per month, and approximately double that figure available when the search range is increased to $1,600 per month, further evidencing that supply is lacking. If the Brown's Farm residential units were constructed and leasing today, the projected rents would start in the $1,300 per month range. Furthermore, based on the applicant's other rental property in Forest Grove, approximately 15 percent of the current residents are utilizing Section 8 housing choice vouchers to supplement income available for rent, and Brown's Farm will also be constructed to the standards required to meet Section 8 voucher qualifications. The text amendment will help ensure an adequate supply of modern and energy-efficient housing that is affordable to Forest Grove residents.

***21. Promote efforts to improve access to housing meeting household needs.***

**Finding:** The 2019 Forest Grove Housing Needs Analysis ("HNA") identifies the need for housing in all segments, including housing for students and renters seeking good quality work force housing. The current rental housing inventory in Forest Grove consists of units priced between $500 to $1,250 per month, creating a gap in market supply for households earning between $50,000 and $75,000 who could afford newer and larger rental units. The proposed development would provide 362 rental apartments, plus 24 row houses which may be for renters or owners. These residential units meet an identified need for student and workforce housing for those who are able to afford a variety of different size apartments, and row houses, which the HNA identifies as not currently available in Forest Grove.

***22. Support efforts to increase transit accessibility throughout the community by establishing minimum development densities necessary to provide cost-effective transit service.***

**Finding:** The subject site is located within a half mile or less of several GroveLink transit stops. Both the West Loop line and East Loop line are located within walking distance of the site and provide regular transit service within the City limits and for transfer to the #57 TriMet Frequent Service Line providing service from Forest Grove to the Beaverton Transit Center. The TriMet Pacific and Cedar stop (ID 4275) is located within a mile of the subject site. The proposed text amendment will allow for a higher density of residential uses within walking or biking distance of both local transit and regional rapid transit lines, providing needed support for cost-effective transit services.

***Community Sustainability Policy Measures***

***11. Ensure that needed housing for all segments of the population in the community is met through land use policy.***

**Finding:** The Forest Grove Comprehensive Plan includes land use policies that support housing in mixed use areas and describes the mixed-use zone location factors as "*areas where a mixture of residential, office and retail uses are appropriate to create complete neighborhoods or provide needed services and housing."* The 2019 Forest Grove HNA identifies multifamily rental housing for college students and middle-income earning renters as a need within the City. The proposed text amendment will provide for an increase in density on the site to develop multi-family residential rental units within a mile of Pacific University and the City Center which serves the identified need. The City of Forest Grove has three NMU Zoned Areas; Area 1 – David Hill, Area 2- Davidson, and Area 3 – East David Hill Road. Details of each NMU site have been provided below.

Area 1 – David Hill is located within the limits of the David Hill Planning Area (DHPA), an area that is significantly constrained by steep slopes and that has been identified as requiring costly infrastructure improvements to support any future development.

Area 2 – Davidson is the subject site of this proposed development. The site is located at the intersection of Sunset Drive and Highway 47, within a mile of Pacific University and the Forest Grove Town Center. The site is relatively flat and can be readily served by economical extensions of existing infrastructure. Habitat areas on site are located so that they may be preserved in conjunction with proposed development.

Area 3 – East David Hill Road has been annexed into the City and has an approved 221-unit PUD and Subdivision ("Davis Estates PUD"). The housing proposed in the Davis Estates PUD includes a mix of single unit detached and attached dwellings on 24.5 acres with a mix of NMU and RML zoning. The site has a proposed density of 12.8 units per acre. As approved, multi-family development is not proposed in this area.

Based on the infrastructure needs and steep slopes of Area 1, it is unlikely that the site will be able to support higher density multi-family residential development. Area 3 has been approved for single-family detached and attached units that will most likely be owner occupied. The proposed text amendment will allow for 386 market rate rental units meeting the City's identified need for multi-family rental housing for middle-income earning renters. Thus, the proposed density increase will support needed housing for this market segment.

***Land Use Policies***

***2. Location factors for the placement of multi-family development shall be included in the Comprehensive Plan and updated periodically to reflect changes in development best practices***

**Finding:** The Forest Grove Comprehensive Plan states that "*lands designated for multi-family developments shall be distributed throughout the city taking into consideration the availability of public services, topography, and environmental constraints. Preferred locations for medium and higher density residential developments include areas within walking distance of schools, parks, commercial areas, or existing/planned transit services.*"

The subject site already allows multifamily housing, just at a slightly lower density than this site can comfortably accommodate. The site is relatively flat and can be readily served by extensions of existing infrastructure. Habitat areas on site are located so that they may be preserved in conjunction with proposed development. The site is within a mile or less of Pacific University, Forest Grove High School, Harvey Clark Elementary School, Lincoln Park, Hazel Sills Park, and the City Center. The site is located within a half mile or less of several GroveLink transit stops. Both the West Loop line and East Loop line are located within walking distance of the site and provide regular transit service within the City limits and for transfer to the #57 TriMet Frequent Service Line providing service from Forest Grove to the Beaverton Transit Center. The TriMet Pacific and Cedar stop (ID 4275) is located within a mile of the subject site.

The subject site meets the location factors for placement of multi-family development as outlined in the Comprehensive Plan.

**6. The City shall take into consideration the housing rules of the State Land Conservation and Development Commission when considering plan amendments affecting future development densities or the mix of housing types**
**Finding:** There are three NMU zoned sites within the City. Each of these sites have individual permitted density ranges which are identified in Section 17.4.315 Table 4-1 of the FGDC.

| Table 4-1: Residential Density | | | |
|---|---|---|---|
| NMU Zoned Area | Minimum Density | Target Density | Maximum Density |
| Area 1 – David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 2 – Davidson | 9.60 units/net acre | 12 units/net acre | **13.80 units/net acre** |
| Area 3 – East David Hill Road | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

The proposed text amendment will allow for a higher density of multi-family development on the site identified as Area 2 – Davidson in the FGDC. The text amendment will not have an effect on future development densities or the mix of housing types for any site within the City. The text amendment will only impact the subject site.

The LCDC housing rules are in OAR 660-007, the purpose of which is:

> "to to ensure opportunity for the provision of adequate numbers of needed housing units and the efficient use of land within the Metropolitan Portland (Metro) urban growth boundary, to provide greater certainty in the development process and so to reduce housing costs * * * * The new construction density and mix standards and the criteria for varying from them in this rule take into consideration and also satisfy the price range and rent level criteria for needed housing as set forth in ORS 197.303."

OAR 660-007-0000.
As described above, the proposed apartments satisfy the rent levels for workforce housing as determined in the HNA and in the marketplace. Therefore, the proposed text amendment is consistent with the LCDC housing rules.

**7. Planned residential developments shall allow for density bonuses in order to encourage the use of the planned development process. Measures shall be taken to ensure that density bonuses do not result in greater negative impacts on surrounding neighborhoods.**
**Finding:** The proposed development is located in the NMU zone, which is subject to the Mixed-Use Planned Development (MUPD) standards. The MUPD code identifies a minimum, maximum, and target density for the subject site. Density Bonuses are not provided as part of a Mixed-Use Planned Development; however, density transfers are allowed across the site at a rate of 1:1. The proposed text amendment would increase the maximum density on site from 13.8 units/net acre to 15.50 units/net acre. The existing maximum density of 13.8 units/net acre on the 24.91-acre MUPD site would result in a maximum of 343 units. The proposed maximum density increase to 15.50 units/net acre would result in a maximum of 386 units with the included density transfer from the natural resource area. The density increase would result in 43 additional units on 24.91 acres, or 1.7 units/net acre.

The multi-family development is proposed on the larger southern parcel. The northern parcel is proposed to be developed with row houses is located at the intersection of Sunset Drive and Highway 47 and is bordered by unimproved right-of-way to the north and west. The southern parcel is located at the intersection of Sunset Drive and Highway 47, with single-family residential development located along the southern property line. The site will meet the buffering standards of FGDC Section 17.8.415. In addition to the buffering standards, the southern parcel design will include the retention of a 3.36-acre wetland and 1.72-acre vegetative corridor along the southern property line, providing an additional buffer between the adjacent single-family homes to the south and the multi-family development. The primary entrance drive has been located along the southern property line. Parking is not proposed along the southern property line to help minimize the impact of vehicle lights, noise, and odor for adjacent property owners. A 20-foot-wide buffer will be provided along the southern property line where parking is proposed. A single multi-family building (Building 18) will be located adjacent to the southern property line. Building 18 is located adjacent to tax lot 2900, which is zoned for residential development but is currently vacant. The applicant has provided a photometric plan which demonstrates that light spill over will not occur on adjacent properties.

As demonstrated in the Traffic Impact Analysis, the surrounding street network is able to accommodate the proposed development without need for improvements. Moreover, the alignment of surrounding streets means that most of the traffic from the northern driveway on Sunset Drive will be routed to Highway 47, and not through the surrounding single family residential streets.

For these reasons, the additional 43 units do not result in greater impacts on surrounding neighborhoods.

**8. Land designated for single family attached and multi-family developments shall be distributed throughout the city taking into consideration availability of public services, topography and environmental constraints. Preferred locations for medium and higher density residential development include areas within walking distance of schools, parks, commercial areas, or existing/planned transit service.**
**Finding:** The subject site is relatively flat and can be readily served by extensions of existing utility infrastructure. Habitat areas on site are located so that they may be preserved in conjunction with proposed development. The site is within a mile or less of Pacific University, Forest Grove High School, Harvey Clark Elementary School, Lincoln Park, Hazel Sills Park, and the City Center. The site is located within a half mile or less of several GroveLink transit stops. Both the West Loop line and East Loop line are located within walking distance of the site and provide regular transit service within the City limits and for transfer to the #57 TriMet Frequent Service Line providing service from Forest Grove to the Beaverton Transit Center. The TriMet Pacific and Cedar stop (ID 4275) is located within a mile of the subject site.

**9. Development regulations shall promote a variety of housing types suitable for owner- and renter occupants. The Economic Opportunity Analysis indicates a need for 3,859 owner-occupied units and 878 renter-occupied units over the next twenty-years.**
**Finding:** The proposed development would provide 362 renter occupied apartments and 24 row houses that may be renter or owner occupied. The proposed mix of studio, one, two and three-bedroom apartments and row houses are proposed, consistent with this policy.

**Housing Goals and Policies**
**Goal 1: Ensure an adequate supply of developable land to support needed housing types and a complete community.**
**Finding:** The 2019 Forest Grove HNA identifies multifamily rental housing for college students and middle-income earning renters as a need within the City. Per the 2019 HNA," Forest Grove has a need for more market rate housing. The current rental housing vacancy rate in Forest Grove is below 5%, which is low relative to many communities, and there is presently a significant need for market rate owner and rental housing units to meet demand by households earning between 80% and 120% of the median family income level."

The proposed text amendment will provide for an increase in density on the site to develop multi-family and row house residential rental units. Figure 3, which is provided

in the City's HNA indicates that new building construction in Forest Grove has primarily been single family housing.

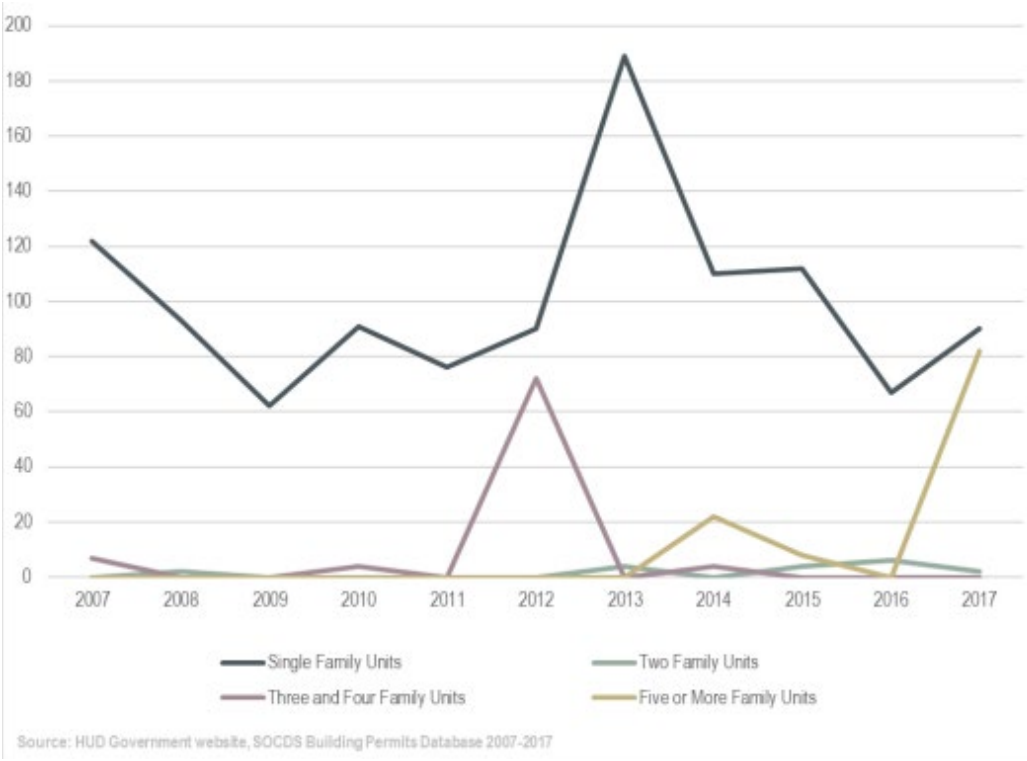



Figure 3: Building Permits Issued, Forest Grove, 2007-2017
*Forest Grove Housing Needs Analysis Exhibit 2.12 (2019)*

The projected housing mix shown in Figure 4 from the HNA illustrates an increase in projected multifamily units.

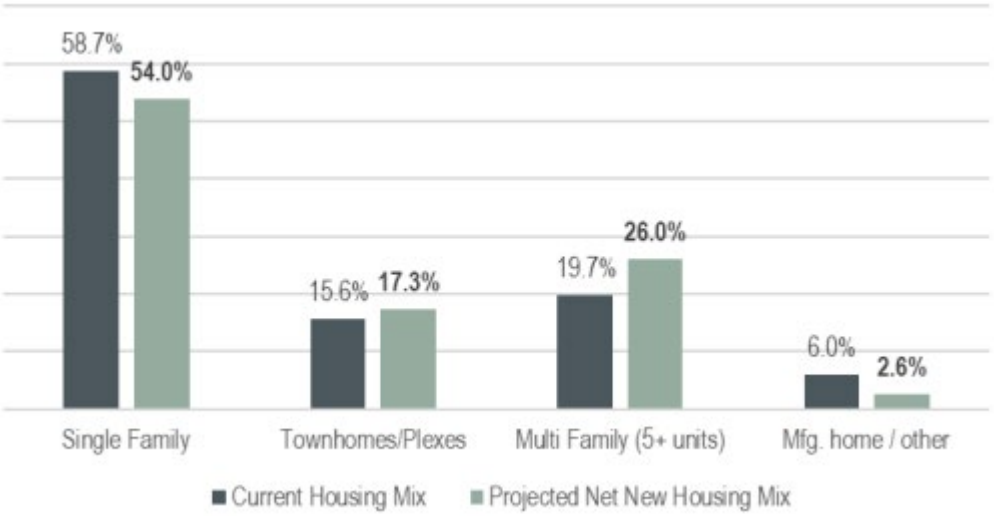



Figure 4: Current and Projected Housing Mix by Type, Forest Grove
*Forest Grove Housing Needs Analysis (2019)*

It is noted in the HNA, that while there is adequate residential land within the City's UGB to accommodate the 20-year growth forecast, not all of the land is available for development, with some areas requiring annexation and infrastructure improvements that are controlled primarily by individual property owners. The subject site is available and serviceable for the proposed development of apartments and row houses, an identified need within the City.

**Policy 1.1 Establish the location and density of residential development based on the following factors:**

**A. The type and distribution of housing units required to meet projected population needs;**

**Finding:** The 2019 Forest Grove HNA identifies multifamily rental housing for college students and middle-income earning renters as a need within the City. The proposed 362 multi-family and 24 row houses units will meet an identified need within the City. The City's HNA identifies 125 net buildable acres that are zoned either High Density Residential or Commercial/Mixed Use.

| General Plan Designation | Gross Vacant & Infill Redevelopment Acres | Environmentally Constrained Acres | Unconstrained Acres | Right-of-Way Deduction Percent / Acres | | Total Net Buildable Acres |
|---|---|---|---|---|---|---|
| Low Density Residential | 513 | 77 | 436 | 25% | 109 | 327 |
| Medium Density Residential | 62 | 6 | 56 | 25% | 14 | 42 |
| High Density Residential | 94 | 8 | 86 | 20% | 17 | 69 |
| Commercial / Mixed Use | 71 | 9 | 62 | 10% | 6 | 56 |
| TOTAL | 740 | 100 | 640 | | 146 | 494 |

Figure 5: Net Buildable Acres
*Forest Grove Housing Needs Analysis (2019)*

The subject site is one of three sites zoned Mixed Use within the City. Of the two other sites, one is approved for the Davis Estates Planned Development, a single-family subdivision which does not have commercial development proposed. The second site, located at the northwest edge of the City, is undeveloped and has several site constraints that will make future development challenging, including wetlands, steep slopes and utility serviceability. There are several sites within the City which are zoned High Density Residential. Many of these are small single-owned properties, have existing residential development, are owned by the City of Forest Grove or Pacific University, or are encumbered by unbuildable areas. The subject site is centrally located, within a mile of the City Center, Pacific University, and nearby transit.

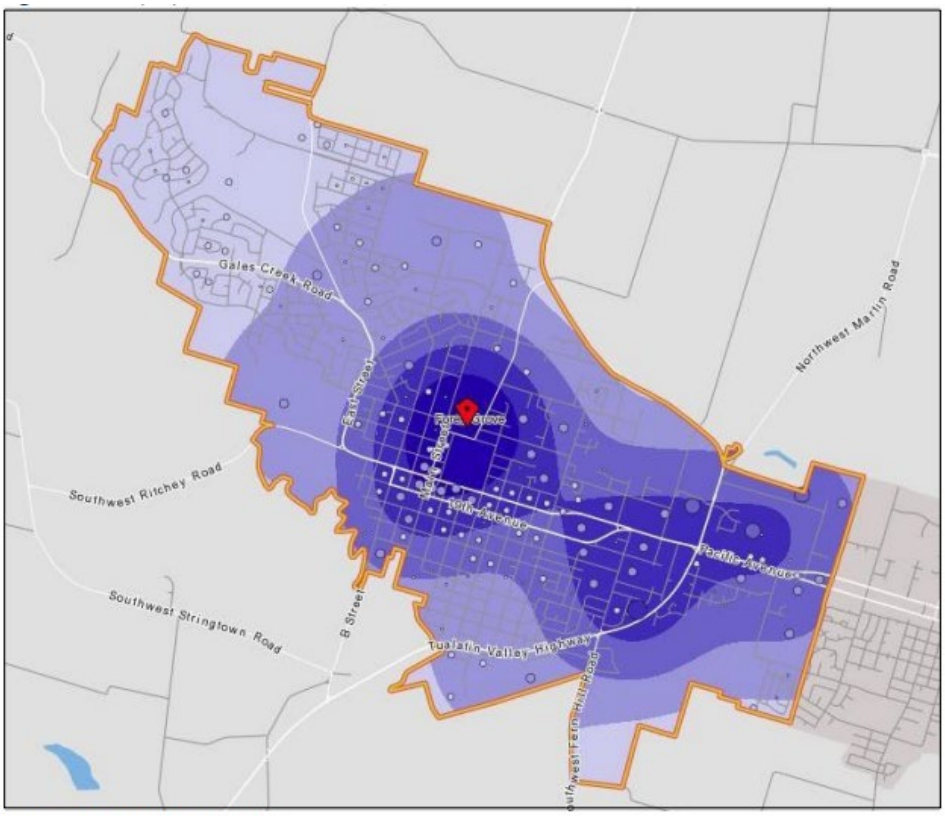
**B. The capacity of land resources given the slope, elevation, wetlands, floodplains, geological hazards, soil characteristics, and urban/rural interface;**

**Finding:** The subject site is 24.91 acres in gross size. A 3.36-acre wetland and 1.72 acre associated vegetative corridor are located in the southeast corner of the site. The site is otherwise free from steep slopes, geological hazards and soil characteristics which would impact the capacity of the site. The total net developable area is 19.78 acres. The site is located within the Forest Grove city limits on Highway 47, a principal arterial and Sunset Drive, a collector. The site is less than a mile from the town center and Pacific University, with nearby transit available. With deductions for preservation of open

space and the commercial uses, this site has ample capacity for the proposed additional 43 units of multifamily housing.

**C. Capacity of public services and facilities including but not limited to water, sanitary sewer, fire and police protection and transportation facilities;**
**Finding:** The subject site is serviceable by City water, and sanitary sewer services. The site is serviceable by both fire and police protection. The Forest Grove Fire Department reviews the Circulation Plan during the land use stage. The site is located on Sunset Drive and Highway 47, which both meet the City's design requirements and do not require further improvements. The Applicant has provided a Transportation Impact Study prepared by Kittelson and Associates which has provided analysis of the existing operating conditions of the surrounding streets and the expected impact of the proposed development. The proposed development is subject to review by the fire department as part of the site plan review process. A fire circulation plan has been provided with the land use application package. The public services have adequate capacity for the proposed addition of 43 more residential units. This standard is met.

**D. Proximity to services including, but not limited to, shopping, employment areas, parks, schools and municipal services. Proximity shall be determined by distance, access, and ability to provide public and private infrastructure service to the site;**
**Finding:** The subject site will be developed as a mixed-use development, with on-site shopping and employment areas. Additionally, the site is located within a mile of the Pacific University, Forest Grove High School, Harvey Clark Elementary School, Hazel Sills Park, Lincoln Park, the Forest Grove Town Center and surrounding residential lands. Figure 6 from the Forest Grove Economic Opportunities Analysis ("EOA") shows the general concentration of employment in Forest Grove in the area of Downtown/Pacific University Area and Pacific Avenue axis.



Source: US Census, Johnson Economics

*Figure 6: Economic Concentrations*
*Forest Grove Economic Opportunities Analysis, Figure 4.4, 2018*

According to the EOA, 24% of jobs within the city are held by local residents, while 76% are held by others who commute into the area. An estimated 83% of local residents who are employed commute outside of Forest Grove. The subject site is located on Highway 47, a principal arterial, and Sunset Drive, a collector. The site is located within a half mile or less of several GroveLink transit stops. Both the West Loop line and East Loop line are located within walking distance of the site and provide regular transit service within the City limits and for transfer to the #57 TriMet Frequent Service Line providing service from Forest Grove to the Beaverton Transit Center. The TriMet Pacific and Cedar stop (ID 4275) is located within a mile of the subject site. The subject site is located less than a mile from major services including, but not limited to, shopping, employment areas, parks, schools and municipal services. Nearby transit is readily accessible from the site. Therefore, the proposed 43 additional units have good proximity to shopping, employment areas, parks, schools and municipal services.

**E. Density standards for minimum residential development for new construction established by the Metropolitan Housing Rule (Oregon Administrative Rules (OAR 660-007-0035).**

**Finding:** The Metropolitan Housing Rule (OAR 660-007-0035) requires that forest Grove provide an overall density of eight or more dwelling units per net buildable acre. The proposed text amendment would establish a maximum density on the site of 15.50 units per acre, a 1.7 unit per acre increase from the existing maximum density of 13.8 units per acre. Per the City's HNA, the City's current zoning and comprehensive plan designations provide an opportunity for about 9.8 dwelling units per net buildable

acre. The proposed development will provide for an increased minimum residential density in the City, which exceeds the Metropolitan Housing Rule minimum requirement. The proposed density provides the City with a surplus to use for other properties that are not amenable to efficient development at the minimum density required by Metro.

**Policy 1.3 Evaluate requests for rezoning from lower density zones to higher density zones based on the following factors:**
**A. Identified housing needs;**
**Finding:** The City's 2019 HNA establishes that the current inventory of rental housing in Forest Grove primarily consists of units priced at $500 to $1,250 per month. This results in a gap in market supply for households that earn between $50,000 and $75,000 who could likely afford newer or larger rental units priced at $1,250 to $1,875/month. The proposed development would provide 362 renter-occupied apartments and 24 row houses that may be renter or owner occupied, that would serve this identified mid-range population. Per the 2019 HNA, the City has a rental housing vacancy rate below 5%, which is considered to be low relative to many communities. The HNA identifies a "significant need for market rate owner and rental housing unit to meet demand by households earning between 80% and 120% of the median family income". Per the City's HNA, Forest Grove is an attractive location for virtually all housing segments, ranging from off-campus housing for students, entry-level homeowners, retirees, and renters seeking good quality workforce housing. Much of this demand can be addressed with new apartments, row houses, plexes and small lot housing developments.

**B. Ability to provide public facilities to the site in an efficient manner;**
**Finding:** The subject site is serviceable by City water and sanitary sewer services. The applicant has provided a Composite Utility Plan (Sheets C300-302) for the subject site. A Preliminary Drainage Report has been provided to address the proposed on-site stormwater system.

Access to the site is provided from Sunset Drive, a collector. The surrounding public streets are adequate and do not require improvements to serve the proposed development. The subject site is able to be served by public facilities in an efficient manner.

**C. The ability of the site to support higher density development; and**
**D. Land use location policies of the Comprehensive Plan. Ability to support higher density development should take into account impact to traffic volumes, ability to provide buffering with less intensive uses, distance to transit service, and site characteristics including topography.**
**Finding:** The proposed text amendment would establish a maximum density on the site of 15.50 units per acre, a 1.67 unit per acre increase from the existing maximum density of 13.8 units per acre.

As demonstrated in the Traffic Impact Analysis ("TIA"), all study intersections are forecast to continue to operate acceptable under year 2026 background and total traffic conditions during the weekday AM and PM peak hours with full build-out and occupancy of the proposed development except the Sunset Drive/Bonnie Lane

Intersection. The stop controlled eastbound approach to the Sunset Drive/Bonnie Lane Intersection is projected to operate at Level of Service ("LOS") E under year 2026 total traffic conditions during the weekday AM peak hour. This is primarily due to the delay associated with the westbound left-turn movement that occurs during the peak 15-minute period of the morning peak hour. Major street turning and through movements along Sunset Drive are projected to operate at LOS A or better during the same period. Given that the intersection is forecast to operate below capacity and is not expected to meet traffic signal warrants, no mitigation measures are recommended within the TIA, however it is recommended that the City continue to monitor this intersection for changes in traffic operations as future development occurs.

The TIS also recommends that the City work with ODOT to review and modify the signal timing plan associated with the OR 47/Sunset Drive intersection to provide more green time for the Sunset Drive approach.

The multi-family development is proposed on the larger southern parcel. The northern parcel is located at the intersection of Sunset Drive and Highway 47 and is bordered by unimproved right-of-way to the north and west. The southern parcel is located at the intersection of Sunset Drive and Highway 47, with single-family residential development located along the southern property line. The site will meet the buffering standards of FGDC Section 17.8.415. In addition to the buffering standards, the southern parcel design will include the retention of a 3.36-acre wetland and 1.72-acre vegetative corridor along the southern property line, providing an additional buffer between the adjacent single-family homes to the south and the multi-family development. The primary entrance drive has been located along the southern property line, with a 20-foot buffer from the property line. Parking is not proposed along the southern property line to help minimize the impact of vehicle lights, noise, and odor for adjacent property owners. A single multi-family building (Building 18) will be located adjacent to the southern property line. Building 18 is located adjacent to tax lot 2900, which is zoned for residential development but is currently vacant.

The site is located within a half mile or less of several GroveLink transit stops. Both the West Loop line and East Loop line are located within walking distance of the site and provide regular transit service within the City limits and for transfer to the #57 TriMet Frequent Service Line providing service from Forest Grove to the Beaverton Transit Center. The TriMet Pacific and Cedar stop (ID 4275) is located within a mile of the subject site. The subject site is located less than a mile from major services including, but not limited to, shopping, employment areas, parks, schools, and municipal services. Nearby transit is readily accessible from the site.

The subject site is 24.91 acres in gross size. A 3.36-acre wetland and 1.72-acre associated vegetative corridor are located in the southeast corner of the site. The site is otherwise free from steep slopes, geological hazards and soil characteristics which would impact the capacity of the site. The total net developable area is 19.83 acres.

**Policy 1.5 Implement codes and ordinances to encourage the development of passed-over and underutilized land for residential development.**

**Finding:** The proposed text amendment will encourage use of this generally vacant site for residential development, by slightly increasing the allowed density. The Neighborhood Mixed-Use (NMU) zone has a maximum density of 13.8 units per acre. The maximum density exceeds the maximum density of all three single-family zones, Residential Multifamily Low (RML), and the neighborhood commercial zones. The maximum density is significantly lower than the Residential Multifamily High (RMH), Community Commercial, Town Center Core and Town Center Transition zones.

| Zone | Max. Density (units/acre) |
|---|---|
| Single Family (R-10) | 4.35 |
| Single Family (R-7) | 6.22 |
| Single Family (R-5) | 8.71 |
| Residential Multifamily Low (RML) | 12.0 |
| Residential Multifamily High (RMH) | 20.28 |
| Neighborhood Mixed Use | 13.8 |
| Neighborhood Commercial | 8.71 |
| Community Commercial | 30 |
| Town Center Core | 40 |
| Town Center Transition | 40 |

There are three sites zoned Neighborhood Mixed Use, all with the same minimum, target, and maximum zoning designations.

| Table 4-1: Residential Density | | | |
|---|---|---|---|
| NMU Zoned Area | Minimum Density | Target Density | Maximum Density |
| Area 1 – David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 2 – Davidson | 9.60 units/net acre | 12 units/net acre | **13.80 units/net acre** |
| Area 3 – East David Hill Road | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

The David Hill site is significantly constrained by steep slopes and wetlands and that has been identified as requiring infrastructure improvements to support any future development. The East David Hill Road site is approved for the Davis Estates PUD, a single-family development with a proposed density of 12.8 units per acre on the 24.5-acre site. Housing Policy 1.5 is met.

**Goal 3: Promote mixed-use development opportunities throughout the community.**

**Policy 3.1 Identify locations on the Comprehensive Plan and Zoning maps for mixed-use development opportunities. Establish standards for residential and commercial densities, desired building mix, and building design for mixed-use areas.**

**Finding:** The subject site is identified in the Comprehensive Plan and zoning map as a mixed-use site, and mixed uses are proposed. The proposed text amendment will provide for an increased residential density on the site of 15.50 units per acre, a 1.7 unit per acre increase across the site. The proposed mix of uses is consistent with the

neighborhood mixed-use requirements found in Article 4 of the development code. Housing Goal 3 is met.

**Goal 6: Promote neighborhoods complete with residences, open space, schools, parks, and shopping opportunities within close proximity to each other. Avoid stand-alone residential developments lacking support activities.**
**Policy 6.1 Designate small-scale neighborhood-oriented commercial areas within walking distance of residential areas.**
**Policy 6.2 Locate parks to maximize access by neighborhood residents.**

**Finding:** The subject site is 24.91 acres in size and will provide 362 apartments of various types and 24 row houses. The subject site has a mapped wetland and vegetative corridor which will be preserved as open space. The residential development has been designed around a central open space area which is focused on the preservation of an existing white oak tree grove. Additional features of the proposed open space park will include covered seating, children's play areas, picnic areas, and an adjacent indoor amenity building. A 4.0-acre mixed commercial development will be provided on site, with a 1.54-acre row house development with 24 row houses located on tax lot 600, shown as Lot 1 on the Preliminary Plat (Sheet C180). The proposed commercial development will be within walking distance of the residential development. Pedestrian connections have been provided to encourage connectivity between the uses. The site is located within a mile of the Forest Grove town center, Pacific University, Forest Grove High School, Harvey Clark Elementary School, Hazel Sills Park, and Lincoln Park.

**B. The text amendment is consistent with relevant statewide and regional planning goals, programs and rules.**

**Finding:** The proposed development will increase the maximum density on site from 13.8 units per acre to 15.50 units per acre. The relevant statewide and regional planning goals, programs and rules are those relating to an increase in density on the site.

Metro Regional Framework Plan
The Metro Regional Framework Plan promotes a compact urban form within the UGB (Policy 1.1) including incentives to utilize land within the UGB more efficiently, encouraging elimination of unnecessary barriers to compact, mixed-use, pedestrian and bicycle friendly and transit-supportive development within Centers, Corridors, Station Communities and Main Streets. The Metro Regional Framework Plan encourages housing choices and opportunities (Policy 1.3) including single family, multi-family, ownership and rental housing. The Plan encourages diverse housing types available to households of all income levels, especially in areas with public services and frequent transit service. As a result, the proposed text amendment to increase the residential density on site is consistent with the relevant policies of the Metro Regional Framework Plan.

Metro Urban Growth Management Functional Plan
The Housing Capacity chapter of the Metro Urban Growth Management Functional Plan (Metro Code Chapter 3.07), outlines options for reducing the minimum density within a

City. The proposed development is consistent with the Metro Urban Growth Management Functional Plan as it will not result in a reduction of density within the City of Forest Grove. Like the Metropolitan Housing Rule, the Metro Urban Growth Management Functional Plan promotes housing choice for all income levels.

The City's 2019 HNA establishes that the current inventory of rental housing in Forest Grove primarily consists of units priced at $500 to $1,250 per month. This results in a gap in market supply for households that earn between $50,000 and $75,000 who could likely afford newer or larger rental units priced at $1,250 to $1,875/month. The proposed development would provide 362 renter-occupied apartments that would serve this identified mid-range population. Per the 2019 HNA, the City has a rental housing vacancy rate below 5 percent, which is low relative to many communities. The HNA identifies a "significant need for market rate owner and rental housing units to meet demand by households earning between 80% and 120% of the median family income". Per the City's HNA, Forest Grove is an attractive location for virtually all housing segments, ranging from off-campus housing for students, entry-level homeowners, retirees, and renters seeking good quality workforce housing. Much of this demand can be addressed with new apartments, row houses, plexes and small lot housing developments. As a result, the proposed text amendment is consistent with the Metro Urban Growth Management Functional Plan.

Oregon Statewide Planning Goals:
The applicable Oregon Statewide Planning Goals for the proposed text amendment to increase the density of the site have been identified as Goal 1, Goal 2, Goal 10, and Goal 12.

Goal 1: Citizen Involvement:
*To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process.*

This is a legislative (Type IV) land use application. The Forest Grove Comprehensive Plan and the administrative procedures delineated in the Forest Grove Development Code contain adopted and acknowledged procedures for citizen involvement and notification. This application has been assembled pursuant to the above-mentioned notification and hearing requirements. The proposal is consistent with Goal 1 of the Oregon Statewide Planning Goals.

Goal 2: Land Use Planning:
*To establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions.*

Goal 2 requires the City to establish a land use planning process and policy framework for the basis of all decisions and actions related to the use of land. The City's land use planning policy and policy framework are outlined within the comprehensive land use plan and implemented by the City's municipal code. The proposed text amendment to increase the density is consistent with the City's comprehensive plan and applicable sections of the municipal code which have both been addressed in detail in this land use narrative. The proposed text amendment is consistent with Goal 2.

Goal 10: Housing
*To provide for the housing needs of citizens of the state.*

Within the Portland Metro Area, Goal 10 is implemented by the Metropolitan Housing Rule (OAR 660-007). The Metropolitan Housing Rule (OAR 660-007-0035) requires that Forest Grove provide an overall density of eight or more dwelling units per net buildable acre. The proposed text amendment would establish a maximum density on the site of 15.50 units per acre, a 1.7 unit per net acre increase from the existing maximum density of 13.8 units per net acre. Per the City's HNA, the City's current zoning and comprehensive plan designations provide an opportunity for about 9.8 dwelling units per net buildable acre. The proposed development will provide for an increased minimum residential density in the City, exceeding the Metropolitan Housing Rule minimum requirement.

Goal 12: Transportation
*To provide and encourage a safe, convenient and economic transportation system.*

A Transportation Impact Study has been prepared by Kittelson and Associates which has provided analysis of the existing operating conditions of the surrounding streets and the expected impact of the proposed development.

The Traffic Impact Analysis ("TIA") found that all study intersections are forecast to continue to operate acceptable under year 2026 background and total traffic conditions during the weekday AM and PM peak hours with full build-out and occupancy of the proposed development except the Sunset Drive/Bonnie Lane Intersection. The stop controlled eastbound approach to the Sunset Drive/Bonnie Lane Intersection is projected to operate at Level of Service ("LOS") E under year 2026 total traffic conditions during the weekday AM peak hour. This is primarily due to the delay associated with the westbound left-turn movement that occurs during the peak 15-minute period of the morning peak hour. Major street turning and through movements along Sunset Drive are projected to operate at LOS A or better during the same period. Given that the intersection is forecast to operate below capacity and is not expected to meet traffic signal warrants, no mitigation measures are recommended within the TIA, however it is recommended that the City continue to monitor this intersection for changes in traffic operations as future development occurs.

The TIS concludes that surrounding street network will continue to meet operating conditions and provide a safe, convenient and economic transportation system, consistent with Goal 12.

This standard is met.

**ADJUSTMENT**

**17.2.100 PURPOSE.**

**17.2.110 PROCEDURE.**

**B. Requests for changes from 10% to 20% of the setback , height or lot coverage standard shall follow the Type II process.**

**Finding:** The applicant is requesting a Type II Adjustment to allow for a 20 percent increase in the building height standard for the multi-family buildings on site. The maximum height allowed for areas outside of the Village Center is 35 feet. A 20 percent increase would allow for a maximum height of 42 feet. The applicant's request is consistent with a Type II adjustment.

**17.2.120 REVIEW CRITERIA.**

**B. Type II Adjustment Process.**

**1. The requested adjustment is from 10% to 20% of the setback, height or lot coverage standard;**

**Finding:** The applicant is requesting a Type II Adjustment to allow for a 20 percent increase in the building height standard for the multi-family buildings on site. The maximum height allowed for areas outside of the Village Center is 35 feet. A 20 percent increase would allow for a maximum height of 42 feet. The applicant's request is consistent with a Type II adjustment.

**2. Granting the adjustment will be consistent with the purpose of the affected zoning district or meet or exceed the purpose of the standard to be modified;**

**Finding:** The purpose of the Neighborhood Mixed Use zone as defined in 17.3.300 is to encourage the development of pedestrian friendly mixed-use neighborhoods.

The proposed height modification will allow for a maximum height of 42 feet which allows for three-story buildings with a pitched roof. Fewer three-story buildings, rather than more two-story buildings, provide for a more compact design of the site, which creates the opportunity to provide more on-site parking and open space for the residents of the development. The applicant has provided a total open space area of 482,892 square feet, which exceeds the minimum requirement by 377 percent. The open space area has been designed with amenities, parks, pedestrian pathways, preserved natural resource areas, and tree retention on site, including the large White Oak Grove and a heritage tree on site.

While flat pitches are technically allowed for the proposed residential development, a 4/12 roof will more easily shed water and snow and will have a longer life span than flat roofs. The pitched roof rather than a flat roof is more harmonious with the surrounding residential neighborhood and is more appropriate for the rainy climate of Forest Grove.

**3. If in a residential zone, the adjustment will not significantly detract from the livability or appearance of the residential area. If in a commercial or industrial zone, the adjustment will be consistent with the desired character of the area;**

**Finding:** The proposed multi-family buildings have been located away from the southern property line to the extent possible to minimize the impact on the livability and appearance of the adjacent residential area. The primary entrance to the proposed development is adjacent to neighboring residential homes and has been designed with an enhanced landscape area. One building has been located within 20 feet of the property shared with an undeveloped property to the south which is zoned for residential use. This neighboring property will likely have a resource area and associated vegetative corridor which will provide additional buffering of the building. The onsite resource area and vegetative corridor will provide additional buffering between the

proposed residential development and the neighboring properties with the south. This standard is met.

4. **If more than one adjustment is requested, the cumulative effect of the adjustments shall result in a project which is consistent with the overall purpose of the zone; and**

**Finding:** The applicant is not requesting multiple adjustments. The requirements of this standard are not applicable.

5. **Any impacts resulting from the adjustment are mitigated to the extent practical.**

**Finding:** The proposed multi-family buildings have been located away from the southern property line to the extent possible to minimize the impact on the livability and appearance of the adjacent residential area. The primary entrance to the proposed development is adjacent to neighboring residential homes and has been designed with an enhanced landscape area. One building has been located within 20 feet of the property shared with an undeveloped property to the south which is zoned for residential use. This neighboring property will likely have a resource area and associated vegetative corridor which will provide additional buffering of the building. The onsite resource area and vegetative corridor will provide additional buffering between the proposed residential development and the neighboring properties with the south. This standard is met.

**ARTICLE 3: ZONING DISTRICTS**
**COMMERCIAL AND MIXED-USE ZONES**

**17.3.310 LIST OF COMMERCIAL AND MIXED-USE ZONES.**

A. **Neighborhood Commercial (NC). The NC zone is established to provide for small to medium sized shopping and service facilities adjacent to residential neighborhoods. The district is intended to meet the convenience shopping and service needs of the immediate neighborhood and to have minimal negative impacts on surrounding residential uses. NC zones should be located on arterial or collector streets, preferably at an intersection. NC zones should be spaced at approximately one-half mile intervals and each zoned area should be limited to a total size of approximately two acres.**

B. **Community Commercial (CC). The CC zone is established to promote a concentration of mixed uses – including retail, service, office and residential uses – along the regional transit corridor. The link between land use and transit is intended to result in an efficient development pattern that supports the regional transit system and makes progress in reducing traffic congestion and air pollution. The location, mix and configuration of land uses are designed to encourage convenient alternatives to the auto, a safe and attractive streetscape, and a more livable community.**

C. **Neighborhood Mixed Use (NMU). The Neighborhood Mixed Use zone is established to support the development of pedestrian-friendly mixed-use neighborhoods with a diversity in the mix of housing types and neighborhood-scale retail sales and service, office, civic or recreational uses. Most non-residential uses must be located within a "Village Center." The Village Center is intended to serve as the center of the**

**neighborhood, providing convenient access to goods and services as well as "third places" where residents can gather. The NMU Zone implements the Comprehensive Plan's Mixed-Use designation. Mixed-Use Planned Development approval is required in the NMU Zone in order to ensure that the objectives of the Comprehensive Plan are addressed.**

| **Table 3-8 Commercial and Mixed-Use Zones Use Table.** | |
|---|---|
| ***USE CATEGORY*** | ***NMU*** |
| **RESIDENTIAL** | |
| Multi-Family Units | P |
| **CIVIC/INSTITUTIONAL** | |
| Basic Utilities | P |
| Major Utility Transmission Facilities | C |
| Community Recreation | L[15] |
| Cultural Institutions | L[15] |
| Day Care | L[15] |
| Emergency Services | L[15] |
| Postal Services | L[15] |
| Religious Institutions | L[15] |
| Schools | L[15] |
| Social/Fraternal Clubs/Lodges | L[15] |
| **COMMERCIAL** | |
| Commercial Lodging | L[15][20] |
| Eating and Drinking Establishments | L[15] |
| - Indoor Entertainment | L[15] |
| General Retail:<br>- Sales-Oriented<br>- Personal Services<br>- Repair-Oriented<br>- Outdoor Sales | <br>L[15]<br>L[15]<br>L[15]<br>L[15] |
| Motor Vehicle Related:<br>- Motor Vehicle Servicing/Repair<br>- Motor Vehicle Fuel Sales | <br>L [16]<br>N |
| Office | L[16][17] |
| P = Permitted L = Limited C = Conditional Use N = Not Permitted<br>Footnotes:<br>[15] Use is only permitted within a Village Center of a Mixed Use Planned Development approved in accordance with § 17.4.300.<br>[16] Restricted to uses existing as of 03/28/2016.<br>[17] Cannabis testing laboratories are prohibited in the NC and NMU and are conditional uses in the CC zone.<br>[20] Entertainment-oriented facilities may be permitted as an accessory use. Events of 500 or more spectators shall require a temporary use permit. | |

**Finding:** The applicant is proposing a 362 apartments of various types and 24 row houses within the NMU zone. The proposed residential use is allowed within the NMU zone. The proposed MUPD will include 4.0 acres of land intended for commercial uses meeting the

Village Center requirements. The proposed commercial development is preliminary in nature and does not yet have intended tenants. The list of allowed uses will be evaluated at the time that tenants are sought for the site.

**17.3.330 COMMERCIAL AND MIXED-USE ZONE DEVELOPMENT STANDARDS.**

**A. Purpose. The development standards for the commercial and mixed use zones are intended to promote efficient site planning, control the overall scale of buildings and promote streetscapes that are consistent with the desired character of the zones.**

**B. Development standards. Development standards for the NC, CC and NMU zones are summarized below:**

| **Dimensional Requirements:** | |
|---|---|
| **Standard** | **NMU** |
| **Maximum Use Size** | **No Maximum** |
| **Minimum Lot Size** | **No Minimum [5]** |
| **Minimum Lot Width** | **No Minimum [5]** |
| **Minimum Lot Depth** | **No Minimum [5]** |
| **Minimum Setbacks[2]**<br>- **Front**<br>- **Interior Side**<br>- **Corner (street side)**<br>- **Rear** | **No Minimum [5]** |
| **Maximum Setback** | **No Maximum** |
| **Maximum Building Height [4]** | **35 feet or 45 feet [6]** |
| **Minimum Landscaped Area** | **No Minimum [5]** |
| [2] New development in the NC and CC zones is subject to Design Review and the Screening & Buffering standards in Article 8. Side or rear yard setbacks are required where the NC or CC zone abuts a Residential zone, pursuant to § 17.8.425.<br>[5] New development in the NMU Zone requires approval of a Mixed Use Planned Development (MUPD) in accordance with § 17.4.300. Development standards are established through the MUPD process.<br>[6] Maximum 45-foot building height allowed only within a Village Center with approved MUPD. | |

**Finding:** The proposed development includes a partition of Lot 100. The NMU zone does not have a minimum lot size, lot width or lot depth requirement. The applicant has provided a detailed partition plan and phasing plan which provide the proposed dimensions of each lot. The applicant has provided the minimum landscape area for each lot as part of the proposed phasing plan.

The NMU zone has a maximum height requirement of 35 feet for residential uses and 45 feet for commercial uses in the Village Center. The applicant is proposing an adjustment for the height of the residential buildings to provide three story buildings with a pitched roof. The applicant has addressed the adjustment criteria in this narrative.

The NMU zone does not have required setbacks. The proposed setbacks for the multi-family have been provided in the table below.

| Multi-family Setbacks | |
|---|---|
| **Standard** | **Dimension** |
| Front | 20 feet |
| Corner (street side) | 20 feet |
| Interior | 10 feet |
| Rear | 15 feet |

| Rowhouse Setbacks | |
|---|---|
| **Standard** | **Dimension** |
| Front | 10 feet |
| Corner (street side) | 10 feet |
| Interior | 10 feet |
| Rear | 10 feet |

The requirements of this section are met.

**ARTICLE 4: OVERLAY DISTRICTS**
**MIXED USE PLANNED DEVELOPMENT**

**17.4.300 PURPOSE.**
**The purpose of the Mixed Use Planned Development is to ensure that sites zoned Neighborhood Mixed Use are developed into pedestrian-friendly mixed use neighborhoods. In order to accomplish that, Mixed Use Planned Developments shall provide:**

**A. Diversity in the mix of housing types including single-family houses, apartments, row houses, cottages, senior housing and residential units above commercial or office space;**

**Finding:** Mixed Use Planned Developments are required to provide a diversity in the housing mix as described here, unless otherwise approved by the Forest Grove Planning Commission per FGDC 17.4.315.E which states *"For MUPDs over three gross acres in size, a mix of housing types is required unless otherwise approved by the Planning Commission."*

The list above provides the following housing types:

- Single-family houses;
- Apartments;
- Row houses;
- Cottages;
- Senior Housing;
- Residential Units above commercial or office space.

FGDC 17.4.315.E states that all housing types are permitted in the NMU zone, which would include housing types not listed in 17.4.300.A. The applicant is proposing many types of apartments, plus row houses.

The proposed development will include a mix of one-, two-, and three-bedroom rental apartments and two and three-bedroom row houses with attached garages. The applicant is proposing a mix of different apartment types and row houses based on the identified needs within the City's HNA which has been addressed within this narrative. The City has identified a need for mid-range rental units as well as the current supply of single-family homes in the City. Additionally, the surrounding single-family residential neighborhood will provide diversity of housing types within the neighborhood. This standard is met.

**B. Pedestrian-orientation in the arrangement and placement of buildings, parking and circulation systems, land uses and utilities;**

**Finding:** The MUPD will have a Village Center commercial area located at the intersection of Sunset Drive and Highway 47. The village center will connect to the adjacent parcel on Sunset Drive which will be developed with residential development. The proposed multi-family residential development has been located south of the commercial Village Center. The multi-family buildings have been located to provide for the preservation of the onsite wetland and Oregon White Oak Grove that is central to the site. Residential buildings have been located to provide usable open space areas and recreation that is centrally located and easily accessible. Residential buildings will connect to onsite amenities through the onsite pedestrian network. This standard is met.

**C. Pedestrian and bicycle access to, and through, the site and provide connectivity to adjacent areas for motorized and non-motorized modes of transportation;**

**Finding:** A Site Circulation Plan (C420) has been provided with this application illustrating the proposed pedestrian and vehicular circulation system within the MUPD. The pedestrian circulation system has been designed to provide connection between the residential and commercial uses on site. The centrally located open space and recreation areas have been designed with a pedestrian focus, with meandering pathways that not only connect to nearby buildings and parking areas, but also provide opportunities for gathering and recreation. This standard is met.

**D. Neighborhood-scale retail sales and service, office, civic or recreational uses conveniently located for neighborhood access, thereby contributing to the livability of the area by reducing the amount of vehicle miles traveled to reach goods and services;**

**Finding:** The proposed Village Center commercial area will include a mix of neighborhood-scale commercial uses that are located within a short walking distance to the proposed 386 unit residential development and the surrounding residential neighborhood. The commercial development will be connected to the surrounding development with on-site pedestrian walkways in addition to the existing sidewalk system on Highway 47 and Sunset Drive. The proposed mixed development will collocate residential and commercial uses thereby reducing vehicle miles traveled to reach goods and services. This standard is met.

**E. Coordinated architectural styles, landscaping, building forms and building relationships which help establish a cohesive sense of place;**

**Finding:** The applicant has provided a custom Design Guidebook for the proposed development which will provide for coordinated architectural styles throughout the development. The MUPD will include design elements that reference the history of the site, including gambrel roof forms, stone, and timber elements. The landscaping will incorporate and feature an existing Oregon White Oak tree which is on the City's historic registry as well as an Oregon White Oak grove which has been incorporated in the Tabitha Moffit Brown Park located in the center of the site. This standard is met.

**F. An urban form that emphasizes the efficient use of land and compact urban form;**

**Finding:** The proposed development will include 24 row houses, a 4.0-acre commercial site and a 362-unit multi-family development with a mix of garden style apartment buildings. The MUPD site will include the preservation of an on-site wetland and associated vegetative corridor, the preservation of a grove of Oregon White Oak trees, on-site recreation areas and amenities and on-site parking. The applicant is requesting a density increase which will contribute to a more compact urban form, utilizing the site at a higher level. As demonstrated in this narrative, the site is able to accommodate the increase in residential density and meet the parking and open space requirements. This standard is met.

**G. The applicant with reasonable assurance of ultimate approval before requiring detailed design and engineering, while providing the city with assurances that the project will retain the character envisioned at the time of approval; and**

**Finding:** The proposed development application includes preliminary plans sufficient for this land use review. Detailed structural design for the different buildings and civil engineering construction drawings will be provided to the City under subsequent permitting reviews for the proposed development. The preliminary plans will guide the final plan development along with the Design Guidebook to retain the character envisioned within this land use application. This standard is met.

**H. A basis for discretionary review of an overall plan of development that can subsequently be developed in phases over time with administrative approval.**

**Finding:** The applicant has provided a Phasing Plan and Design Guidebook which provide an overall plan of development that can be subsequently developed in phases over time with administrative approval. This standard is met.

**17.4.305 PROCEDURES.**

**A Mixed Use Planned Development (MUPD) is reviewed through a two-step process.**

**A. Preliminary plan. The preliminary plan is reviewed under Type III procedures. The preliminary plan review examines the MUPD with respect to items such as the mix of uses; density, including the number, type and location of dwelling units; the location and amount of non-residential uses; parking; impacts on surrounding areas; adequacy of services; and conceptual plan for service improvements. Preliminary plan approval will only be granted when there is a reasonable certainty that the MUPD will fulfill all applicable requirements of the City Codes.**

**Finding:** This application is for the preliminary plan. The applicable requirements for the preliminary plan have been addressed within this narrative. This standard is met.

**B. Final plan. The final plan for the MUPD is reviewed under Type I administrative procedures. The applicant must submit the detailed and technical information necessary to demonstrate that all applicable city standards, requirements and conditions have been met. Approval will only be granted if the final plan is in substantial conformance with the preliminary plan.**

**Finding:** The applicant acknowledges that a Final Plan will be required to demonstrate compliance with the preliminary plan, city standards and requirements and conditions. This standard is met.

**C. Concurrent land division. A MUPD may be filed and processed concurrently with a partition or subdivision application; however, no land division shall be approved unless it is found to be consistent with the applicable MUPD. All of the submittal requirements and review standards of Article 6 will apply to a concurrent MUPD/land division request. The tentative plat will be combined with the preliminary MUPD review and the final plat will be combined with the final MUPD review.**

**Finding:** The applicant is proposing a preliminary partition of Lot 100 to create three new lots identified as Lot 2, Lot 3, and Lot 4. Lot 2 will be a 4.00-acre commercial lot which will be constructed as Phase C1. Lot 3 is a 6.22-acre parcel which will be developed with 128 residential units as Phase R1. Lot 4 is a 13.15-acre parcel which will be developed with 234 residential units in two phases. Phase R2 will have 108 units. Phase R3 will have 126 units.

| Lot | Lot Size | Zoning Designation | Proposed Development | Phase |
|---|---|---|---|---|
| Tax Lot: 1N331A000100 | | | | |
| Lot 2 | 4.00 acres | NMU | Commercial | Phase C1 |
| Lot 3 | 6.22 acres | NMU | Residential 128 units | Phase R1 |
| Lot 4 | 13.15 acres | NMU | Residential 108 units<br>Residential 126 units | Phase R2<br>Phase R3 |

The review standards of Article 6 have been addressed in this narrative. This standard is met.

**D. Site development/design review. The MUPD approval shall remove the requirement for subsequent site development or design review of individual buildings, if the MUPD includes building elevations and sufficient information to demonstrate compliance with the applicable site development /design review standards. The MUPD decision shall expressly state whether individual buildings within the MUPD (such as commercial or**

**multi-family buildings) shall require subsequent site development or design review approval.**

**Finding:** The Applicant is proposing a Mixed-Use Planned Unit Development on Lot 100 that will include 4.0 acres of commercial development and a 362-unit multi-family residential community. A 1.54-acre row house development is proposed on Lot 600. Preliminary elevations and floorplans of the residential buildings have been provided with this land use application. The proposed development will include a Design Guidebook which will provide the framework for the proposed commercial buildings within the MUPD.

This standard is met.

**17.4.310 PROFESSIONAL DESIGN TEAM REQUIRED.**

**For MUPDs over three gross acres in size, the MUPD applicant must certify, in writing, that a member of each of the following professions will be used in the planning and design process for the proposed MUPD:**

**A. A licensed architect or professional urban designer approved by the Planning Director;**
**B. A licensed landscape architect, a certified nurseryman or landscape designer approved by the Director; and**
**C. A registered civil engineer or land surveyor.**

**One of the above professionals shall be designated by the applicant to act as a liaison between the Community Development Department, the design team, and the applicant during the two-step MUPD review process. The Planning Commission or City Council may require the expertise of other professionals on the design team if it is determined that the site merits special consideration to unique or adverse features or conditions.**

**Finding:** The development team for the proposed development includes a licensed architect, a licensed landscape architect and a civil engineer. This standard is met.

**17.4.315 MUPD DEVELOPMENT STANDARDS.**

**A. Base zone standards. The development standards of the base zone apply unless they are superseded by the standards of this section or an MUPD approval.**

**Finding:** The base zone standards have been addressed within this narrative. This standard is met.

**B. Site size. There are no minimum or maximum size limitations for a MUPD.**

**Finding:** The subject site includes two existing parcels (Lot 100 and Lot 600) and is 24.91 acres in size. The applicant is proposing a MUPD for the site to include a 4.0-acre commercial site developed with a mix of allowable uses in the NMU zone, a 19.34-acre parcel which will be developed with 362 multi-family residential uses and a 1.54-acre parcel which will be developed with 24 row houses. The proposed partition and MUPD are consistent with the requirements of this section.

**C. Residential density. The target, minimum and maximum residential density for each of the NMU zoned area is shown in Table 4-1. Dwelling units may be transferred between parcels as part of an approved MUPD provided the average density within the MUPD meets the standards in Table 4-1.**

| **Table 4-1: Residential Density** | | | |
|---|---|---|---|
| **NMU Zoned Area** | **Minimum Density** | **Target Density** | **Maximum Density** |
| **Area 2 - Davidson** | **9.60 units/net acre** | **12 units/net acre** | **13.80 units/net acre** |

**Finding:** The Applicant is requesting a text amendment to Forest Grove Development Code Section 17.4.315 Table 4-1. The maximum density for the NMU site identified as *Area 2 – Davidson* is 13.8 units/net acre. The proposed text amendment would increase the maximum density of the site to 15.50 units/net acre, an increase of 1.7 units/net acre.

| Table 4-1: Residential Density | | | |
|---|---|---|---|
| NMU Zoned Area | Minimum Density | Target Density | Maximum Density |
| Area 1 – David Hill | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |
| Area 2 – Davidson | 9.60 units/net acre | 12 units/net acre | ~~13.80 units/net acre~~ **15.50 units/net acre** |
| Area 3 – East David Hill Road | 9.60 units/net acre | 12 units/net acre | 13.80 units/net acre |

The Applicant has provided the requirement materials to initiate a text amendment.

**D. Lot sizes. There are no required minimum lot sizes.**

**Finding:** The subject site includes two existing parcels (Lot 100 and Lot 600) and is 24.91 acres in size. The applicant is proposing a MUPD for the site to include a 4.0-acre commercial site developed with a mix of allowable uses in the NMU zone, a 1.54-acre parcel with 24 row houses, and a 19.34-acre parcel which will be developed with 362 multi-family residential uses. The proposed partition and MUPD are consistent with the requirements of this section.

**E. Housing types allowed. All housing types are permitted. For MUPDs over three gross acres in size, a mix of housing types is required unless otherwise approved by the Planning Commission. Multi-unit buildings shall be subject to Multi-Unit Residential Focus Area standards unless standards are modified through an approved MUPD.**

**Finding:** The proposed development includes 362 multi-family units, in 14 walkup three story buildings, units above the field house, and 24 row houses with attached garages. The proposed housing mix includes one-, two-, and three-bedroom rental apartment units. The applicant is proposing multi-family units based on the identified needs within the City's HNA which has been addressed within this narrative. The City has identified a need for mid-range rental units as well as the current supply of single-family homes in the City. The proposed development will provide multifamily residential units and row houses with a mix of number of bedrooms. Additionally, the surrounding single-family

residential neighborhood will provide diversity of housing types within the neighborhood.

The Multi-unit residential focus area standards have been addressed in this narrative.

This standard is met.

**F. Village center. Commercial Uses and Institutional Uses (other than emergency services, basic utilities, major utilities transmission facilities, daycare, home occupations and community recreation) shall be located within a village center.**

**1. The Village Center shall provide services at a neighborhood scale within a compact, pedestrian-friendly environment. The Design and Development Standards and/or Design Guidelines applicable to the Town Center Transition (TCT) zone shall be used as a basis for development within the Village Center unless modified through an approved MUPD.**

**Finding:** The proposed development will include a 4.0-acre commercial lot that will meet the Village Center requirements of the proposed MUPD. Design Guidelines applicable to the Town Center Transition (TCT) zone have been addressed as applicable to the Village Center plan of the proposed MUPD. This standard is met.

**2. The minimum and maximum floor area of commercial or institutional uses permitted within the Village Center is shown in Table 4-2.**

| **Table 4-2: Commercial/Institutional Uses within the Village Center** | | |
|---|---|---|
| **NMU Zoned Area** | **Minimum Square Footage** | **Maximum Square Footage** |
| **Area 2 – Davidson** | **25,000 SF Gross Floor Area** | **130,000 SF Gross Floor Area [1]** |
| **[1] Maximum building footprint is 50,000 square feet** | | |

**Finding:** The village center will be comprised of one phase. Phase C1 will have a total building area of approximately 30,000-40,000 square feet. The total commercial area meets the minimum and maximum requirements for the site. No building footprint will exceed 50,000 square feet.

This standard is met.

**3. The total area of the Village Center shall not exceed 50% of the buildable land within the MUPD or three acres, whichever is greater. For the purposes of this calculation the area of the Village Center shall include the contiguous areas dedicated to commercial and institutional uses and related parking. Streets and open space shall not be included in the Village Center area calculations.**

**Finding:** The proposed MUPD site is 24.91 acres in size. The Village Center is 4.0 acres in size, or 16.1 percent of the total MUPD. This standard is met.

4. **Only one Village Center is permitted within each of the NMU Zoned Areas.**

**Finding:** The proposed development includes one 4.0-acre Village Center. This standard is met.

5. **Institutional uses shall not exceed 10% of the maximum allowed square footage within the Village Center.**

**Finding:** The proposed Village Center does not currently have tenants or uses proposed for the flexible commercial space. If institutional uses are proposed, they will not exceed 10 percent of the maximum allowed square footage.

6. **Within Area 2 (Davidson), the maximum building footprint is 50,000 square feet. One tenant in Area 2 may occupy up to 50,000 square feet of gross floor area. Multiple tenants in a single building are allowed.**

**Finding:** The proposed Village Center does not currently have tenants or proposed building footprints. At the time of development of the commercial spaces in the Village Center, the maximum building footprint proposed will not exceed 50,000 square feet. This standard is met.

**G. Height. The height limits of the base zone apply.**

**Finding:** The NMU zone has a maximum height requirement of 35 feet for residential uses and 45 feet for commercial uses in the Village Center. The applicant is proposing an adjustment for the height of the multi-family residential buildings to provide three story buildings with a pitched roof. The applicant has addressed the adjustment criteria in this narrative.

**H. Building setbacks. Building setbacks are established as part of the preliminary development plans approval.**

**Finding:** The proposed setbacks for the MUPD are listed below:

| **Multi-family Setbacks** | |
|---|---|
| **Standard** | **Dimension** |
| Front | 20 feet |
| Corner (street side) | 20 feet |
| Interior | 10 feet |
| Rear | 15 feet |

| **Rowhouse Setbacks** | |
|---|---|
| **Standard** | **Dimension** |
| Front | 10 feet |

| | |
|---|---|
| Corner (street side) | 10 feet |
| Interior | 10 feet |
| Rear | 10 feet |

This standard is met.

**I. Open space. A MUPD shall include a minimum of 20% usable common open space, landscaped areas and/or protected natural areas.**

**Finding:** The MUPD has a total area of 1,018,081 square feet, therefore a total useable common open space of 203,616 square feet is required. The open space in the southeast corner of the site will include 482,892 square feet of usable common open space including a 3.36-acre wetland and 1.72-acre vegetative corridor. This standard is met.

**J. Pedestrian-orientation and circulation. A MUPD shall include a transportation system that emphasizes pedestrian mobility and accessibility, and demonstrates an effective and convenient system of pedestrian facilities that provides connectivity throughout the MUPD and to adjacent properties. The transportation system shall identify existing and proposed pedestrian connections and may include a combination of sidewalks, multi-use pathways and trails.**

**Finding:** Pedestrian pathways will connect all buildings with the surrounding parking areas, open spaces and recreation areas, city sidewalks and walking paths, and will provide connection between the residential and commercial uses on site. The proposed commercial development will be developed with neighborhood scale commercial development consistent with the allowed uses in the NMU zone. This standard is met.

**K. Parking. The base zone parking requirements apply except that shared parking is encouraged within the MUPD. Where the MUPD abuts land zoned for single-family residential development, common parking and maneuvering areas must be set back at least 20 feet from the lot line. No parking or vehicular circulation areas shall be located between the building and the street. Garages and off-street parking areas for residential developments shall be accessed by alleys unless otherwise approved by the Planning Commission.**

**Finding:** The proposed development will include 516 parking spaces within the multi-family residential community, 48 parking spaces for the row houses, and 152 parking spaces for the commercial development. All proposed parking and maneuvering areas will be set back at least 20 feet from the southern property line which abuts land zoned for single-family residential development.

**L. Water features. Water features such as streams or ponds must be left in a natural state unless altered to improve the natural values of the water feature or to improve stormwater drainage. Water features and their buffers should be kept in common ownership.**

**Finding:** The subject site has a wetland and associated vegetative corridor located in the southeast corner of the site. The proposed development will include the preservation of

the wetland and associated vegetative corridor which will be kept under common ownership. This standard is met.

**M. Facilities and services. It is the responsibility of the applicant to provide all service facilities necessary for the functioning of the MUPD. Service facilities such as streets, water supply facilities, sanitary sewers and stormwater detention facilities must be dedicated to the public if they are to provide service to any property not included in the MUPD. However, the review body may approve private service facilities with the consent of the appropriate service provider.**

**Finding:** The subject site is served by two existing streets. New public streets are not proposed. The applicant has provided a Composite Utility Plan demonstrating the proposed utility connections for water, sanitary sewer, and stormwater detention. A Preliminary Stormwater Management Report has been provided which provides further detail on the proposed stormwater system.

**N. Underground utilities. All service facilities must be placed underground except those that by their nature must be on or above ground, such as fire hydrants and open watercourses. The applicant is responsible for making the necessary arrangements with utility companies and other appropriate entities when installing all service facilities.**

**Finding:** All proposed utilities will be placed underground, except for those that by their nature must be on or above ground. This standard is met.

**O. Construction to standards. All service facilities dedicated to the public must be constructed to city standards. All private service facilities must be designed by a qualified civil engineer to city standards or comparable design life as determined by the City Engineer.**

**Finding:** All proposed service facilities dedicated to the public will be constructed to city standards. This standard is met.

**17.4.320 PRELIMINARY PLAN REVIEW.**

**A. Procedure. Preliminary plan reviews are processed through a Type III procedure.**

**B. Submittal requirements. Applications for a preliminary plan review must contain the information stated below in addition to that required by § 17.1.325.**

**1. General statement. A statement of how the purpose of § 17.4.300 will be achieved by the proposed MUPD. The statement should include sketches or illustrations of the proposed character of the development, a description of how the MUPD will relate to surrounding land uses and whether other land use reviews are requested.**

**Finding:** The applicant provided this narrative addressing all applicable code requirements outlined within the general statement. This standard is met.

**2. Summary report. A summary report identifying the different land uses, including the amount of land for housing, Village Center and other non-residential uses, open areas, streets and parking; the number and type of housing units; and a**

**statement of how necessary services will be provided and whether the services will be publicly or privately owned and operated.**

**Finding:** The applicant provided this narrative summarizing the proposed land uses, including land used for housing and the Village Center, open spaces, streets and parking, the number and type of units and details on how services will be provided.

| Lot | Phase | Lot Size | Proposed Zoning Designation | Proposed Development |
|---|---|---|---|---|
| Lot 1 | Phase R1A | 1.54 acres | NMU | Residential 24 row houses |
| Lot 2 | Phase C1 | 4.00 acres | NMU | Commercial/Village Center |
| Lot 3 | Phase R1 | 6.22 acres | NMU | Residential 128 units |
| Lot 4 | Phase R2<br>Phase R3 | 13.15 acres | NMU | Residential 108 units<br>Residential 126 units |

This standard is met.

1. **Drawings of existing site conditions. A drawing or drawings must be submitted which display and inventory existing site conditions including the items listed below:**
   a. **Ground elevations shown with contour lines at two-foot intervals or less;**
   b. **Areas of moderate or severe landslide potential, as identified on city maps or documented by an engineering geologist or geotechnical engineer;**
   c. **General soil types as identified on city maps or as documented by an engineering geologist of soils engineer;**
   d. **Existing natural features, including rock outcroppings, trees and tree groves, fish and wildlife habitats, ponds, wetlands and watercourses;**
   e. **Existing on-site or abutting sanitary sewage, storm drainage and water supply facilities. If such facilities are not on or abutting the site, indicate the direction and distance to the nearest ones;**
   f. **Width, location and purpose of all existing easements of record on or abutting the site;**
   g. **A description of the traffic circulation system for all modes on or abutting the site, including street sizes, level of improvements and condition of the streets**
   h. **A description of areas abutting the MUPD, indicating zoning districts, land uses, densities, circulation systems, public service facilities, natural features and approximate locations of nearby structures; and**
   i. **Any additional information about existing site conditions required for a concurrent subdivision application.**

**Finding:** The applicant has provided an Existing Conditions Plan (Sheet C100) meeting the requirements of this section.

2. **MUPD Site plan. The site plan must include the information stated below:**

a. **Setbacks and orientation to the street all buildings;**
b. **The traffic circulation system for all modes, including connections to existing public rights-of-way, off-street parking and the ownership of streets, street trees and street lighting;**
c. **The general location of parking areas, identify ingress and egress locations, and the number of spaces to be provided;**
d. **Conceptual plans for pedestrian and bicycle circulation systems;**
e. **Conceptual plans for all necessary services, including their location and whether the services will be publicly or privately owned and maintained;**
f. **Conceptual plans for all facilities for the control and disposal of stormwater and groundwater;**
g. **Conceptual plans for the location and design of public and private open areas or structures; and**
h. **Treatment proposed for the periphery of the site, including the approximate amount, location and type of any required landscaping.**

**Finding:** The applicant has provided an Overall Site Plan (Sheet C200) and detailed Site Plans (Sheets C201-C203) meeting the requirements of this section.

3. **Drawings. Drawings showing the existing site conditions and the proposed site plan must be at a reasonable size and scale to clearly show all required information. The drawings must display the following:**
   i. **Name of the proposed PD;**
   j. **Date, north arrow and scale of the drawing;**
   k. **Legal description of the PD sufficient to define its location and boundaries;**
   l. **Names, addresses and telephone numbers of the owner, applicant and design team; and**
   m. **Appropriate identification of the drawing as a preliminary plan.**

**Finding:** The submitted plan set includes all of the required information listed above. This standard is met.

4. **Building elevations or Design Guidebook. The application shall include sample elevations for detached single-family dwellings and specific elevations for all other buildings. In lieu of providing detailed elevations for each building, the application may include a Design Guidebook, created by a qualified architect or urban designer, which outlines the design standards that will be applicable to all development within the MUPD including architectural features for all building types and identify proposed color palates, materials and typical elevations.**

**Finding:** The applicant has provided building elevations for the residential development as well as a Design Guidebook for the proposed development meeting the requirements of this section.

5. **Phased MUPDs. If the project will be built in phases, a Development Phasing Plan is required. The Development Phasing Plan shall:**

**n. Demonstrate how the required mix of uses will be provided through phasing, including the approximate locations, amount in square footage of non-residential uses (a size range may be provided), number of residential dwelling units and phasing schedule of each use;**

**o. Demonstrate how on-site circulation, parking, landscaping and tree planting, lighting and other on-site improvements will function, after the completion of each phase and following complete buildout of the development site; and**

**p. Identify the timeframe, in what order and how proposed public utilities, public facilities and other improvements and amenities necessary to support the project will be constructed, dedicated or reserved.**

**Finding:** The proposed development will be constructed in five phases. A summary of each phase is provided below.

| Phase | Lot | Phase Acreage | Proposed Zoning Designation | Proposed Development |
|---|---|---|---|---|
| Tax Lot: 1N331A000100 | | | | |
| R1 | Lot 3 | 6.45 acres | NMU | Residential 126 units |
| R2 | Lot 4 | 3.76 acres | NMU | Residential 108 units |
| R3 | Lot 4 | 3.96 acres | NMU | Residential 128 units |
| Resource Area | Lot 4 | 5.42 acres | NMU | None |
| C1 | Lot 2 | 3.77 acres | NMU | Commercial |
| Tax Lot: 1N331A000600 | | | | |
| R1A | Lot 1 | 1.54 acres | NMU | Residential 24 houses |

Residential Phases:

**Phase R1** will be comprised of 6.47 acres of residential development in the NMU zone. The R-1 phase will include an access drive (0.25 acres) that extends across the commercial lot which will be completed as Phase C-1. A total of 128 units are proposed in five garden style apartment buildings. Phase R-1 will include the field house building, five garage buildings, both entry drives, the entry greenspace and Tabitha Moffat Brown Pioneer Park. The total open space provided across all three residential phases will be 482,892 square feet. Phase R-1 will include 206 parking spaces.

**Phase R2** will be comprised of 3.76 acres of residential development in the NMU zone. A total of 108 units are proposed in four garden style apartment buildings. Phase R-2 will include two garage buildings. The total open space provided across all three residential phases will be 482,892 square feet. Phase R-1 will include 161 parking spaces.

**Phase R3** will be comprised of 3.96 acres of residential development in the NMU zone. A total of 108 units are proposed in five garden style apartment buildings. Phase R-2 will

include two garage buildings. The total open space provided across all three residential phases will be 482,892 square feet. Phase R-3 will include 149 parking spaces.

**Phase R1A** will be comprised of 1.54 acres of residential development. The site will have 24 row houses. The site will have approximately 21,991 square feet of landscaped open space that may be private for each row house.

Commercial Phases:
**Phase C1** will be comprised of 3.77 acres (4.0-acre parcel) of commercial development and established as the Village Center of the MUPD. The commercial phase does not include the access drive which will be constructed under Phase R-1. The site will include approximately 30,000-40,000 square feet of flexible commercial development. A total of 152 parking spaces to serve the commercial development are proposed. The commercial site will have approximately 48,280 square feet of landscaped open space.

Phasing of Infrastructure
The existing public infrastructure adjacent to the site is currently built to full standard. The public infrastructure will be extended to serve each phase as development occurs. All public driveway connections for the multi-family portion will be installed during Phase R1.

Sanitary sewer and water access for the multi-family phases will be installed in Phase R1. The service lines for the utilities will be installed through phase R1 and connection points will be installed at the phase line for extension through to phases R2 and R3.

The Storm outfall for the project is located within Phase R3. A portion of the storm infrastructure constructed during Phase R1 will be located within phases R2 and R3. When Phases R2 and R3 are constructed, the storm infrastructure will be expanded to account for those additional impervious area.

This standard is met.

**C. Approval criteria. The preliminary plan will be approved if the review body finds that the applicant has shown that all of the following approval criteria are met:**

**1. The plan fulfills the purpose for MUPDs stated in § 17.4.300;**

**Finding:** The requirements of 17.4.300 have been addressed within this narrative. The proposed MUPD meets the stated purpose of the mixed use planned development.

**2. The plan meets the submittal requirements of § 17.4.320B.;**

**Finding:** The applicant has provided all submittal requirements of 17.4.320B with this land use application. This standard is met.

**3. Adequate public services exist or can be provided to serve the proposed MUPD; and**

**Finding:** The applicant has provided a Composite Utility Plan and Preliminary Stormwater Management report for the proposed development. The applicant has provided a fire

circulation plan demonstrating that the development meets fire protection standards. This standard is met.

4. **Where a tentative subdivision plat is requested, the requirements of Article 8 are met.**

**Finding:** The applicant is requesting a preliminary partition plat. The requirements of Article 8 are addressed within this narrative.

**D. Time limit. Preliminary plan approval is valid for three years and may not be extended.**

**The three-year period will not begin until any appeals beyond the jurisdiction of the city are completed. Within the three-year time period, the applicant must submit a final development plan for the entire site, or for the first phase if the MUPD has been approved for phased development. The applicant must submit final development plans for any subsequent phases within the time limit specified for the phases.**

**Finding:** The applicant acknowledges that the preliminary plan approval is valid for three years and may not be extended. The applicant has provided a phasing plan and timeline for the construction of the proposed phases. This standard is met.

**ARTICLE 5: SPECIAL PROVISIONS**

**NATURAL RESOURCE AREAS**

**17.5.010 INFORMATION REQUIREMENTS.**

**An applicant who wishes to remove vegetation or do work within a Natural Resource Area (NRA) shall submit for a tree permit. It shall include the information required by this subsection. The information shall be submitted either prior to or concurrent with a land use application such as site development, conditional use permit, planned development application, preliminary subdivision or partition application. Where no land use permit is required, the tree permit shall be submitted and approved prior to any physical modification of the subject site.**

**A. Applicants must verify the natural resource area on their property as described in § 17.5.050.**

**B. For the entire subject property (natural resource area and non-natural resource area), applicants must submit a scale map of the property that includes:**

1. **Location of all natural resource areas on the property;**
2. **Outline of any existing disturbance area, including the location of existing adjacent streets and paved areas, utilities, culverts, stormwater management facilities or bridges;**
3. **Location of any wetlands or water bodies on the property, including a delineation of the sensitive lands and vegetative corridors consistent with Clean Water Services Design and Construction Standards;**
4. **Location of 100-year floodplain and floodway boundary as defined by § 17.8.315B. Basis for Establishing Areas of Special Flood Hazard; and**
5. **Topography shown by contour lines of two-foot intervals for slopes less than 15% and by ten-foot intervals for slopes 15% or greater. On properties that are two acres or larger, such a contour map is required only for the portion of the property to be developed.**

**C. The nature of the work proposed, and/or the reasons for removal of vegetation. If applicable, this shall include detailed site plan of proposed development outlining total disturbance area, including, proposed building footprints, site property improvements, utilities and landscaping.**

**D. The following additional information shall be provided about the natural resource area:**

1. **For properties containing less than one acre of natural resource area, the location of all trees within the natural resource area that are greater than six inches diameter at breast height (DBH), shall be identified by size and species. For properties containing one acre or more of natural resource area, the applicant may approximate the number of trees and the diameter range, and provide a listing of the dominant species;**
2. **For proposed disturbance areas containing less than one acre of natural resource area, all trees with a diameter of six inches or greater that will be removed shall be specifically identified as to diameter at breast height (DBH) and species. For proposed disturbance areas containing one acre or more of natural resource area an approximate of the number of trees, their diameters and the dominant species; and**
3. **If grading will occur within the natural resource area, a grading plan showing the proposed alteration of the ground at 1-foot vertical contours in areas of slopes less than 5%, and two-foot vertical contours in areas of slopes 6-15%, and at five-foot vertical contours of slopes 15% or greater.**

**E. A plan for mitigation or re-vegetation consistent with the applicable mitigation requirements of § 17.5.035 or § 17.5.040; and**

**F. Evidence of submittal of appropriate applications to local, state and/or federal agencies as required.**

**Finding:** The Applicant has provided natural resources plans which provide all necessary information listed above. This standard is met.

**17.5.015 EXEMPT USES AND CONDITIONED ACTIVITIES.**

**E. The following uses and activities are exempt from the requirements of this section:**

- **A. Change of ownership;**
- **B. Where construction of a residence was completed before January 1, 2006, the owners or residents shall not be restricted from engaging in any development that was allowed prior to September 22, 2005; unless such development required obtaining a land use decision, or a building, erosion control or grading permit;**
- **C. A building permit for a phased development project for which the applicant has previously met the application requirements, so long as the site for new construction was identified on the original permit and no new portion of the natural resource areas will be disturbed;**
- **D. Where a property has been subdivided under § 17.5.035E. of these NRA provisions, and the mitigation requirements of § 17.5.035D. have been completed for the subdivision, development on the individual lots may proceed without further review under this Code;**
- **E. Limited types of development, redevelopment, operations and improvements, including the following:**
  1. **Maintenance, alteration, expansion, repair and replacement of existing structures, provided that:**

a. **The rebuilding of existing residential and non-residential structures damaged by fire or other natural hazards occurs within the same foundation lines ("building footprint"); and**
b. **The alteration, expansion or replacement of a structure will not intrude more than 500 square feet into the natural resource areas, and so long as the new intrusion is no closer to the protected water feature than the preexisting structure or improvement.**

2. **Minor encroachments not to exceed 120 square feet of impervious surface such as accessory buildings, eave overhangs, exterior building improvements for access and exiting requirements or other similar features;**
3. **Temporary and minor clearing not to exceed 200 square feet for the purpose of site investigations and pits for preparing soil profiles, provided that such areas are restored to their original condition when the investigation is complete;**
4. **Up to 10% of vegetative cover within the original mapped natural resource areas on a lot or parcel may be removed, provided that no more than 20,000 square feet is removed; and provided that if more than 10% has been removed at the time of a development application , the review process shall use the original mapped natural resource areas , subject to map verification, as the basis for determining the Maximum Disturbance Area in § 17.5.035B. and mitigation standards in §§ 17.5.035D. and § 17.5.040B., § 17.5.040C., § 17.5.040D.1.b. and § 17.5.040D.2.d.;**
5. **Maintenance of existing gardens, pastures, lawns and landscape perimeters, including the installation of new irrigation systems within existing gardens, pastures, lawns and landscape perimeters;**
6. **Removal of plants identified as nuisance or prohibited plants on the Metro Native Plant List and the planting or propagation of plants identified as native plants on the Metro Native Plant List. Handheld tools must be used to remove nuisance or prohibited plants, and after such removal all open soil areas greater than 25 square feet must be replanted;**
7. **Maintenance, alteration, repair and replacement of roads and utilities when no additional incursion into the natural resource areas is proposed;**
8. **Maintenance and repair of existing streets, railroads, shipping terminals and utilities within rights-of-way, easements and access roads;**
9. **Existing water-dependent uses that can only be carried out on, in, or adjacent to water because they require access to the water for waterborne transportation or recreation;**
10. **Operation, maintenance and repair of manmade water control facilities such as irrigation and drainage ditches, constructed ponds or lakes, wastewater facilities and stormwater pretreatment facilities;**

11. **Projects with the sole purpose of restoring or enhancing wetlands, streams or fish and wildlife habitat areas, provided that the project is part of an approved local, state or federal restoration or enhancement plan; and**
12. **Low-impact outdoor recreation facilities for public use, outside of Water Quality Resource Areas, including, but not limited to, multi-use paths, access ways, trails, picnic areas or interpretive and educational displays and overlooks that include benches and outdoor furniture, provided that the facility meets the following requirements:**
    a. **It contains less than 500 square feet of new impervious surface ; and**
    b. **Its trails shall be constructed using non-hazardous, pervious materials, with a maximum width of four feet.**

**F. Emergency procedures or activities undertaken which are necessary to remove or abate hazards and nuisances or for the protection of public health, safety and welfare; provided that such remedial or preventative action must take place within a timeframe too short to allow for compliance with the requirements of this Code. After the emergency, the person or agency undertaking the action shall fully restore any impacts to the natural resource areas resulting from the emergency action. Hazards that may be removed or abated include those required to maintain aircraft safety.**

**Finding:** The applicant is proposing minimal work within the vegetative corridor on site. The proposed work includes the removal of 14 invasive sweet cherry trees from the vegetative corridor and a permanent encroachment for a 96 square foot riprap outfall pad for stormwater management. Per R&O 19-5 3.05.6, Surface Stormwater Facilities a. Stormwater outfalls where the permanent encroachment area is less than 100 square feet shall be allowed without mitigation. The installation of the stormwater outfall pipe via trenching will require a 1,465 temporary encroachment. This area will be restored to "good" corridor condition. The applicant has provided a Natural Resource Assessment under Appendix D of this land use application which has been reviewed by Clean Water Services in accordance with this section. This standard is met.

**17.5.025 CRITERIA.**

**The request for vegetation removal shall be approved based on the criteria below.**

**A. The permanent impact will be negligible or minor and mitigation meets the requirements of this section, § 17.5.035D. or that allowed by § 17.5.040.**

**B. The removal is necessary to prevent the spread of disease or insects declared to be a nuisance by a government agency or qualified arborist, or to correct or eliminate a natural hazard (as identified by the city or qualified arborist) to the property owner, surrounding properties or community at large.**

**C. The loss of value will be of temporary duration of two years or less until new vegetation can be established, or the mitigation plan provides satisfactory replacement of the lost vegetation and establishment of a new resource area of equal value to be completed within two planting seasons. Mitigation for lost vegetation is preferred on-site, or within the immediate vicinity of the subject site. Off-site mitigation may be approved if there is no reasonable alternative and a method of guaranteeing permanent use of the area off-site is found, such as dedication of the area to a public entity, easement or deed restriction.**

**D. Timetables for the work shall be established which minimize the impact on wildlife.**

**F. Notwithstanding the above criteria, intrusion into the natural resource area is allowed provided the requirements in §§ 17.5.035 or 17.5.040 are met.**

**Finding:** As detailed in the Natural Resource Assessment, vegetated corridor enhancement is proposed, which will include the removal of invasive species and the planting of native trees, shrubs, and native seed mix per CWS's Appendix A "Planting Requirements" for trees and shrubs. This standard is met.

**17.5.030 CONSTRUCTION MANAGEMENT PLANS.**

**In order to ensure that trees and vegetation within NRAs are not damaged during construction, all applicants, even those not developing within an NRA, shall provide a construction management plan that includes the following information:**

**A. Location of site access and egress that construction equipment will use;**

**B. Equipment and material staging and stockpile areas;**

**C. Erosion and sediment control measures; and**

**D. Measures to protect trees and other vegetation located within the NRA, but outside of the disturbance area approved under the provisions of §§ 17.5.035 or 17.5.040.**

**Finding:** The applicant has provided a construction management plan that meets the requirements of this section. This standard is met.

**17.5.035 STANDARDS.**

**The following standards are to be met when the subject site contains natural resource areas. In order of preference, these natural resource areas are to be avoided when development as allowed by the underlying zone district can be achieved outside the area or through alternative site design allowed by a planned development; minimize intrusion into the area to the extent feasible; or mitigate impacts from intrusions where no feasible alternatives exists. The following standards shall apply to achieve these avoid, minimize or mitigate objectives. As an alternative, the applicant may submit for discretionary approval pursuant to § 17.5.040:**

**A. *Methods for avoiding or minimizing disturbance in Natural Resource Areas* The following habitat-friendly development practices may be used to avoid or minimize development within NRAs by allowing flexible site design:**

**1. Building setback flexibility to avoid, or minimize, development within NRAs. The minimum building setback of the base zone may be reduced to any distance between the base zone minimum and zero, unless this reduction conflicts with applicable fire or life safety requirements;**

**2. Flexible landscaping requirements to avoid, or minimize, development within NRAs.**

**a. Landscaping requirements, apart from those required for parking lots or street berms, may be met by preserving the NRA.**

**b. Facilities that infiltrate stormwater onsite, including the associated piping, may be placed within the NRA so long as the forest canopy and the areas within the drip lines of the trees are not disturbed. Such facilities may include, but are not limited to, vegetated swales, rain gardens, vegetated filter strip and vegetated infiltration basins. Only native vegetation may be planted in these facilities.**

**3. Flexible Site Design (On-site Density Transfer) to avoid or minimize development within NRAs.**

a. **Residential. For residential development, up to 100% of the development that could be allowed on lands within a natural resource areas can be transferred to other portions of the property outside the resources area.**
b. **In order to accommodate the transferred density, dimensional standards and lot sizes may be adjusted by no more than 20%.**
c. **Commercial and industrial developments shall avoid natural resource areas unless no other practicable alternative is available.**
d. **Mixed-Use Zones. Within mixed-use zones, the density transfer credit can be factored using either a. or b. above, depending on the type of development proposed.**

4. **Site capacity incentives. The following site capacity standards provide flexibility in the design of land divisions in order to allow ways to better protect NRAs.**
   a. **Density bonus if NRA is protected. In the Multi-Family (RMH) Residential Zone District, a 25% density bonus over the based density may be allowed for any development of four or more dwelling units if 75% or more of the NRA on a site is permanently preserved.**
   b. **All area within a NRA, or any portion of it, may be subtracted from the calculations of net size for purposes of determining minimum density provided that such area is protected. This provision may only be applied to properties that were inside the Metro UGB on January 1, 2002.**
   c. **Projects can be developed below minimum density allowed by the zone district if the natural resource area is protected. This provision may only be applied to properties that were inside the Metro UGB on January 1, 2002.**
5. **All natural resource areas that are preserved shall be permanently restricted from development and maintained for habitat functions, such as by making a public dedication or executing a restrictive covenant.**

**Finding:** The applicant is proposing minimal work within the Natural Resource Area, which falls under the exempt requirements of this section. The applicant is proposing a density transfer of 100 percent of the units that would be allowed within the natural resource area to the remaining developable area on site. This standard is met.

**B.** ***Development within NRA.***

**The following development standards apply to all development that occurs within the NRA except for exempt uses and conditioned activities addressed in § 17.5.015 and utility facilities addressed in § 17.5.035C. If all development occurs outside of an NRA on a property, these standards do not apply. These standards also do not apply to development that occurs pursuant to the standards established by the alternative discretionary development standards in § 17.5.040.**

1. ***Disturbance area limitations to minimize impact to NRA.***
   a. ***Single-family residential.*** **The maximum disturbance area (MDA) allowed within NRAs is determined by subtracting the area of the lot or parcel outside of Habitat Conservation Area (HCA) from the total disturbance area (TDA) calculated as described in Table 5-1 below.**
   b. ***All other zones.*** **The maximum disturbance area (MDA) allowed by right within Natural Resource Areas in these zones is found in Tables 5-2 and 5-3 below; this MDA is subject to the mitigation requirements described in § 17.5.035D.**
   c. **Parks and open space.**

**i. Publicly owned property designated for open space or for habitat on the city 's Park, Recreation and Open Space Master Plan shall be limited to vegetation removal for trail development . Any other vegetation removal shall be mitigated by replanting consistent with this section.**

**ii. Parks intended for active recreational purposes as designated on the city 's Park, Recreation and Open Space Master Plan shall not be considered in an NRA.**

**d. Development within an NRA in accordance with the provisions of this Code shall not result in a change of the NRA status of such developed areas on a property. In the case of a later development request seeking to develop within previously undisturbed NRAs on a property where a prior development request was subject to the provisions of this Code, the calculation of the MDA allowed on the property shall be based on the location of the NRA, notwithstanding the location of any authorized development within the NRA.**

**2. *Protection of habitat during site development.* During development of any site containing a NRA, the following standards apply.**

**a. Work areas shall be marked to reduce potential damage to the NRA.**

**b. Trees in NRAs shall not be used as anchors for stabilizing construction equipment.**

**c. Native soils disturbed during development shall be conserved on the property.**

**d. An erosion and sediment control plan is required and shall be prepared in compliance with requirements set forth by Clean Water Services Design and Construction Standards;**

**e. Prior to construction, the NRA that is to remain undeveloped shall be flagged, fenced, or otherwise marked and shall remain undisturbed.**

**f. All work on the property shall conform to the Construction Management Plan described in § 17.5.030.**

**Finding:** The applicant is proposing minimal work within the vegetative corridor on site. The proposed work includes the removal of 14 invasive sweet cherry trees from the vegetative corridor and a permanent encroachment for a 96 square foot riprap outfall pad for stormwater management. Per R&O 19-5 3.05.6, Surface Stormwater Facilities a. Stormwater outfalls where the permanent encroachment area is less than 100 square feet shall be allowed without mitigation. The installation of the stormwater outfall pipe via trenching will require a 1,465 temporary encroachment. This area will be restored to "good" corridor condition. The applicant has provided a Natural Resource Assessment under Appendix D of this land use application which has been reviewed by Clean Water Services in accordance with this section. This standard is met.

**C. *Utility facility standards.* The following disturbance area limitations apply to new utilities, private connections to existing or new utility lines, and upgrade.**

**1. The disturbance area for utility facility connections to utility facilities is no greater than ten feet wide.**

**2. The disturbance area for the upgrade of existing utility facilities is no greater than 15 feet wide.**

**3. The disturbance area for new underground utility facilities is no greater than 25 feet wide and disturbs no more than 200 linear feet of Water Quality Resource Area, within any 1,000 linear foot stretch of Water Quality Resource Area; provided that this**

**disturbance area shall be restored with the exception of necessary access points to the utility facility.**

4. **No fill or excavation is allowed within the ordinary high water mark of a stream, unless a permit is obtained from the U.S. Army Corps of Engineers through the Standard Local Operating Procedures for Endangered Species (SLOPES) process.**
5. **Mitigation is required as described in § 17.5.035D. below.**

**D.** ***Mitigation requirements for disturbance in NRAs.*** **In order to achieve the goal of reestablishing forested canopy that meets the ecological values and functions described in this Chapter, tree replacement and vegetation planting are required when development intrudes into a NRA according to the following standards, except for wetlands mitigation requirements imposed by state and federal law.**

**Finding:** The applicant is proposing a permanent encroachment for a 96 square foot riprap outfall pad for stormwater management. Per R&O 19-5 3.05.6, Surface Stormwater Facilities a. Stormwater outfalls where the permanent encroachment area is less than 100 square feet shall be allowed without mitigation. The installation of the stormwater outfall pipe via trenching will require a 1,465 square foot temporary encroachment. This area will be restored to "good" corridor condition. The applicant has provided a Natural Resource Assessment under Appendix D of this land use application which has been reviewed by Clean Water Services in accordance with this section. Mitigation is not proposed. This standard is met.

**E.** ***Standards for partitions and subdivisions.*** **The purpose of this section is to allow for partitions in a manner that limits the total amount of allowable development within NRAs on the partitioned parcels; and to require that new subdivision plats delineate and show the Moderate and High NRAs as a separate unbuildable tract.**

1. ***Standards for partitions containing NRAs.***
    a. **When partitioning a property into parcels, an applicant shall verify the boundaries of the NRA on the property according to § 17.5.050.**
    b. **Applicants who are partitioning, but are not simultaneously developing their property, do not need to comply with § 17.5.030.**
    c. **When partitioning a property into parcels there shall be no more than a 30percentage point difference in the percentage of NRA on the parcels; for example, a partition that produces two parcels, one that is 55% NRA and the other that is 35% NRA is permissible; whereas a partition that produces two parcels, one that is 75% NRA and the other that is 30% NRA is not permissible. However, an applicant may partition a property such that at least 90% of the original property's High NRA and 80% of its moderate NRA is on a separate unbuildable parcel, protected by a restrictive covenant or a public dedication.**
    d. **Subsequent development on any parcels containing NRAs shall comply with § 17.5.030, and the development standards of either §§ 17.5.035 or 17.5.040.**

**Finding:** The applicant has provided a Natural Resource Assessment under Appendix D which provides a boundary verification for the NRA on site in accordance with 17.5.050. The proposed partition will locate the entire natural resource area on a single parcel. This standard is met.

**B. 17.5.050 MAP ADMINISTRATION AND NRA VERIFICATION.**

2. **Exempt development. Development that is outside of any NRA and no closer than 100 feet to the border of an NRA (including all impervious surfaces and landscaping), based on the NRA map, may proceed without having to comply with this section or any other portion of this Code except for § 17.5.030, Construction Management Plan.**
3. **Verification of the location of NRAs as described in this section shall not be considered a comprehensive plan or zoning amendment.**
4. **Map verification is available to correct for mistakes in the location of NRAs on properties. Map verification shall not be used to dispute whether identified NRAs provide the ecological functions that they are assumed to provide based on the ecological criteria used to identify them. If an applicant believes that a properly identified NRA does not provide the ecological functions that it has been identified as providing, then the applicant may use the discretionary review process to decrease its mitigation responsibilities for disturbing such an area.**
5. **Except for applicants seeking approval to undertake any exempt activities or conditioned uses described in § 17.5.015, the map verification requirements described in this § 17.5.050 shall be met at the time an applicant requests a building permit, grading permit, tree removal permit, land division approval, or some other land use decision. A property owner, or another person with the property owner's consent, may request to verify the location of NRAs on a real property lot or parcel pursuant to this § 17.5.050 at other times, but whether the city processes such request shall be at the Community Development Director 's sole discretion, based on staff availability, funding resources and policy priorities. If a person receives verification separate from a simultaneous request for a building permit, grading permit, tree removal permit, land division approval or some other land use decision, then the person may use the verification to satisfy the requirements of this section at any time up until five years after the date the verification was issued.**
6. **Notwithstanding any other provisions of this § 17.5.050, for utility projects undertaken by public utilities across property that is not owned by the utility, the utility shall not be required to map or provide any information about the property except for the area within 300 feet of the location of the proposed disturbance area of the utility's project.**
7. **Basic verification approaches. The basic verification approaches described in § 17.5.050F.1. through 3. are available for applicants who believe either: (A) that the NRA map is accurate; (B) that there is a simple incongruity between the NRA map and the boundary lot lines of a property; or (C) that the property was developed prior to March 9, 2009.**
    - i. **Applicant believes NRA map is accurate. An applicant who believes that the NRA map is accurate may comply with § 17.5.050F.1. The applicant shall submit the following information regarding the real property lot or parcel:**
        a. **A detailed property description;**
        b. **A copy of the applicable NRA map;**
        c. **A summer 2005 aerial photograph of the property, with lot lines shown, at a scale of at least one map inch equal to 50 feet for lots of 20,000 or fewer square feet, and a scale of one map inch equal to 100 feet for larger lots (available from the Metro Data Resource Center, 600 NE Grand Avenue, Portland, Oregon 97232; 503-797-1742);**
        d. **The information required to be submitted under §§ 17.5.035 or 17.5.040 if the applicant proposes development within any NRA under those provisions; and**

**e. Any other information that the applicant wishes to provide to support the assertion that the NRA map is accurate.**

**ii. Obvious misalignment between mapped habitat and property lot lines. In some cases, the mapped vegetative cover layer in the GIS database might not align precisely with the tax lot layer that shows property lines, resulting in a NRA map that is also misaligned with tax lot line . An applicant who believes that the NRA map is inaccurate based on such an obvious misalignment may comply with this § 17.5.050F.2. The applicant shall submit the following information regarding the real property lot or parcel:**

**a. The information described in §§ 17.5.050F.1.a. through d.; and**

**b. A documented demonstration of the misalignment between the NRA map and the property's tax lot boundary lines. For example, an applicant could compare the boundary lot lines shown for roads within 500 feet of a property with the location of such roads as viewed on the aerial photograph of the area surrounding a property to provide evidence of the scale and amount of incongruity between the NRA maps and the property lot lines, and the amount of adjustment that would be appropriate to accurately depict habitat on the property.**

**8. Property developed between Summer 2002 and January 5, 2006. Where a property was developed between the summer of 2002 (when the aerial photo used to determine the regional habitat inventory was taken) and January 5, 2006, the applicant shall submit the following information regarding the real property lot or parcel:**

**i. The information described in §§ 17.5.050F.1.a. through d.;**

**ii. A summer 2002 aerial photograph of the property, with lot lines shown, at a scale of at least one map inch equal to 50 feet for lots of 20,000 or fewer square feet, and a scale of one map inch equal to 100 feet for larger lots (available from the Metro Data Resource Center, 600 NE Grand Avenue, Portland, Oregon 97232; 503-797-1742);**

**iii. Any approved building permits or other development plans and drawings related to the development of the property that took place between summer 2002 and January 5, 2006; and**

**iv. A clear explanation and documentation, such as supporting maps or drawings or an more recent aerial photograph, indicating the new development that has occurred and where previously identified habitat no longer exists because it is now part of a developed area.**

**9. *Decision process.* The Community Development Director 's map verification decision made pursuant to this § 17.5.050F. may be an administrative decision. The Director 's decision shall be based on consideration of the information submitted by the applicant, any information collected during a site visit to the lot or parcel, any information generated by prior map verifications that have occurred on adjacent properties, and any other objective factual information that has been provided to the Director.**

**10. Detailed verification approach. All applicants who believe that the NRA map is inaccurate for a reason other than as described in §§ 17.5.050F.2. and 3. may file a verification request consistent with this § 17.5.050G.**

**i. *Application requirements.* The applicant shall submit a report prepared and signed by either: (A) a knowledgeable and qualified natural resource professional, such as a wildlife biologist, botanist or hydrologist; or (B) a civil or environmental engineer registered in Oregon to design public sanitary or**

**storm systems, stormwater facilities or other similar facilities. Such report shall include:**

**ii. A description of the qualifications and experience of all persons that contributed to the report, and, for each person that contributed, a description of the elements of the analysis to which the person contributed;**

**iii. The information described in §§ 17.5.050F.1.a. through e.;**

**iv. The information described in §§ 17.5.050F.2.b. and 17.5.050F.3.b. through d., if the applicant believes such information is relevant to the verification of habitat location on the subject lot or parcel;**

**v. Additional aerial photographs if the applicant believes they provide better information regarding the property, including documentation of the date and process used to take the photos and an expert's interpretation of the additional information they provide;**

**vi. A map showing the topography of the property shown by contour lines of two-foot intervals for slopes less than 15% and by ten-foot intervals for slopes 15% or greater; and**

**vii. Any additional information necessary to address each of the verification criteria in § 17.5.050G.4., a description of where any NRAs are located on the property based on the application of the verification criteria in § 17.5.050G.4., and factual documentation to support the analysis.**

**viii. *Notice requirements.* Upon receipt of a completed application pursuant to this § 17.5.050G., the Community Development Director shall provide notice of the map verification application to Metro, to the owners of record of property on the most recent property tax assessment roll where such property is located within 300 feet of the subject property, to any neighborhood or community planning organization recognized by the governing body and whose boundaries include the property, and to any watershed council recognized by the Oregon Watershed Enhancement Board and whose boundaries include the property. The notice provided by the jurisdiction shall comply with the notice requirements of O.R.S. 197.763. The Community Development Director shall accept written public comments regarding the matter during a public comment period.**

**ix. *Decision process.* The Community Development Director shall apply the verification criteria in § 17.5.050G.4. to confirm the location of any NRAs based on the NRA map, the information submitted by the applicant, any information received during the public comment period, and any additional information readily available, including information collected during a site visit to the lot or parcel. The applicant and all persons that submitted written comments shall be provided with a written explanation of the Community Development Director 's decision.**

**x. *Verification criteria.* The verification of the location of NRAs shall be according to the four-step process described in this § 17.5.050G.4. A verification application shall not be considered complete and shall not be granted unless all the information required to be submitted with the verification application has been received.**

**a. Step 1. Verifying boundaries of inventoried riparian habitat. Locating habitat and determining its riparian habitat class is a four-step process:**

**i. Locate the Water Feature that is the basis for identifying riparian habitat.**

**b. Locate the top of bank of all streams, rivers and open water within 200 feet of the property.**

**c. Locate all flood areas within 100 feet of the property.**

**d. Locate all wetlands within 150 feet of the property based on the Local Wetland Inventory map (if completed) and on the Metro 2002 Wetland Inventory Map (available from the Metro Data Resource Center, 600 NE Grand Avenue, Portland, Oregon 97232). Identified wetlands shall be further delineated consistent with methods currently accepted by the Oregon Division of State Lands and the U.S. Army Corps of Engineers.**

**ii. Identify the vegetative cover status of all areas on the property that are within 200 feet of the top of bank of streams, rivers and open water, are wetlands or are within 150 feet of wetlands, and are flood areas and within 100 feet of flood areas.**

**(1) Vegetative cover status shall be as identified on the Metro Vegetative Cover Map (available from the Metro Data Resource Center, 600 NE Grand Avenue, Portland, Oregon 97232).**

**(2) The vegetative cover status of a property may be adjusted only if (1) the property was developed prior to the time the regional program was approved (see § 17.5.050F.3. above), or (2) an error was made at the time the vegetative cover status was determined. To assert the latter type of error, applicants shall submit an analysis of the vegetative cover on their property using summer 2002 aerial photographs and the definitions of the different vegetative cover types provided in §§ 17.12.200 et seq.**

**iii. Determine whether the degree that the land slopes upward from all streams, rivers and open water within 200 feet of the property is greater than or less than 25% (using the methodology as described in Chapter 3 of CWS Design and Construction Standards; and**

**iv. Identify the riparian habitat classes applicable to all areas on the property using Table 5-6 and the data identified in §§ 17.5.050G.4.a.i. through iii.**

**e. Step 2. Verifying boundaries of inventoried upland habitat in future urban growth boundary expansion areas. Upland habitat was identified based on the existence of contiguous patches of forest canopy, with limited canopy openings. The "forest canopy" designation is made based on analysis of aerial photographs, as part of determining the vegetative cover status of land within the region. Upland habitat shall be as identified on the NRA map unless corrected as provided in this subsection.**

**i. Except as provided in § 17.5.050G.4.a.ii., vegetative cover status shall be as identified on the Metro Vegetative Cover Map used to inventory habitat at the time the area was brought within the urban growth boundary (available from the Metro Data Resource Center, 600 NE Grand Avenue, Portland, Oregon 97232).**

**ii. The only allowed corrections to the vegetative cover status of a property are as follows:**

**A. To correct errors made when the vegetative status of an area was determined based on analysis of the aerial photographs used to inventory the habitat at the time the area was brought within the urban growth boundary. For example, an area may have been identified as "forest canopy " when it can be shown that such area has less than 60% canopy crown closure, and therefore should not**

**have been identified as "forest canopy." The perimeter of an area delineated as "forest canopy " on the Metro Vegetative Cover Map may be adjusted to more precisely indicate the drip line of the trees within the canopied area provided that no areas providing greater than 60% canopy crown closure are de-classified from the "forest canopy" designation. To assert such errors, applicants shall submit an analysis of the vegetative cover on their property using the aerial photographs that were used to inventory the habitat at the time the area was brought within the urban growth boundary and the definitions of the different vegetative cover types provided in §§ 17.12.200 et seq.; and**

**B. To remove tree orchards and Christmas tree farms from inventoried habitat; provided, however, that Christmas tree farms where the trees were planted prior to 1975 and have not been harvested for sale as Christmas trees shall not be removed from the habitat inventory.**

**iii. If the vegetative cover status of any area identified as upland habitat is corrected pursuant to § 17.5.050G.4.b.ii.1. to change the status of an area originally identified as "forest canopy," then such area shall not be considered upland habitat unless it remains part of a forest canopy opening less than one acre in area completely surrounding by an area of contiguous forest canopy.**

**Finding:** The applicant has provided a Natural Resource Assessment under Appendix D which provides a boundary verification for the NRA on site in accordance with 17.5.050. The proposed partition will locate the entire natural resource area on a single parcel. This standard is met.

**TREE PROTECTION**

**17.5.110 CITY APPROVAL REQUIRED.**

**A. In no case can trees within the public right-of-way that are deemed by the city to be healthy and pose no risk of property damage or personal injury be removed or topped. In addition, unless approved by a tree permit or specifically exempted under § 17.5.110C. below, it shall be unlawful within any one year to modify protected trees included in § 17.5.100 as follows:**

1. **Remove or prune as to remove over 20% of a tree 's canopy;**
2. **Top a tree; or**
3. **Disturb over 10% of the critical root zone of any protected tree or vegetation except in accordance with the provisions of this Code.**

**B. Permit requirements.**

1. **The applicant shall file an application for protected tree removal or pruning with the city. The application shall include information on the location and size of the parcel, the location, type and size of the tree or proposed for removal or pruning, and the reasons for the request. Where specified by this Code, a tree protection plan shall be provided in accordance with the provisions of § 17.5.120. The application and reasons shall address appropriate criteria based on the categories described in § 17.5.100 (i.e., street trees, trees on developable land, etc.).**

2. **Where an application involves infested tree (s), the application shall contain an analysis of the tree (s) by an arborist.**
3. **The Director shall determine whether the request is valid under the terms of this Code within four working days of submittal of the application. If valid, the application shall be processed as a Type I permit within seven working days unless referred to or appealed to the Community Forestry Commission (CFC).**
4. **Applications for the removal or pruning of trees pursuant to § 17.5.125 shall be submitted as part of the land use permit application or grading permit, whichever is first. The application shall be reviewed and acted upon by the Community Forestry Commission prior to the issuance of any land use approval for new development or grading permit. Notice will be sent consistent with the Type II procedures with appeal to the City Council.**

**C. Permit exemption. The following activities do not require a permit.**

1. **Imminent danger. If an imminent danger exists to the public or any property owner or occupant, the city may issue an emergency removal permit. The removal shall be in accordance with accepted arboricultural standards and be the minimum necessary to eliminate the danger.**
2. **Penalty for incorrect danger assessment. If it is determined that imminent danger did not exist or that the hazardous condition had existed for over 60 days and the owner delayed in applying for a permit, mitigation shall be required as established in § 17.5.145 of this Code.**
3. **Maintenance. Regular maintenance which does not require removal of over 20% of the tree 's canopy, tree topping or disturbance of over 10% of the root system.**

**Finding:** The applicant has provided an Arborist Report which provides analysis of the 244 inventoried trees on or adjacent to the site. The proposed development will require the removal of 68 of the 244 inventoried trees, 28 percent of the surveyed trees. Of the 68 trees planned for removal, 38 are directly affected by site grading, buildings, or other site improvements. This includes five street trees at the proposed entrances and 34 trees located around the existing house and vicinity of the main entrance to the development. The applicant has provided all required materials for a tree removal permit for the site in conjunction with the proposed development. This standard is met.

**17.5.115 TREE PROTECTION PLAN AND PROTECTION REQUIREMENTS.**

**A. Plan requirements. Where required by this Code, a tree protection plan shall be submitted and approved by the Director or, where specified, the Community Forestry Commission. The plan shall be prepared by an Arborist and shall include:**

1. **A scale drawing of the subject property;**
2. **Location, species and diameter of each tree on site and within 15 feet of the site;**
3. **Location of the critical root zone;**
4. **Location of existing and proposed roads, water, sanitary and storm sewer, irrigation and other utility lines/facilities and easement;**
5. **Location of dry wells and soakage trenches;**
6. **Location of existing and proposed structures;**

7. **Existing topography and proposed grade change or cut and fill as a result of development;**
8. **Existing and proposed impervious surfaces;**
9. **Identification of a contact person and/or arborist who will be responsible for implementing and maintaining the approved tree protection plan;**
10. **Identification of a contact person and/or arborist who will be responsible for implementing and maintaining the approved tree protection plan; and**
11. **For Register Trees, an assessment of tree health or hazard condition, and recommendations for treatment of each applicable tree.**

**B. Protection standards. The following construction practices shall apply.**

1. **Excavations and driveways shall not be placed within six feet of any tree or within the closest 80% of the critical root zones to the tree trunk whichever is the greater distance. During such excavation or construction this distance shall be protected and no temporary building, building material, vehicle or debris shall be kept within this area. Exceptions to this distance may be approved with a favorable report by a qualified arborist.**
2. **During the erection, repair, alteration or removal of any building, structure or sign within the critical root zone of a register tree there shall be a sufficient fence to prevent injury to such tree before start and during construction. Special care shall be taken to avoid soil compaction within the critical root zone, including a prohibition of vehicle parking or driving and the prohibition of storage of equipment, construction supplies or construction debris.**

**Finding:** The applicant has provided a Tree Protection Plan and protection requirements within the Arborist Report submitted with this land use application. The protection plan and requirements meet the requirements outlined in subsection 1-11 above. This standard is met.

**17.5.120 STREET TREES (TREES IN PUBLIC RIGHTS-OF-WAY).**

**A. Standards and requirements.**

1. **Street trees required. All development projects fronting on a public or private street more than 100 feet in length approved after the adoption of this title shall be required to plant street trees.**
2. **Street tree planting list. Certain trees can severely damage utilities, streets and sidewalks or can cause personal injury. Approval of any planting list shall be subject to review by the Director.**
3. **Tree plan required. New street trees shall conform to an existing tree plan unless a specific exception is granted. When a tree plan does not exist, the city shall determine tree species. In selection of tree species, the city shall consider the list of prohibited trees, the available planting area, above or below ground restrictions, the need for tree diversity, and the requests of adjacent property owners.**
4. **Size and spacing of street trees. The specific spacing of street trees by size of tree shall be as follows.**

a. **Small or narrow-stature trees under 25 feet tall and less than 16 feet wide branching at maturity shall be spaced no greater than 20 feet apart.**
b. **Medium-sized trees 25 to 40 feet tall, 16 to 35 feet wide branching at maturity shall be spaced no greater than 30 feet apart.**
c. **Large trees over 40 feet tall and more than 35 feet wide branching at maturity shall be spaced no greater than 40 feet apart.**
d. **Except for signalized intersections, trees shall not be planted closer than 20 feet from a street intersection, nor closer than two feet from private driveways (measured at the back edge of the sidewalk), fire hydrants or utility poles to maintain visual clearance.**
e. **No new utility pole location shall be established closer than five feet to any existing street tree.**
f. **Street trees shall not be planted closer than 20 feet to light standards.**
g. **Where there are overhead power lines, the street tree species selected shall be of a type which, at full maturity, will not interfere with the lines.**
h. **Street trees shall not be planted within two feet of any permanent hard surface paving or walkway:**
    i. **Space between the tree and the hard surface may be covered by a nonpermanent hard surface such as grates, bricks on sand, paver blocks and cobblestones; and**
    i. ii. **Sidewalk cuts in concrete for tree planting shall be at least four feet by four feet to allow for air and water into the root area.**

5. **Pruning requirements. Trees or shrubs within any public right-of-way, or on public and private grounds and having branches projecting into the public street or sidewalk, shall be kept pruned by the owner or owners of property adjacent to or in front of which such trees, shrubs or plants are growing and shall meet the following:**
    a. **At least eight feet of clearance above sidewalks, 13 feet above local streets, and 15 feet above collector and arterial street roadway surfaces shall be provided.**
    b. **The branches of any tree, shrub or other vegetation shall be pruned so as to maintain the clear vision area requirements as set forth in § 17.8.150.**
    c. **Newly planted trees may remain untrimmed, provided they do not interfere with street traffic or persons using the sidewalk.**
6. **Cut and fill around existing trees. Existing trees may be used as street trees if no cutting or filling takes place within the drip line of the tree.**
7. **Granting of adjustments. Adjustments to the street tree requirements may be granted by the Director by means of a Type I or II procedure, using approval criteria in Article 2 for Adjustments.**
8. **Street tree maintenance – property owner responsibility.**
    a. **The adjacent property owner shall appropriately water the tree for two years following planting, unless a city irrigation system, maintenance program, or separate maintenance contract is developed which specifically removes the property owner of this responsibility.**

**b. Pruning requirements. Trees or shrubs within any public right-of-way, or on public and private grounds and having branches projecting into the public street or sidewalk, shall be kept pruned according to city standards by the owner or owners of property adjacent to or in front of which such trees, shrubs or plants are growing.**

**c. Where tree roots create hazardous sidewalk conditions, the owner is responsible for pruning the roots or modifying the sidewalk to alleviate the hazardous condition.**

**9. City maintenance of street trees.**

**a. The city may perform pruning on any street tree within the rights-of-way without a permit if total pruning results in removal of less than 20% of the crown or disturbance of less than 10% of the root system. Major pruning of a series of street trees may be combined in one permit.**

**b. If the owner or owners, lessees, occupants or person in charge of the property shall fail and neglect to trim such trees, shrubs or plants within ten to 45 days after notice, the city shall trim such trees, shrubs or plants and shall bill the property owner for the cost of the work. Such trimming by the city shall not relieve such owner, lessee, occupant or person in charge of responsibility for violation of the Code.**

**10. Additional requirements.**

**a. It shall be unlawful to attach anything to a tree, or to the support of protection devices of a tree, except that which is used for support or protection or approved by the city.**

**b. It shall be illegal to remove protective devices from around a tree, or in any way damage a street tree.**

**c. The applicant shall state when products of pruning or tree removal will be used for a financial return. The commercial harvesting of tree products (e.g., harvesting and selling of spring foliage) shall not be the primary purpose for pruning or cutting street trees.**

**d. If removal is allowed, the stump shall be removed to a depth of six inches below the surface of the ground or finish grade of the street, whichever is of greater depth.**

**e. A tree of at least two-inch or larger caliper size shall be planted within one year of removal of the street tree.**

**B. Criteria for pruning or removal. The permit for major pruning or removal shall be granted if any of the following criteria are met.**

**1. The tree is dead or diseased. This criterion shall not be used as the sole reason for removal if the cost of curing the disease is less than one-fourth of the value of the tree. Criterion 1 is to determine if major pruning or removal is appropriate, and shall not be used to require treatment of the tree.**

**2. The tree has become a major nuisance by virtue of damage to personal property or improvements, either public or private, on the subject site or adjacent sites, and that**

**the maintenance required to prevent damage to such improvements or property outweighs the value of the tree to the community.**

3. **The tree is unsafe to the occupants of the property, an adjacent property or the general public.**
4. **The removal has been approved as part of a development project, pursuant to the provisions of § 17.5.135.**
5. **The removal is for a public purpose, and there is no alternative without significant cost or safety problems.**
6. **The removal is part of a street tree improvement program, such as improving the streetscape, or improving the age and species diversity within the city .**

**Finding:** The property frontages on Sunset Drive and Highway 47 have existing street trees. The proposed development will require the removal of five existing street trees located at the proposed driveway entrances. As the existing street trees meet the City's requirements, new street trees are not needed and are not proposed. This standard is met.

**17.5.125 TREES IN NATURAL RESOURCE AREAS.**

**Modification of any trees within Natural Resource Areas shall comply with Clean Water Service Design and Construction Standards and, where applicable, §§ 17.5.050 et seq.**

**Finding:** The proposed development will include the removal of 14 invasive trees within the vegetative corridor. The proposed modifications will comply with the Clean Water Services Design and Construction Standards. This standard is met.

**17.5.135 TREES IN APPROVED DEVELOPMENTS.**

**The following provisions apply to trees that were existing and retained as part of a development review procedure.**

A. **Criteria. The permit for major pruning or removal shall be granted if any of the following criteria have been met.**
   1. **The tree is dead or diseased. Criterion 1 shall not be used as the sole reason for removal if the cost of curing the disease is less than one-fourth of the value of the tree. Criterion 1 is to determine if major pruning or removal is appropriate, and shall not be used to require treatment of the tree.**
   2. **The tree has lost its significance in terms of its original designation due to damage from natural or accidental causes, or if some other reason can be established that it is no longer of historic significance.**
   3. **The tree has become a major nuisance by virtue of damage to personal property or improvements, either public or private, on the subject site or adjacent sites, and that the maintenance required to prevent damage to such improvements or property outweighs the value of the tree to the development.**
   4. **The tree is unsafe to the occupants of the property, an adjacent property or the general public.**

5. **The pruning, removal or replacement of the tree results in an improved development as measured by the original review criteria. Decisions under this provision may be referred to the original review body.**

**Finding:** The applicant has provided an Arborist Report which provides analysis of the 244 inventoried trees on or adjacent to the site. Of the surveyed trees, 46 are located off-site and will not be affected by the proposed development. A total of 198 trees have been surveyed on the site or along the site frontage. The proposed development will require the removal of 68 of the 244 inventoried trees, 28 percent of the surveyed trees. Of the 68 trees planned for removal, 38 are directly affected by site grading, buildings, or other site improvements. This includes five street trees at the proposed entrances and 34 trees located around the existing house and vicinity of the main entrance to the development. The applicant has provided all required materials for a tree removal permit for the site in conjunction with the proposed development.

**On-Site Tree Count By Treatment:**

| | **Total** |
|---|---|
| Unaffected (off-site) | 46 |
| Retained | 130 |
| Removed | |
| - Invasive | 24 |
| - Street Trees | 5 |
| - For Development | 34 |
| - Removed for Poor Health | 5 |
| | 244 |

This standard is met.

**17.5.140 PROTECTION OF REGISTER TREES.**

A. **Register Trees. Register Trees are those identified and adopted by Council ordinance, and are subject to this section in addition to any requirements set forth in this article.**

B. **When development is proposed within a significant grove or when Register trees are located within a site proposed for development, a tree protection plan pursuant to § 17.5.115 shall be submitted for approval. If justification for removal is based upon the health of the tree, and a visual inspection by the city cannot establish that the tree is dead or seriously diseased, the applicant shall hire a certified arborist or pay a fee established by the city so that an arborist can be hired to inspect and evaluate the health of the tree.**

C. **Criteria. The permit for major pruning or removal shall be granted if any of the following criteria have been met.**

1. **The tree is dead or diseased. Criterion 1 shall not be used as the sole reason for removal if the cost of curing the disease is less than one-fourth of the value of the tree. Criterion 1 is to determine if major pruning or removal is appropriate, and shall not be used to require treatment of the tree.**

2. **The tree has lost its significance in terms of its original designation due to damage from natural or accidental causes, or if some other reason can be established that it is no longer of historic significance.**
3. **The tree is unsafe to the occupants of the property, an adjacent property or the general public.**
4. **The proposed removal is part of a development project; and**
    a. **The removal is for a public purpose, and there is no alternative without significant cost or safety problems as determined by the CFC; or**
    b. **Protecting register trees results in a density reduction of over 15%, or an increase in costs of 15%. If this is documented, the allowed tree removal shall be the minimum required to reduce the impact on density and/or costs to less than 15%.**

**D. Issuance of permit. All permits for removal shall be issued with the following conditions attached:**

1. **Any Register tree shall be removed or pruned following professional standards. These standards shall be provided to all applicants at the time the permit is issued.**
2. **It is the responsibility of the applicant to ensure that all protected trees are removed or pruned in a manner that ensures safety to individuals and public and private property.**
3. **Other conditions (such as one or more replacement trees) shall be attached in keeping with the purpose of this section.**

**E. Relative value. The relative significance and historic value of the tree (based on the Manual of Tree and Landscape Appraisers), as determined in the inventory or other study, shall be considered in evaluating the need for removal or mitigation requirement.**

**F. Referral and appeals. The Director may refer the review to the CFC. The Director may also request a recommendation from the Historic Landmarks Board if the permit request involves trees with historic significance. A decision of the Director may be appealed to the CFC. Appeals of the CFC decision shall go directly to the City Council within the time periods and procedures as set forth in §§ 17.1.200 et seq. of this Code.**

**Finding:** The site has two historic trees listed on the City's Register of Significant Trees, an Apple tree and an Oregon White Oak tree. The applicant has confirmed with the City that the Apple tree was lost in a storm in 2015. The Oregon White Oak tree is identified on the tree survey as tree 324. The applicant is proposing to retain the Historic Tree which will be featured at the entrance of the community. Tree protection standards have been addressed in the Arborist Report provided with this land use application.

**17.5.145 MITIGATION AND PENALTIES.**

**A. Tree replacement. Replacement trees shall be new trees, two inches in caliper size or larger, meeting city requirements for tree type, placement, installation and watering provisions. The owner (or the adjacent property owner in the case of street trees) shall be responsible for the continued health of the new tree including regular watering. Replacement shall be completed within one year of tree removal.**

**B. Mitigation for improper tree removal.**

1. **Removal or destruction of a tree in violation of this Code on developed single-family zoned property (and which does not meet the criteria of developable land) is punishable by replacement of the tree and a fine. The fine shall not exceed the schedule for fines set forth in the Municipal Code or the value of the tree, whichever is less.**
2. **In all other cases, removal or destruction of a protected tree in violation of this Code is punishable by a fine which shall not exceed the replacement value of the tree as based on the Guide for Plant Appraisal. In lieu of a cash payment to the city, the city may accept mitigation of said value based on the following alternatives, either singularly or in combination:**
   a. **One or more trees resulting in the same or higher value of the removed tree, except that the value shall be not less than the cost of tree replacement; and/or**
   b. **One or more trees of a species acceptable to the city in which the caliper size (cumulative square inches) of the replacement trees equal the diameter measurement at four and one-half feet above natural grade of the removed trees.**
3. **Mitigation shall be completed within 180 days. The Director may extend the time for up to 60 days due to extenuating circumstances (such as hot weather).**
4. **Where it is determined that tree removal was performed illegally, all land use permit processing for the parcel shall be suspended until mitigation is complete.**
5. **Partial compliance with criteria. If the required criteria have only been partially met, then the reviewing body can require mitigation greater than § 17.5.145A. Tree Replacement but less than § 17.5.145B.**

**Finding:** All trees proposed for removal meet the City's requirements for tree removal. Mitigation trees are not required or proposed.

**ARTICLE 6: LAND DIVISIONS**

**PARTITION**

**17.6.055 APPLICATION REQUIREMENTS FOR TENTATIVE PLAT REVIEW.**

**Applications shall be on forms provided by the Director and shall be accompanied by the tentative partition plat. The tentative plat shall be sufficiently accurate to ensure proper review and shall not exceed 24 inches by 36 inches. The tentative plat shall include the following information where applicable:**

**A. Names of the owner, applicant, engineer and surveyor as appropriate;**
**B. Date, scale and north arrow;**
**C. Property line boundaries of all contiguous land in the same ownership as the area encompassed in the application;**
**D. Sufficient description to define location and boundaries of the area to be partitioned;**
**E. Location of existing structures;**
**F. Number and type of units proposed where known;**
**G. Location and width of all existing or proposed public or private accessways (rights-of-way) including any reserve strips and parking areas;**
**H. Location of all existing and proposed public and private utilities, including water, sewer and storm drainage;**
**I. Proposed parcel layout indicating dimensions, parcel lines and lot areas of parcels;**
**J. Approximate location and width of watercourses;**

**K. All areas to be dedicated to the public and their proposed uses including street rights-of-way, drainageways, easements and reserve strips;**
**L. Location and use of adjacent structures within 150 feet of the development site;**
**M. Identification of significant natural features including heavily wooded areas; and**
**N. Where it is evident that the subject can be further partitioned the applicant shall show, either on the tentative plat or as an attachment, that the land partition will not preclude efficient division of land in the future.**

**The Director may waive any of the submittal requirements where determined that the information is unnecessary to properly evaluate the proposed partition. The Director may also require any additional information needed to evaluate the proposal.**

**The tentative partition plat application shall be reviewed for compliance with the application requirements above according to Type II procedures. Please refer to Article 1 for a summary of the procedures.**

**Finding:** The Applicant has provided a civil plan set which provides all necessary information listed in subsections A-N above. This standard is met.

**17.6.060 REVIEW CRITERIA.**

**Approval of a tentative partition plat will be granted if the Director finds that the applicant has met all of the following criteria:**

**A. The tentative partition plat complies with all applicable requirements for submittal;**

**Finding:** The Applicant documented compliance with all applicable requirements in this narrative. This standard is met.

**B. The tentative partition plat complies with all applicable standards and design requirements of this Code;**

**Finding:** The Applicant documented compliance with all applicable requirements in this narrative. This standard is met.

**C. Any special features of the site (such as topography, floodplains, wetlands, vegetation, historic sites) have been adequately considered and addressed in the design of the tentative plat;**

**Finding:** The site has an existing wetland and associated vegetative corridor which will be retained as part of the development. The site has been designed to preserve an existing mature tree stand. The proposed plat will not impact the preservation of on-site features. This standard is met.

**D. All parcels shall be suitable for their intended use. No parcel shall be of such size or design as to be detrimental to the health, safety or sanitary needs of the occupants of such parcel or partition;**

**Finding:** All proposed parcels will meet the requirements and be suitable for their intended use. The parcels have been designed to not be detrimental to the health, safety, or sanitary needs of occupants. This standard is met.

**E. Development of any remainder of property under the same ownership can be accomplished in accordance with this Code;**

**Finding:** The development of the remainder of property under the same ownership can be accomplished in accordance with the code. This standard is met.

**F. Adjoining land can be developed or is provided access that will allow its development in accordance with this Code;**

**Finding:** The proposed development does not hinder the development of adjoining land. This standard is met.

**G. The proposed street plan provides safe, convenient and direct options for pedestrian, bicycle and vehicular circulation; and**

**Finding:** The proposed internal drive and pedestrian network provides safe, convenient, and direct options for pedestrian, bicycle, and vehicular circulation. This standard is met.

**H. Adequate public facilities are available or can be provided by the applicant to serve the proposed partition.**

**Finding:** The site can be served by public facilities. This standard is met.

**ARTICLE 7: MISCELLANEOUS PROVISIONS**

**SOLID WASTE AND RECYCLING**

**17.7.205 SIZE, LOCATION, DESIGN AND ACCESS STANDARDS FOR STORAGE AREAS.**

**The applicant shall indicate the size and location of the storage area for solid waste and recycling on the site plan required for site development review or design review.**

**O. Storage area size. The following guidelines shall be used to determine the appropriate size for the storage area.**

1. **Multi-family residential building with three to ten units: 50 square feet.**
2. **More than ten units: 50 square feet plus five square feet for each unit above ten.**
3. **Office: four square feet/1,000 square feet of gross floor area (GFA).**
4. **Retail: ten square feet/1,000 square feet of GFA.**
5. **Wholesale/warehouse/manufacturing: six square feet/1,000 square feet of GFA.**
6. **Educational/institutional: four square feet/1,000 square feet of GFA.**
7. **Other: four square feet/1,000 square feet of GFA.**

**Finding:** Multi-family development:
The subject site has a total of 362units.
50 sq.ft. + 5 sq.ft./unit above 10.
362 units – 10 units = 352 units
352 units x 5 sq.ft./unit = 1,760 sq.ft.
50 sq.ft. + 1,760 sq.ft. = 1,810 sq. ft. required

Per Subsection 2 above, a total of 1,800 square feet of waste storage area is needed for the multi-family development. Six waste storage areas have been located throughout the site, providing a total waste storage area of 1,836 square feet. This standard is met.

Residential (Phase R1A):
Total of 24 row houses
50 sq.ft. + 5 sq.ft./unit above 10
24 units – 10 units = 14 units
14 units x 5 sq.ft./unit = 70 sq.ft.
50 sq.ft. + 70 sq.ft. = 120 sq.ft. required

Per Subsection 2 above, a total of 130 square feet of waste storage area is needed for the row house development. One waste storage area has been located on the site for shared use, providing a total waste storage area of 306 square feet. This standard is met.

Commercial/Retail (Phase C1): 33,175 sq.ft.
10 sq.ft. per 1,000 GFA
33,175 sq. ft. GFA/1,000 GFA = 33.175 sq.ft.
10 sq.ft. x 33.175 sq.ft. = 332 sq.ft.
Per Subsection 4 above, a total of 332 square feet of waste storage area is needed for Phase C-1 of the commercial development. One waste storage area has been located on the site, providing a total waste storage area of 379.5 square feet.

**P. Location standards.**

1. **To encourage its use, the storage area for recycling shall be co-located with the storage area for solid waste.**

**Finding:** Recycling has been co-located with the storage area for solid waste. This standard is met.

2. **Indoor and outdoor storage areas shall comply with Building and Fire Code requirements.**

**Finding:** The storage area will comply with Building and Fire Code requirements, which will be reviewed during the building permit submittal. This standard is met.

3. **Storage area space requirements can be satisfied with a single location or multiple locations, and combine both interior and exterior locations.**

**Finding:** Multiple storage areas have been located across the site. This standard is met.

4. **Exterior storage areas can be located within interior yard or rear yard areas. Exterior storage areas shall not be located within a required front yard setback or in a yard adjacent to a public or private street.**

**Finding:** The exterior storage areas have not been located within the front, side, or rear yard setback areas. This standard is me.

5. **Exterior storage areas shall be located in central and visible locations on a site to enhance security for users.**

**Finding:** The exterior storage areas have been located in central and visible locations on the site. This standard is met.

6. **Exterior storage areas can be located in a parking area, if the proposed use provides at least the minimum number of parking spaces required by this Code.**

**Finding:** The waste storage areas are located within the parking area. The minimum parking requirements of this Code have been met, as addressed in this narrative under Section 17.8.515.H.1 below. This standard is met.

7. **The storage area shall be accessible for collection vehicles and located so that the storage area will not obstruct pedestrian or vehicle traffic movement on the site or on public streets adjacent to the site.**

**Finding:** The waste storage areas have been located so that they are accessible for collection vehicles and so that they will not obstruct pedestrian or vehicular movements on the site or adjacent public streets. This standard is met.

**Q. Design standards.**

1. **The dimensions of the storage area shall accommodate containers consistent with current methods of local collection.**
2. **Storage containers shall meet Fire Code standards and be made and covered with waterproof materials or situated in a covered area.**
3. **A sight-obscuring fence, wall or hedge at least six feet in height shall enclose exterior storage areas. Gate openings, which allow access to users and haulers, shall be provided. Gate openings for haulers shall be a minimum of ten feet wide and shall be capable of being secured in a closed and open position.**
4. **Storage area(s) and containers shall be clearly labeled to indicate the type of material accepted.**

**Finding:** The waste storage areas have been designed to accommodate containers consistent with current methods of local collection. All storage containers will meet the Fire Code standards and be made and covered with a waterproof material. A sight-obscuring wall at least six feet in height will enclose each of the storage areas. Gate openings that are at least ten feet wide have been provided on each of the storage areas. All storage areas and containers will be clearly labeled to indicate the type of material accepted. This standard is met.

**R. Access standards.**

1. **Access to storage areas can be limited for security reasons. However, the storage area shall be accessible to users at convenient times of the day, and to collection service personnel on the day and approximate time they are scheduled to provide collection service.**
2. **Storage areas shall be designed to be easily accessible to collection trucks and equipment, considering paving, grade and vehicle access. A minimum of ten feet horizontal clearance and eight feet of vertical clearance is required if the storage area is covered.**
3. **Storage areas shall be accessible to collection vehicles without requiring backing out of a driveway onto a public street. If only a single access point is available to the**

**storage area, adequate turning radius shall be provided to allow collection vehicles to safely exit the site in a forward motion.**

**Finding:** The waste storage areas will be accessible to users at convenient times of the day, and to the collection service personnel on the day and time that they are scheduled to provide collection service. Storage areas have been designed to be easily accessible to collection trucks and equipment. A minimum of ten feet horizontal clearance and eight feet of vertical clearance has been provided on all waste storage areas. All storage areas have been located to be accessible without requiring backing out of a driveway onto a public street. The requirements of this section are met.

**ARTICLE 8: GENERAL DEVELOPMENT STANDARDS**

**ACCESS AND CIRCULATION**

**17.8.110 GENERAL PROVISIONS.**

**A. Continuing obligation of property owner. The provision and maintenance of access and egress stipulated in this section are continuing requirements for the use of any structure or parcel of real property in the city.**

**B. Access plan requirements. No building or other permit shall be issued until a scaled site plan is submitted that shows how access, egress and circulation requirements are to be fulfilled. The Director shall provide the applicant with information about the submittal requirements for an access plan.**

**C. Joint access. Owners of two or more uses, structures or parcels of land may agree to jointly use the same access and egress when the combined access and egress of both uses, structures or parcels of land satisfies their requirements as designated in this article, provided:**

**1. Satisfactory legal evidence shall be presented in the form of deeds, easements, leases or contracts to establish the joint use; and**

**2. Copies of the deeds, easements, leases or contracts are placed on permanent file with the city.**

**D. Public street access. All vehicular access and egress shall connect directly with a public or private street approved by the city for public use, except where joint access is provided through adjacent or other property which is connected to a street. Vehicular access to a residential use shall be provided within the same lot for single-family and two-family dwellings, and within the same lot or development for multi-family dwellings. Access to multi-family units shall avoid being located through single-family residential areas before being connected to a collector or arterial as designated by the city 's Transportation Plan.**

**E. Transit agency referral. The city shall submit all development proposals located along the Pacific Avenue/19th Avenue transit corridor to Tri-Met and along existing and proposed collectors and arterials in the Westside Planning Area to Ride Connection/GroveLink for review and comment regarding facilities necessary to support transit. The following facilities may be required as a condition of a permit:**

**1. Walkways to transit stops;**

**2. Bus stop shelters or waiting areas; and**

3. **Turnouts for buses.**

F. **Where hard surfaces are stipulated by these requirements, pervious surfaces are encouraged to be used. Where improvements are within the public rights-of-way, such surfaces can be used upon approval by the City Engineer.**

G. **Landscaped areas should include water quality features such as bio-swales or wetlands, trees, grass, shrubs and other plant material when possible, so as to cover landscape areas.**

**Finding:** This submittal includes a scaled site plan showing how access, egress and circulation is accomplished on-site. Access to the proposed development will be provided from Sunset Drive. A Traffic Impact Analysis detailing the proposed traffic impact of the development has been submitted under Appendix D. Pervious surfaces are not proposed. This standard is met.

**17.8.115 ON-SITE PEDESTRIAN WALKWAYS.**

A. **Required walkways. On-site pedestrian walkways are required as follows:**

1. **Walkways shall extend from the ground floor entrances or from the ground floor landing of stairs, ramps or elevators of all commercial, institutional and industrial uses, to the public sidewalk or curb of the public street or streets which provide the required access and egress. Walkways shall provide convenient connections between buildings in multi-building commercial, institutional and industrial complexes. Walkways shall be constructed between a new development and neighboring developments. If connections aren't currently available, then planned connections shall be designed to provide an opportunity to connect adjoining developments.**

**Finding:** Walkways have been designed to extend from the ground floor entrances of all buildings to the public sidewalk. The walkways will provide connections between buildings. This standard is met.

2. **The maximum distance between a parking space and a walkway shall not exceed 45 feet. All walkways constructed within parking lots shall be raised to standard sidewalk height. All surface treatment of walkways shall be firm, stable and slip resistant.**
3. **Required walkways shall be paved with hard-surfaced materials such as concrete, asphalt, stone, brick, etc. Walkways may be required to be lighted and/or signed as needed for safety purposes. Lighting and or signs may be required for walkways for safety purposes.**
4. **Whenever required walkways cross vehicle access driveways or parking lots, such crossings shall be designed and located for pedestrian safety. Required walkways shall be physically separated from motor vehicle traffic and parking by either a minimum six-inch vertical separation (curbed) or a minimum three-foot horizontal separation, except that pedestrian crossings of traffic aisles are permitted for distances no greater than 36 feet if appropriate landscaping, pavement markings or contrasting pavement materials are used. Walkways shall be a minimum of four feet**

**in width, exclusive of vehicle overhangs and obstructions such as mailboxes, benches, bicycle racks and signposts, and shall be in compliance with ADA standards.**

5. **Where required for pedestrian access, interior landscape areas in combination with pedestrian walkways between rows of parking shall be at least ten feet in width to accommodate walkways, shrubbery and trees 20 to 30 feet on-center. This ten-foot width may be reduced between tree areas depending on the characteristics of the vegetation. Angled or perpendicular parking spaces shall provide bumper stops or widened curbs to prevent bumper overhang into interior landscaped areas or walkways.**

**Finding:** All parking spaces are located within 45 feet of a walkway. All main walkways within the parking lots will be raised to standard sidewalk standard height and will be constructed of a firm, stable and slip resistant surface. Accessible routes to the trash enclosure areas will be provided. As requested by the City, the parking stalls in the residential area have been shortened in length by 18 inches in lieu of bumper stops. Adjacent sidewalks have been widened by 18 inches to allow for bumper overhang and five feet of clearance for pedestrians. The commercial development will have 10-foot-wide sidewalks which will provide adequate clearance for pedestrians. This standard is met.

**17.8.120 MINIMUM ACCESS REQUIREMENTS FOR RESIDENTIAL USES.**

**A. Direct access to arterial streets from a residential dwelling established after the effective date of this Code is prohibited. The city may permit direct access to an arterial for lots of subdivisions approved prior to the effective date of this Code, and for multi-family residential complexes if the access is designed to local residential street standards.**

**B. Single-family dwellings and duplexes shall be required to have one driveway, fully improved with hard surface pavement, with a minimum width of ten feet.**

**C. Service drives for multi-family dwellings shall be fully improved with hard surface pavement with a minimum width of:**

1. **Twelve feet when accommodating one-way traffic; or**
2. **Twenty feet when accommodating two-way traffic.**

**In no case shall the design of said service drive or drives require or facilitate the backward movement or other maneuvering of a vehicle within a street.**

**D. Private residential access drives shall be provided and maintained in accordance with the provisions of the Uniform Fire Code.**

**E. Dead-end access drives in excess of 150 feet shall be provided with approved provisions for the turning around of fire apparatus by one of the following:**

1. **A circular, paved surface having a minimum turn radius measured from center point to outside edge of 35 feet;**
2. **A hammerhead, paved surface with each leg of the hammerhead having a minimum depth of 40 feet and a minimum width of 20 feet; or**
3. **The maximum cross slope of a required turnaround is 5%.**

**F. Driveway grades shall not exceed a maximum of 20%.**

**Finding:** Access to the proposed development will be provided from Sunset Drive, a collector. All access drives have been designed to meet the Uniform Fire Code to provide for turning

around and fire apparatus access. Driveway grades do not exceed 20 percent. This standard is met.

**17.8.125 MINIMUM ACCESS REQUIREMENTS FOR NON-RESIDENTIAL USES.**

**A. Service drives for non-residential uses shall be fully improved with hard surface pavement with a minimum width of:**

**1. Fifteen feet when accommodating one-way traffic; or**

**2. Twenty-four feet when accommodating two-way traffic.**

**B. All non-residential uses shall be served by one or more service drives as determined necessary to provide convenient and safe access to the property. In no case shall the design of said service drive or drives require or facilitate the backward movement or other maneuvering of a vehicle within a street, other than an alley.**

**Finding:** The proposed commercial service drives will be constructed of hard surface pavement and have been designed to be at least 15 feet wide when accommodating one-way traffic and 24 feet wide when accommodating two-way traffic. The proposed circulation system has been designed with two access points for the commercial site. The system has been designed so that it does not require backward movement or maneuvering of a vehicle within a street. This standard is met.

**17.8.130 WIDTHS AND LOCATIONS OF DRIVEWAYS AND CURB CUTS.**

**A. Minimum driveway widths at the street right-of-way line shall be 15 feet for institutional, commercial, industrial and multi-family residential projects with at least five units, and ten feet for single-unit detached and townhomes, duplex, triplex, fourplex and cottage clusters.**

**B. Maximum driveway widths at the street right-of-way line shall be as follows.**

**1. In residential zones:**

**a. Twenty-four feet for lots with less than 60 feet of street frontage;**

**b. Thirty feet for lots with street frontages of 60 feet or greater;**

**c. There shall be a minimum distance of 30 feet between any two adjacent curb cuts on the same lot;**

**d. Triplex and quadplexes on lots or parcels with frontages only on local streets may have either two driveway approaches not exceeding 32 feet in total or one maximum 16-foot-wide driveway approach per frontage;**

**e. A maximum of one driveway approach is allowed for every single-unit attached unit/townhouse. Driveway approaches and driveways may be shared provided reciprocal access easements are recorded.**

**2. Thirty-six feet in institutional, town center or commercial zones; and**

**3. Forty feet in industrial zones.**

**C. Location of curb cut. No portion of a curb cut shall be located closer to an intersecting street right-of-way line than:**

**1. One hundred feet on an arterial street with four or more travel lanes;**

**2. Fifty feet on an arterial street with two or three travel lanes;**

**3. Fifty feet on a collector street; or**

4. **Twenty feet on a local street.**

**D. Minimum distance between curb cuts. On arterial and collector streets, minimum distances shall be maintained as follows between adjacent curb cuts on the same side of any such street:**

1. **Eighty-five feet where the speed limit is 20 mph or less;**
2. **One hundred five feet where the speed limit is 25 mph;**
3. **One hundred twenty-five feet where the speed limit is 30 mph;**
4. **One hundred fifty feet where the speed limit is 35 mph;**
5. **One hundred eighty-five feet where the speed limit is 40 mph;**
6. **Two hundred thirty feet where the speed limit is 45 mph; and**
7. **Two hundred seventy-five feet where the speed limit is 50 mph or greater.**

**E. In measuring the distance between curb cuts on arterial and collector streets, existing curb cuts, or accesses serving single-family and two-family dwellings shall not be considered.**

**F. City Engineer's authority to restrict driveway widths and locations. To ensure that driveways do not conflict with public infrastructure, the City Engineer has the authority to restrict the width and location of any driveway.**

**Finding:** The proposed development will have three access driveways on the east side of Sunset Drive, a collector. All proposed driveways are at least 23 feet in width. The speed limit on Sunset Drive is posted as 35 mph. The proposed curb cuts will not be located closer than 50 feet from an intersecting street right of way line. All curb cuts will maintain a minimum distance of 150 feet between each other.

| | Development | Access Type | Distance Between Curb Cut |
|---|---|---|---|
| Driveway 1 | Residential | Full Access | South – 545 feet<br>North – 715 feet |
| Driveway 2 | Commercial | Full Access | South – 715 feet<br>North – 150 feet |
| Driveway 3 | Commercial | Right-in/Right-out | South – 150 feet<br>North – 250 feet |
| Driveway 4 | Residential (TL 600) | Full Access | North – 251 feet<br>South – 235 feet |

This standard is met.

**17.8.135 SPECIAL ACCESS-EGRESS PROVISIONS.**

**A. One-way vehicular access points. Where a proposed parking facility indicates only one-way traffic flow on the site, it shall be accommodated by a specific driveway serving the facility; the entrance drive shall be situated closest to oncoming traffic and the exit drive shall be situated farthest from oncoming traffic.**

**Finding:** One-way traffic is not proposed on the site. The requirements of this section are not applicable.

**B. Director 's authority to restrict access. The Director has the authority to restrict access when the need to do so is required by one or more of the following conditions:**

1. **To provide for increased traffic movement on congested streets and to eliminate turning movement problems, the Director may restrict the location of driveways on streets and require that the location of driveways be placed on adjacent streets, upon the finding that the proposed access would:**
   a. **Cause or increase existing hazardous traffic conditions;**
   b. **Provide inadequate access for emergency vehicles; or**
   c. **Cause hazardous conditions to exist, which would constitute a clear and present danger to the public health, safety and general welfare.**
2. **To eliminate the need to use public streets for movements between commercial or industrial properties, parking areas shall be designed to connect with parking areas on adjacent properties unless not feasible. The Director shall require access easements between properties where necessary to provide for parking area connections.**
3. **To facilitate pedestrian and bicycle circulation, access and parking area plans shall provide efficient sidewalk and/or a pathway connection, as feasible, between neighboring developments and land uses.**
4. **A decision by the Director per subsections B.1. through B.3. above may be appealed by means of a Type II procedure.**

**C. Joint Access in Commercial Zones. If feasible, joint access and the provision of reciprocal easements shall be required as a condition of issuing a building permit in all commercial zones.**

**D. In all zones where the spacing of access and egress drives cannot be readily achieved within a particular parcel; joint access with an adjoining property shall be sought. If the Director is satisfied that sufficient attempts to secure joint access have been made and the joint access is not possible, and access separation as specified in § 17.8.130 cannot be maintained, driveway access may be granted with less separation between adjacent driveways. The spacing shall be the minimum required to provide adequate, yet safe and convenient access to the property. The clear vision area requirements of Article 8 are applicable.**

**Finding:** The residential development will be primarily accessed through a full access driveway at the southwest corner of the site on Sunset Drive. The commercial lot will have two access points on Sunset Drive, a full access, and a restricted access. The development will have internal access between the residential and commercial developments and will be connected through an internal access drive. A traffic impact analysis has been provided which provides further detail on the traffic movements and operation of the street network.

This standard is met.

**17.8.140 SPECIFIC SITE ACCESS AND CIRCULATION STANDARDS.**

**The following access and circulation standards apply specifically to certain types of development or apply within certain locations within the community.**

**A. Multi-unit development. A functional and safe environment for vehicles and pedestrians is important within residential areas. Multi-unit development should be visually**

**appealing from the adjacent street right-of-way and be functionally and aesthetically tied to adjacent residential neighborhoods.**

1. **Circulation.**
   a. **A continuous pedestrian connection shall be provided from the front door of all residential buildings to the public sidewalk.**
   b. **Separate pathways from dwellings a minimum distance of ten feet. The separation is measured from the pathway edge closest to any dwelling unit.**
   c. **On-site pedestrian walkways are required to be a minimum width of five feet connecting dwelling units to parking/open space /recreation areas.**

**Finding:** A continuous pedestrian connection has been provided from the front door of all buildings to the public sidewalk. All on-site pedestrian walkways are a minimum width of five feet and have been separated from dwellings a minimum distance of ten feet. This standard is met.

2. **Parking areas.**
   a. **Separate physically and visually parking areas greater than 10,000 square feet in area with landscape planter bays at least 18 feet in width. Individual parking areas may be connected by a driveway.**
   b. **The sidewalk system shall connect the front door of all residential buildings to parking area(s).**

**Finding:** The parking area has been designed with landscape planter bays at least 18 feet in width. A sidewalk system connects the front door of all residential buildings to the parking areas. This standard is met.

3. **Pedestrian environment.**
   a. **Residential doors which face a public right-of-way shall be setback a minimum of three feet plus any additional width needed to meet the minimum sidewalk requirements (where applicable) from a public sidewalk.**
   b. **The following types of doors shall not provide the primary entrance into a dwelling unit: sliding glass or solid metal doors without glazing.**
   c. **Residential stoops, porches or terraces shall be raised a maximum of three feet above grade at the adjacent right-of-way.**
   d. **Residences with entry porches or terraces shall have a minimum area of 40 square feet.**
   e. **Residential entries shall be lowered a maximum of four feet below grade measured at adjacent right-of-way.**

**Finding:** The proposed residential buildings will not have residential doors which face a public right-of-way. Access will be provided through central covered breezeways located at each building. Primary entrances will not be sliding glass or solid metal doors. Residential porches will be raised at least three feet above grade when adjacent to the right-of-way. This standard is met.

4. **Screening/service areas.**

a. **All mechanical equipment shall be screened from view by an opaque fence or solid landscape screen eight feet high.**
b. **Service/refuse collection areas shall not be located within 20 feet of public rights-of-way.**
c. **All development of two or more stories in height shall be required to provide screening of garbage collection and storage areas from above.**
d. **All roof mounted mechanical equipment other than vents shall be screened from ground level view. The screening shall be as high as the height of the equipment and shall be integrated with the exterior building facade.**

**Finding:** All proposed waste storage areas will be located at least 20 feet from a public right-of-way and will be screened. This standard is met.

5. **Landscaping.**
   a. **At least 75% of required landscaped area shall be planted with any suitable combination of trees, shrubs or evergreen ground cover.**
   b. **A maximum of 25% of required landscaped area may include architectural features or artificial ground covers such as sculptures, benches, masonry or stone walls, rock groupings, decorative hard paving and gravel areas interspersed with planting areas.**

**Finding:** At least 75% of the required landscape area will be planted with a combination of trees, shrubs, or evergreen ground cover. A maximum of 25% of the required landscape area will include architectural features. This standard is met.

6. **Crime Prevention Through Environmental Design (CPTED).**
   a. **No landscaping, fences, walls or plant materials greater than five feet in height shall be installed which obstruct the visibility of a dwelling entry from a public street.**

**Finding:** Landscaping, fencing, walls or plant materials will not obstruct the visibility of the dwelling entry from the public street. This standard is met.

   b. **A minimum of 25 square feet of window area shall be provided within each dwelling unit facing a common open space, pedestrian path or car park to allow visual surveillance.**

**Finding:** As shown on the submitted elevation drawings, a minimum of 25 square feet of window area will be provided within each dwelling unit facing a common open space, pedestrian path or car park. This standard is met.

   c. **A clear line of site between all front building entries and the public sidewalk or car park shall be maintained.**

**Finding:** A clear line of sight between all front building entries and the public sidewalk or car park will be maintained. This standard is met.

   d. **Lighting shall be provided at all exterior dwelling unit entrances.**

**Finding:** Lighting will be provided at all exterior dwelling unit entrances. This standard is met.

**e. Guard or a keyed variation of gated residential development is prohibited.**

**Finding:** Guard or a keyed variation of gated residential development is not proposed. This standard is met.

**f. Motion activated security lighting is prohibited along public rights-of-way.**

**Finding:** Motion activated security lighting is not proposed along the public right-of-way. This standard is met.

**B. Commercial development. Commercial development should accommodate automobiles, mass transit, bicycles and pedestrians in a safe, functional and visually appealing manner.**

**1. Circulation.**

**a. Auto/truck access to parking shall be from a local or collector street, an adjacent development, alley or existing driveways along arterial roads.**

**Finding:** The commercial parking area has been designed with two access points, with direct access from Sunset Drive, a collector. A joint access drive will connect the adjacent residential development and provide access to a third driveway on Sunset Drive. This standard is met.

**b. Where buildings are setback from right-of-ways, a continuous and direct sidewalk with a 12-foot minimum width shall be provided between the public sidewalk and the front door to all buildings on site.**

**Finding:** A minimum 12-foot continuous and direct sidewalk will be provided for the commercial development and will connect the public sidewalk to the front door of all buildings. This standard is met.

**c. All roadways or drives shall include sidewalks on both sides of travel lanes with the exception of vehicle facilities that provide access to loading and service areas.**

**Finding:** Sunset Drive and Highway 47 have existing sidewalks along the street frontage. New roads are not proposed. This standard is met.

**2. Parking.**

**a. Construct off-street surface parking that does not occupy more than 50% of the street frontage. Where a site has frontage along a side street a surface car park may occupy more than 50% of the side street frontage.**

**Finding:** The proposed off-street surface parking areas will not occupy more than 50 percent of the street frontage on Sunset Drive or Highway 47. This standard is met.

| | Length of Frontage of Commercial Lot | Length of Parking Along Frontage | Percent of Parking Along Frontage |
|---|---|---|---|
| Tax Lot: 1N331A000100 | | | |
| Sunset Drive | 565 Feet | 116 Feet | 20.5% |
| Highway 47 | 407 Feet | 60 Feet | 14.7% |

**b. Screen parking with a solid perimeter wall, decorative welded metal (wrought iron) fencing and columns, earthen berm or evergreen hedge (or a combination thereof). The maximum height of screening shall be five feet except along the street frontage where the maximum height shall be three feet six inches.**

**Finding:** All parking within the commercial development will be screened in accordance with this section. This standard is met.

**c. Provide a minimum of 15% of the car park as water pervious surface – either paving or landscaped retention areas.**

**Finding:** A minimum of 15 percent of the car park area will be provided as water pervious surface. This standard is met.

**d. Development sites shall not consist of paved parking areas of more than 50% of the entire site area.**

**Finding:** The 4.0-acre commercial property has a total paved area of 36.1 percent. This standard is met.

**3. Pedestrian environment.**

**a. The sidewalk system shall connect all customer entrances to the public sidewalk.**

**Finding:** The sidewalk system on the commercial site connects all customer entrances to the public sidewalk. This standard is met.

**b. Minimum sidewalk width ten feet. Sidewalks shall meet American with Disabilities Act (ADA) requirements and may include landscaped areas, benches and other pedestrian amenities.**

**Finding:** The sidewalks within the commercial area are ten feet wide, except where required to be twelve feet wide. All sidewalks have been designed to meet the ADA requirements. This standard is met.

**c. Plazas, squares or courts shall be fronted by commercial building facades with 75% or more transparency/window opening of first 15 feet of building.**

**Finding:** Any proposed plazas, squares or courts shall be fronted by commercial building facades with 75% or more transparency/window opening of first 15 feet of building. This standard will be reviewed at the time of permit submittal for the commercial development.

**d. All development shall provide a sheltered entry area at the entrance to each commercial establishment with a minimum area of 50 square feet and a minimum dimension of six feet.**

**Finding:** The proposed commercial development will provide sheltered entrances with a minimum area of 50 feet and minimum dimension of six feet. This standard will be reviewed at the time of permit submittal for the commercial development.

**4. Screening of service areas.**

**a. All loading areas shall be physically separated from customer pedestrian and residential areas with a solid five-foot tall fence, evergreen hedge, arbor, berm or a combination of these elements.**

**Finding:** All loading areas will be physically separated from customer pedestrian and residential areas with a solid five-foot tall fence, evergreen hedge, arbor, berm or a combination of these elements. This standard will be reviewed at the time of permit submittal for the commercial development.

**b. All ground level and roof-top mechanical equipment shall be screened from view with landscaping, fencing and or walls. The height of the screen shall equal or exceed the height of the equipment, and include screening from views from above when visible from adjacent inhabited buildings.**

**Finding:** All ground level and roof-top mechanical equipment shall be screened from view with landscaping, fencing and or walls. This standard will be reviewed at the time of permit submittal for the commercial development.

**5. Landscaping.**

**a. Landscaping standards vary depending on zoning, use, adjacent zoning and existing site conditions.**

**Finding:** The proposed commercial development is located in the NMU zone and subject to the MUPD standards. The NMU zone does not prescribe a minimum landscape requirement. The applicant is proposing 72,789 square feet of landscaping on the commercial site, or 41. 8 percent.

**b. A landscaped strip at least ten feet in width shall be provided abutting any property line facing a street. The landscape strip shall be appropriately landscaped with ground cover, planted berm, shrubbery and/or trees.**

**Finding:** A 10-foot landscape strip has been provided along the commercial property abutting Sunset Drive and Highway 47. As shown on the landscape plan, the landscape strip is appropriately landscaped with a mix of ground cover, shrubbery and trees. This standard is met.

**c. At least 75% of required landscaped area shall be planted with any suitable combination of trees, shrubs or evergreen ground cover.**

**Finding:** At least 75 percent of the required landscaping on the commercial sites will be planted with a combination of trees, shrubs, and evergreen ground cover. This standard is met.

**d. A maximum of 25% of required landscaped area may include architectural features or artificial ground covers such as sculptures, benches, masonry or stone walls, rock groupings, decorative hard paving and gravel areas interspersed with planting areas.**

**Finding:** A maximum of 25% of the required landscape area on the commercial lot will include architectural features. This standard is met.

**C. Town Center Districts. The intent of the following standards is to provide a functional and safe environment for vehicles and pedestrians, where the needs of pedestrian are emphasized. The Town Center should have a clear separation between pedestrian and vehicular areas and should be comfortable and safe in all seasons and hours of the day.**

**1. Building orientation.**

**a. TCC: Building facades shall be built along at least 80% of the primary building frontage line.**

**b. TCT: Building facades shall be built along at least 75% of the primary building frontage line.**

**c. One entrance shall be provided for each building facade. When building is located on a corner, one entrance at the corner is permitted.**

**d. If a building is setback from right-of-way, it shall be a minimum of four feet in depth and include plazas, forecourts or other paved areas for public seating, artwork and landscaped planting beds.**

**e. If a building is setback from the right-of-way, mechanical units, meters or other above grade or wall mounted utilities shall not be located in the front setback area.**

**Finding:** The Village Center commercial development is subject to the Design and Development Standards of the Town Center Transition Zone per 17.4.315.F.1. The commercial building facades will be built with at least 75 percent of the primary building frontage line. One entrance will be provided for each building façade. Where buildings are set back from the right-of-way, plazas and other paved areas for public seating, artwork or landscaping will be provided. Where buildings are setback from the right of way, mechanical units will not be located in the setback area. This standard is met.

**2. Pedestrian connections.**

**a. When provided on-site, parking shall not be located between the front facade and the front property line.**

**Finding:** Parking is not proposed between the front property line and the front building façade. The commercial development will feature multiple buildings located along the perimeter of the development, with parking located central to the development. This standard will be reviewed at the time of permit submittal for the commercial development.

**b. Where walkways are parallel and adjacent to a driveway or street (public or private), they shall be raised six inches and curbed or separated from the driveway /street with bollards and/or a three-foot minimum landscape barrier.**

**Finding:** Where walkways are parallel or adjacent to a driveway or street, they will be separated from the driveway or street by a curb. This standard will be reviewed at the time of permit submittal for the commercial development.

**c. Where pathways cross a parking area, driveway or street ("crosswalk"), they shall be clearly marked with contrasting paving materials, humps/raised crossings, or painted striping. If painted striping is used, it shall consist of thermo-plastic striping or similar type of durable application.**

**Finding:** Where walkways cross a parking area or driveway, they will be clearly marked with contrasting paving materials, humps/raised crossings, or painted striping. This standard will be reviewed at the time of permit submittal for the commercial development.

**d. All mechanical equipment, outdoor storage and manufacturing and service and delivery areas shall be screened from view from pedestrian sidewalks. Screening shall be provided by one or more of the following: decorative wall (masonry or similar quality material, evergreen hedge, wood fence - non-see through).**

**Finding:** All mechanical equipment, outdoor storage and manufacturing and service and delivery areas will be screened from view from pedestrian sidewalk. This standard will be reviewed at the time of permit submittal for the commercial development.

**3. Site amenities. Every development shall provide at least one of the "pedestrian amenities" listed below:**

**a. A plaza, courtyard next to the building entrance a minimum of four feet in depth for residential food, beverage or entertainment establishments only or, for other uses, an area with public art which incorporates seating (e.g., a fountain);**

**b. Public seating areas (chairs, tables, benches); or**

**c. Building canopy, awning or similar weather protection across 75% of the facade, projecting a minimum of four feet over the sidewalk.**

**Finding:** The proposed commercial development will provide a pedestrian amenity listed above. This standard will be reviewed at the time of permit submittal for the commercial development.

**CLEAR VISION AREA**

**17.8.155 STANDARDS.**

**Except in the Town Center zones, a clear vision area shall be maintained on the corners of all property adjacent to the intersection of two streets, a street and a railroad, or a driveway providing vehicular access to a public street, excluding alleys.**

**A. On corner lots, no vehicle, fence, wall, hedge or other planting or structure shall be parked, erected, planted, placed, located or maintained, except for occasional tree trunks or poles, so as to impede visibility within the greater of the two clear vision areas defined below (see Figure 8-5):**

**1. The triangular area formed by the curb lines along such lots and a straight line joining said curb lines at points which are 30 feet distant from the intersection of the curb lines and measured along such lines; or**

**2. The triangular area formed by the property lines of such lots and a straight line joining said property lines at points which are ten feet distant from the intersection of the property lines and measured along such lines.**

**B. A private access shall be treated as a public street for the purpose of this section. The edge of the paved surface area of the private access, be it roadway, curb or sidewalk, shall be treated as the curb line in determining the vision clearance area.**

**C. The vision clearance area for all commercial, industrial, institutional and multi-family uses shall be determined in the manner set forth in subsectionA.1. above.**

**D. The vision clearance area for single-family homes and duplexes shall be determined in the manner set forth in subsection A.2. above.**

**E. Any obstruction maintained in violation of this section shall be deemed in violation of the Development Code and shall be abated pursuant to § 17.1.400 enforcement procedures.**

**Finding:** The clear vision standards of this section have been met as demonstrated by the clear vision triangles shown on the Site Plan (Sheet C200), submitted under Appendix E. This standard is met.

**OPEN SPACE, RECREATIONAL FACILITIES AND COMMON AREAS**

**17.8.205 STANDARDS.**

**A. Open space areas may be required to avoid placing structures or other improvements either in identified hazard or resource areas as required by §§ 17.5.005 et seq. and 17.8.300 et seq.**

**Finding:** The subject site has a delineated wetland in the southeastern portion of the site. The delineated wetland and associated vegetative corridor have been identified as open space areas. Structures have not been located in the identified resource areas. This standard is met.

**B. Areas retained to comply with Clean Water Services (CWS) water quality sensitive area and vegetative corridor requirements of the Design and Construction Standards or surface water quality or quantity facilities requiring over 100 square feet of area shall be considered open space but not be considered a recreational area unless so designed as to be integrated with a development 's site design and available for access for residents in the development.**

**Finding:** The subject site has a delineated wetland in the southeastern portion of the site. The delineated wetland and associated vegetative corridor are areas identified to be retained to comply with CWS water quality sensitive area and vegetative corridor requirements. These areas have been designated as open space but have not been designed to be recreation areas. This standard is met.

**C. Except for developments in TCC or TCT zones, any development not involved in a division of land, open space and recreation areas shall be held in common for residential condominiums or by the primary land owner for apartment complexes or non-residential development. The area shall be placed within an easement unless waived by the Director for minor recreation facilities or recreation facilities that are integrated with the developed portion of the project. Developments within the NMU zone may modify the standards below through an approved MUPD.**

**1. Residential projects in the Residential Multi-family Low (RML) and Residential Multi-family High (RMH) districts shall provide the following: All condominium, two-family dwellings, multi-family dwellings, residential care facilities, residential care institutions and nursing or convalescent homes shall provide 20% of the lot area in open space, excluding that area designated in the site plan and improved for off-street parking and driveways. All dwelling units shall be immediately accessible to a minimum of 600 square feet of open space.**

**Finding:** The proposed development is not in the RML or RHM district. The requirements of this section are not applicable.

2. **All condominium, two-family dwellings and multi-family dwellings of 20 units or more, residential care facilities, residential care institutions and nursing or convalescent homes shall improve one-half of the required open space as recreation space. Recreation space shall be planted in grass and/or improved for recreational use, and have a minimum area of 870 square feet and a minimum dimension of 20 feet. For two-family and multi-family dwellings, the recreational area shall include a children's play area. A fence shall be installed that is a minimum of 30 inches in height to separate a parking lot, street or driveway from any children's play area.**

**Finding:** The proposed multi-family development has a minimum requirement of 128,092 square feet of open space. The multi-family development will provide 482,892 square feet of open space. A total of 68,140 square feet (53% of the required) of which will be improved for recreational use consistent with the requirements of this section.

This standard is met.

3. **For the development of condominiums, two-family and multi-family dwellings of 20 units or more, residential care facilities and residential care institutions, individual private open space (patio or balcony) shall be provided for each dwelling unit. All private open space shall be directly accessible from the dwelling unit through a doorway. Patios and balconies shall be at least 48 square feet in size with a minimum width dimension of four feet.**

**Finding:** Individual private open spaces have been provided for each dwelling unit. All private open space will be directly accessible from the dwelling unit through a doorway. The proposed private balconies will be at least 48 square feet and will have a minimum dimension of four feet. This standard is met.

4. **Floor area of ground floor patios and all balconies for individual units can be used to meet no more than one-half of the recreational land area requirement. Private open space shall be separated from common open space through the use of perimeter landscaping, fencing or a change in vertical grade (e.g., second floor balconies).**

**Finding:** The total floor area of ground floor patios for individual units is 7,715 square feet. A total of 50% of the private patios have been used in the calculation for recreation space. Private open space will be separated from common open space through the use of perimeter landscaping, fencing or a change in vertical grade.

This standard is met.

5. **Where a proposed condominium, multi-family development, residential care facility, residential care institution, or nursing or convalescent home will abut an existing or proposed public park or open space, the development shall integrate into its design the adjoining park or open space to maximize its benefits to development residents.**

**Finding:** The proposed development will abut an existing open space with a wetland and vegetative corridor. The proposed development will retain the connecting wetland and vegetative corridor, integrating the two natural areas. This standard is met.

6. **No less than 75% of all open space areas excluding recreational space shall be landscaped with living ground cover, shrubs or trees.**

**Finding:** A at least 75 percent of the open space areas, excluding recreational spaces and natural areas will be landscaped with living ground cover, shrubs or trees. This standard is met.

7. **State law and administrative codes pertaining to residential care facilities, assisted care and nursing facilities shall supersede the provisions of this section where there is a conflict.**

**Finding:** The proposed development does not include residential care facilities, assisted care and nursing facilities. The requirements of this section are not applicable.

**D. Areas and tracts of land to be held in common, shall meet the following requirements.**

1. **Common areas shall be held in ownership by either a homeowners association or operator of a multi-family development, residential care facility, residential care institution or nursing or convalescent home.**
2. **To ensure adequate maintenance of common areas within the land division, the applicant shall provide maintenance provisions in Covenants, Conditions and Requirements (CC & Rs) when to be maintained by a homeowners association or another method an operator of a multi-family development, residential care facility, residential care institution or nursing or convalescent home.**

**Finding:** All common areas within the multi-family development will be held in ownership by the operator of the multi-family development. This standard is met.

**E. A development shall include proposed dedication of open space or recreational facilities to the city or reserve such areas for acquisition by the city based on the following requirements:**

1. **The dedication or reservation shall be approved by the Parks and Recreation Commission prior to any acceptance of the reservation or dedication by the city. The Parks and Recreation Commission shall only consider any dedication or reservation if found:**
    a. **Consistent with the Parks, Recreation and Open Space Master Plan in terms of location, size, shape and purpose of the facility or area;**
    b. **Adequate recreational elements for active and/or passive recreational needs (e.g. trails, benches, play equipment, ball fields, etc.) are provided;**
    c. **Open Space areas provide connectivity with other open space or recreational areas as shown on the Parks, Recreation and Open Space Master Plan;**
    d. **Adequate services and facilities are available to maintain the dedication or reservation; and**

**e. For reservations, that acquisition of the property has been programmed in the most recently adopted capital improvement program or otherwise authorized by the City Council.**

**2. Where the city will accept a dedication pursuant to paragraph (1) above, no more than 50% of the System Development Charges (SDC) for a project can be waived by the Community Development Director upon consultation with the Parks and Recreation Director. The amount of the waiver shall be based on the completeness of the recreational elements and maintenance facilities provided, and the importance of the property to the completion of the Park, Recreation and Open Space Master Plan. There shall be no waiver of park SDC for any reservation of an open space area or recreational facility.**

**3. If the developer is required to reserve land area for a park, playground, or other public use, such land shall be acquired by the appropriate public agency within 18 months following final land use approval including but not limited to final plat, site plan, conditional use or design review approvals. The price shall be agreed upon prior to final approval or such reservation shall be released to the subdivider.**

**F. Where it is determined by the Director that to achieve a greater sense of open space of an area, open space that is proposed for two adjoining developments shall be located adjacent to each other.**

**Finding:** The proposed development does not include the dedication of the proposed open space to the City. The requirements of this section are not applicable to this development.

**HAZARDS AND RESOURCES**

**17.8.305 RESOURCE AREAS.**

**A. Wetlands, Wetland Buffer Areas, Wildlife Conservation Areas and Vegetated Corridors subject to the provisions of § 17.5.005 shall be left undisturbed unless:**

**1. Division of State Lands has issued a permit to allow fill in a wetland; or**

**2. Enhancements that are required or allowed either by the report approved by the city for Wildlife Conservation Areas pursuant to § 17.5.025 or by the Service Provider Letter issued by Clean Water Service.**

**B. Wetland buffer areas and vegetated corridors shall be provided consistent with the requirements of Clean Water Service (CWS) Design and Construction Standards. Pursuant to § 17.5.025A., a service provider letter from CWS shall be issued prior to filing for a land use permit with the city.**

**C. All development with Natural Resource Areas shall attempt to design development through avoidance of the resource area. If that cannot be achieved through standard development requirements, then the requirements of §§ 17.5.005 et seq. shall apply and shall override any conflicting development requirements established by other portions of the Development Code in order to minimize intrusion into the NRA.**

**D. All wetlands, wetland buffers, vegetated corridors and wildlife habitats shall be established as follows.**

1. **For divisions of land, the area shall be placed in an open space tract separate from areas intended for development. The open space tract is subject to the requirements of §§ 17.8.200 et seq.**
2. **For development not involved in a division of land, the area shall be held in common for residential condominiums or by the primary land owner for apartment complexes or non-residential development. The area shall be placed within an easement and adequate maintenance provisions shall be provided consistent with the requirements of § 17.8.200.**

**E. Historic structures and trees. Any modification of historic structures or the removal of trees shall comply with the requirements of §§ 17.5.200 et seq. and 17.5.100 et seq. respectively.**

**Finding:** The proposed development includes a 3.36-acre wetland and 1.72-acre vegetative corridor which will be preserved in accordance with the requirements of Clean Water Services. Development is not proposed within a Natural Resource Area. The Natural Resource Area will be held in common by the primary landowner of the apartment complex. This standard is met.

**17.8.310 HAZARD AREAS.**

**A. Information and studies for hazards shall be provided as follows.**

1. **For development sites partially or totally within Flood Management Areas or areas of special flood hazard as determined by § 17.8.315B., there shall be provided a study prepared by an engineer certified by the State of Oregon to provide hydraulic, flood plain elevation and any other necessary analysis to meet the requirements of § 17.8.325D. as determined by the City Engineer.**

**Finding:** The subject site is not located in a Flood Management Area or area of special flood hazard. The requirements of this section are not applicable.

2. **For development sites having slopes of 10% or more, the following requirements shall be met. To ensure compliance with the provisions of this Code, prior to the issuance of a building permit for the construction of any new building (as defined by § 17.12.210B.8.) within the city, and prior to any grading, excavation or filling or other site modification within areas having a slope of 10% or greater, there shall be submitted to the Community Development Department for review and approval, or approval with modifications:**
   a. **A site plan (showing any grading, excavating or filling) drawn to scale of the entire property developed and of the proposed construction; and**
   b. **The submission of a geological assessment and geotechnical report prepared and stamped by a Certified Engineering Geologist who is a registered geologist certified in the specialty of Engineering Geology under provisions of O.R.S. 672.505 to 672.705 and a Geotechnical Engineer under provisions of O.R.S. 672.002 to 672.325. The assessment and report shall address the entire site and meet the following requirements:**

i. **The geological and engineering assessment shall include information and data regarding the nature, distribution of underlying geology, and the physical and chemical properties of existing soils; an opinion as to stability of the site, and conclusions regarding the effect of geo-logic conditions on the proposed development.**

ii. **The geotechnical report shall include a comprehensive description of the site topography and geology; an opinion as to the adequacy of the proposed development from an engineering standpoint; and opinion as to the extent that instability on adjacent properties may adversely affect the project; a description of the field investigation and findings ; conclusions regarding the effect of geologic conditions on the proposed development ; and specific requirements for plan modification, corrective grading and special techniques and systems to facilitate a safe and stable development . The report shall provide other recommendations as necessary, commensurate with the project grading and development.**

iii. **Address the requirements of § 17.8.310B.**

**B. Through hazard study(ies) required pursuant to § 17.8.310A., the applicant shall establish methods to minimize hazards to acceptable risks by:**

1. **Site design approaches that avoids development within hazard area;**
2. **Grading, erosion control and other site preparation techniques to minimize hazard impacts;**
3. **Techniques to minimize impacts from utility installation; and/or**
4. **Building and foundation techniques to minimize hazard impacts.**

**C. Where a hazard area is proposed to be avoided:**

1. **For divisions of land, the area shall be placed in an open space tract separate from areas intended for development. The open space tract is subject to the requirements of §§ 17.8.200 et seq.**
2. **For development not involved in a division of land, the area shall be held in common for residential condominiums or by the primary land owner for apartment complexes or non-residential development. The area shall be placed within an easement and adequate maintenance provisions shall be provided consistent with the requirements of § 17.8.200.**
3. **The tract or easement area shall be restricted to open space. Utilities may be located within the area provided that the report proposes acceptable measures to minimize hazard impacts. Open space tracts are subject to the provisions of § 17.8.200.**

**Finding:** The subject site is relatively flat, with a few small areas identified as having slopes of 10% or greater. The applicant has provided an Existing Conditions Plan and Preliminary Grading and Erosion Control Plan for the proposed development. A geological assessment of the site has been provided by GeoEngineers. This standard is met.

**LANDSCAPING, SCREENING AND BUFFERING**

**17.8.410 GENERAL PROVISIONS.**

**A. Obligation to maintain. It shall be the continuing obligation of the property owner to maintain required landscaped areas in an attractive manner free of weeds and noxious vegetation. In addition, the minimum amount of required living landscape materials shall be maintained.**

**B. Ground preparation. The ground in all required landscaped areas should be properly prepared with suitable soil and fertilizer. Specifications shall be submitted with the landscape plans showing that adequate preparation of the top soil and sub-soil will be undertaken prior to planting to support the plantings over a long period of time.**

**C. Installation requirements. The installation of all landscaping shall be as follows:**

1. **All landscaping shall be installed according to accepted planting procedures and the provisions of this article;**
2. **The plant materials shall be of high grade, and shall meet the size and grading standards of the American Standards for Nursery Stock; and**
3. **All required landscaped areas must be provided with a piped underground irrigation system unless a licensed landscape architect or certified nurseryman submits written verification that the proposed plant materials do not require irrigation.**

**D. Pruning required. All plant growth in landscaped areas of developments shall be controlled by pruning or trimming so that it will not:**

1. **Interfere with the maintenance or repair of any public utility;**
2. **Restrict pedestrian or vehicular access; and**
3. **Constitute a traffic hazard because of reduced visibility.**

**E. Certificate of occupancy. Certificates of occupancy shall not be issued unless the landscaping requirements have been met or other arrangements have been made and approved by the city such as the posting of a performance bond or security equal to 125% of the cost of the landscaping.**

**F. Care of landscaping along public rights-of-way. Appropriate methods for the care and maintenance of street trees and landscaping materials shall be provided by the owner of the property abutting the rights-of-way unless otherwise required for emergency conditions and the safety of the general public.**

**Finding:** The applicant acknowledges that it's the continuing obligation of the property owner to maintain the required landscaping areas. This standard is met.

**17.8.415 GENERAL STANDARDS.**

**A. Non-invasive native vegetation is encouraged to be used for all landscaping except within 100 feet of a natural resource area. In such situations, native vegetation is required.**

**B. Installation of bio-swales or preservation of wetlands should be located where possible in landscaped areas.**

**C. Required landscaping adjacent to public rights-of-way. A strip of land at least five feet in width located between the abutting right-of-way and the off-street parking area or vehicle use area which is exposed to an abutting right-of-way, except in required vision clearance areas.**

**D. Perimeter landscaping relating to abutting properties. On the site of a building or structure or open lot use providing an off-street parking area or other vehicular use area, where such areas will not be entirely screened visually by an intervening building or structure from abutting property, a five-foot landscaped strip shall be between the common lot line and the off-street parking area or other vehicular use area exposed to abutting property. Landscaped areas should include where possible water quality features such as bio-swales or wetlands, trees, grass, shrubs and other plant material so as to cover the landscape area.**

**Finding:** The off-street parking area has been screened from the public right-of-way by a strip of land at least five feet in width. Parking has been screened from abutting properties by a five-foot wide landscape strip. This standard is met.

**E. Parking area interior landscaping. Landscaped areas shall be appropriately distributed to break up large expanses of pavement, improve the appearance and climate of the site, improve safety and delineate pedestrian walkways and traffic lanes. Except for industrial development within industrial zones, the following interior landscaping shall be met.**

1. **Percentage approach. For the purpose of this section, INTERIOR PARKING LOT AREA is defined as the hard surface parking area (parking stalls and aisles). Such area does not include loading and unloading zones or perimeter landscaping around the lot. Where perimeter landscaping intrudes into the parking lot four or more feet, that area is included in both the interior parking lot area and interior parking lot landscaping.**
2. **A required landscaped area shall have a minimum interior dimension of six feet and be no less than 48 square feet in area.**

**Finding:** All landscape islands have a minimum interior dimension of six feet and a minimum area of 48 square feet. This standard is met.

3. **At least 8% of the Interior Parking Lot Area shall be landscaped. Landscaped areas may include water quality features such as bio-swales or wetlands, trees, grass, shrubs and other plant material so as to cover the landscape area.**

**Finding:** The table below provides the total parking area, required landscaping, and provided landscaping for each parking lot on site.

| | Parking Lot Area | Required Landscaping | Provided Landscaping |
|---|---|---|---|
| Multi-family Residential Site | 203,300 sq.ft. | 16,264 sq.ft. | 17,092 sq.ft. |
| Commercial Site | 61,170 sq.ft. | 5,182 sq.ft. | 11,153 sq.ft. |
| Row House Site | 4,811 sq.ft. | 385 sq.ft. | 912 sq.ft. |

This standard is met.

4. **One tree shall be required for every 1,600 square feet of interior parking lot area as defined in subsection 1. above. Trees shall have a minimum two-inch caliper and six-foot branch height at time of planting.**

**Finding:** The table below provides the number of required trees and provided trees for each parking lot on site.

| | Parking Lot Area | Required Trees | Provided trees |
|---|---|---|---|
| Multi-family Residential Site | 203,300 sq.ft. | 127 | 128 |
| Commercial Site | 61,170 sq.ft. | 41 | 41 |
| Row House Site | 4,811 sq.ft. | 3 | 5 |

This standard is met.

5. **Interior parking area landscaping and trees must be dispersed throughout the parking area. Some trees may be grouped, but the groups must be dispersed. Required trees may be planted within five feet of the edges of the parking area.**

**Finding:** The landscaping and trees within the interior parking area have been dispersed throughout the parking area. This standard is met.

6. **Perimeter landscaping area may not substitute for interior landscaping. However, interior landscaping may join perimeter landscaping as long as it extends four feet or more into the parking area from the perimeter landscape line.**

**Finding:** Perimeter landscaping has not been included in the interior landscaping area calculation. This standard is met.

**17.8.420 LANDSCAPING REQUIREMENTS BY ZONE.**

A. **Landscaping required in the Neighborhood Commercial Zone. All required yards (exclusive of accessways and other permitted intrusions) adjacent to a public or private street shall be landscaped.**

B. **Landscaping required in the Community Commercial Zones. A landscaped strip at least ten feet in width shall be provided abutting any property line facing a street. The landscape strip shall be appropriately landscaped with ground cover, planted berm, shrubbery and/or trees.**

**Finding:** The subject site is not located in the Neighborhood Commercial Zone or the Community Commercial Zone. The requirements of this section are not applicable.

C. **Landscaping required in the Town Center Zones. All new commercial and residential developments in the Town Center Transition Zone shall landscape no less than 5% of the lot area using appropriate native plant materials and/or architectural features such as benches, planters and water fountains which are suitable and supportive of the downtown commercial environment. Jointly improved landscaped areas are encouraged to facilitate continuity of landscape design within the Town Center. The city may choose to waive this requirement for developments that provide streetscape**

**amenities within the public right-of-way. New development in the Town Center Core zone is exempt from the minimum landscaping requirement.**

**Finding:** The proposed commercial development will provide a total landscape area of 48,280 square feet, or 27.7 percent of the site. At least five percent of each site will be planted with native landscaping. This standard is met.

**D. Landscaping required in the Institutional Zone. Landscaping shall be in context with the use and surrounding zones. For institutional uses that consist of primarily open space, such as a park or playground, the landscaped area shall be defined by the site plan and include a landscaped strip at least ten feet in width abutting any property line facing a street. For institutional uses in which the site is primarily devoted to non-open space, the landscaping requirements shall match the zone district immediately adjacent to the use. Where there are no landscaping requirements for the adjoining zone, the landscaping requirements shall meet the requirements of subsection B., Community Commercial above.**

**Finding:** The subject site is not located in the Institutional Zone. The requirements of this section are not applicable.

**E. Seventy-five percent coverage. Except in the Town Center Core Zone, at least 75% of the required landscaped area shall be planted with any suitable combination of trees specified time as follows:**

1. **Trees – within five years from the date of final inspection by the Building Official;**
2. **Shrubs – within two years from the date of final inspection by the building Official; and**
3. **Ground covers – at the time of final inspection by the Building Official.**

**Finding:** The landscape area in the residential development will have at least 75 percent of the required landscape coverage as required above. This standard is met.

**F. Twenty-five percent architectural features. Except in the Town Center Core Zone, landscaped areas as required by this article may include architectural features or artificial ground covers such as sculptures, benches, masonry or stone walls, fences, rock groupings, decorative hard paving and gravel areas, interspersed with planting areas. The exposed area developed with such features shall not exceed 25% of the required landscaped area. Artificial plants are prohibited in any required landscaped area.**

**Finding:** The landscape area in the residential development will include architectural features which will not exceed 25 percent of the required landscape coverage as required above. This standard is met.

**17.8.425 BUFFERING AND SCREENING STANDARDS.**

**A. General provisions.**

1. **It is the intent that these requirements shall provide for privacy and protection and reduce or eliminate the adverse impacts of visual or noise pollution at a**

**development site, without unduly interfering with the view from neighboring properties or jeopardizing the safety of pedestrians and vehicles;**

2. **Buffering and screening is required to reduce the impacts on adjacent uses which are of a different type in accordance with the matrices in this chapter (Tables 8-2, 8-3 and 8-4). The owner of each proposed development is responsible for the installation and effective maintenance of buffering and screening.**
3. **In lieu of these standards, a detailed buffer area landscaping and screening plan may be submitted for the Director 's approval as an alternative to the standards, provided it affords the same degree of buffering and screening as required by this Code.**

**Finding:** The proposed development is primarily bordered by residential development. The northern portion of the property located at the corner of Sunset Drive and Highway 47 will be developed with a commercial development, therefore buffering is required along the shared property line meeting the C buffering standard. This standard is met.

**B. Buffering and screening requirements.**

1. **A buffer consists of an area within a required setback adjacent to a property line and having a depth equal to the amount specified in the buffering and screening matrix and containing a length equal to the length of the property line of the abutting use or uses.**

**Finding:** The buffer area between the residential site and the commercial development located at the corner of Sunset Drive and Highway 47 will meet the C buffer standards of Table 8-3. This standard is met.

2. **Utilities, screening, sidewalks and bikeways, and landscaping may only occupy a buffer area. No buildings, accessways or parking areas shall be allowed in a buffer area except where an accessway has been approved by the city.**

**Finding:** The required buffer areas will not include buildings, accessways or parking areas. This standard is met.

3. **The minimum improvements within a buffer area shall consist of combinations for landscaping and screening as specified in Tables 8-2, 8-3 and 8-4. In addition, improvements shall meet the following specifications:**
    a. **At least one row of trees shall be planted. They shall have a minimum caliper of two inches at four feet in height above grade for deciduous trees and a minimum height of five feet high for evergreen trees at the time of planting. Spacing for trees shall be as follows:**

1. **Small or narrow-stature trees, less than 25 feet tall or less than 16 feet wide at maturity shall be spaced no further than 20 feet apart;**
2. **Medium-sized trees between 25 to 40 feet tall and with 16 to 35 feet wide branching at maturity shall be spaced no greater than 30 feet apart; and**
3. **Large trees, over 40 feet tall and with more than 35 feet wide branching at maturity, shall be spaced no greater than 40 feet apart.**

**b. In addition, at least ten five-gallon shrubs or 20 one-gallon shrubs shall be planted for each 1,000 square feet of required buffer area; and**

**c. The remaining area shall be planted in lawn or other living ground cover.**

**Finding:** The buffer area between the residential site and the commercial development located at the corner of Sunset Drive and Highway 47 will meet the C buffer standard of Table 8-3. This standard is met.

**4. Where screening is required the following standards shall apply in addition to those required for buffering:**

**a. A hedge of narrow or broad leaf evergreen shrubs shall be planted which will form a four-foot continuous screen of the height specified in Table 8-3 within two years of planting;**

**b. An earthen berm planted with evergreen plant materials shall be provided which will form a continuous screen of the height specified in Table 8-3 within two years; or**

**c. A fence or wall of the height specified in Table 8-3 shall be constructed to provide a continuous sight-obscuring screen.**

**Finding:** The buffer area between the subject site and the commercial development lot located at the corner of Sunset Drive and Highway 47 will meet the C buffer standard of Table 8-3. A hedge meeting the requirements of subsection a above has been provided along the property line. This standard is met.

**5. Buffering and screening provisions shall be superseded by the clear vision area requirements as set forth in § 17.8.150.**

**Finding:** The vision clearance area requirements of section 17.8.150 will be met. This standard is met.

**6. When the use to be screened is downhill from the adjoining zone or use, the prescribed heights of required fences, walls or landscape screening shall be measured from the actual grade of the adjoining property. In this case, fences and walls may exceed the permitted six-foot height at the discretion of the Director as a condition of approval. When the grades are so steep so as to make the installation of walls, fences or landscaping to the required height impractical, a detailed landscape/screening plan shall be submitted for approval.**

**Finding:** The adjacent property is not downhill from the proposed development. This standard is not applicable to the development.

**7. Fences and walls.**

**a. Fences and walls shall be constructed of any materials commonly used in the construction of fences and walls such as wood, stone, rock or brick, or otherwise acceptable by the Director;**

**b. Such fence or wall construction shall be in compliance with other city regulations;**

**c. Walls shall be a minimum of six inches thick; and**

**d. Chain link fences with slats shall qualify for screening. However, chain link fences without slats shall require the planting of a continuous evergreen hedge to be considered screening.**

**Finding:** The proposed development will not include any new walls or fences. The requirements of this section are not applicable to the proposed development.

**C. Screening: special provisions.**

**1. Screening and landscaping of parking and loading areas. Screening and landscaping of parking and loading areas is required as provided in this article.**

**2. Screening of service facilities. Except for one-family and two-family dwellings, any service facilities such as gas meters and air conditioners which would otherwise be visible from a public street, customer or resident parking area, any public facility or any residential area shall be screened from view by placement of a solid wood fence or masonry wall between five and eight feet in height.**

**3. Screening of refuse containers. Except for one- and two-family dwellings, any refuse container or refuse collection area which would be visible from a public street, parking lot, residential or commercial area, or any public facility such as a school or park shall be screened or enclosed from view by placement of a solid wood fence, masonry wall or evergreen hedge. All refuse shall be contained within the screened area.**

**4. Screening of swimming pools. All swimming pools shall be enclosed as required by the City of Forest Grove Building Code.**

**D. Buffer Matrix.**

**1. The Buffer Matrices contained in Table 8-2 shall be used in calculating widths of buffering/screening and required improvements to be installed between proposed uses and abutting uses or zoning districts.**

**2. An application for an adjustment or variance to the standards required in Tables 8-2 and 8-3 shall be processed as a Type I, II or III procedure, as regulated by Article 2 provisions for Adjustments and Variance**

| **Table 8-2: Buffer Matrix Proposed Use** | | | |
|---|---|---|---|
| ***Development Site ➡ Abutting Use*** | **Single Units, Detached; Manufactured Units** | **Attached Single Units and Multi- family, 5+ Units** | **Town Center Zones (TCC, TCT)** |
| **Attached Single Units and Multi-family, 5+ Units** | **A** | **--** | **C** |
| **Town Center Zones (TCC, TCT)** | **C** | **C** | **--** |

| Table 8-3 Buffer Combinations for Landscaping and Screening [1] | | | | | |
|---|---|---|---|---|---|
| | Options | Minimum Width (feet) | Trees (per linear feet of buffer) | Shrubs or groundcover | Screening |
| A | -- | 10 | -- | Lawn/living groundcover | -- |
| C | 1 | 10 | 15' min/30' max spacing | Shrubs | 4' hedges |
| | 2 | 8 | | Shrubs | 5' fence |
| | 3 | 6 | | Shrubs | 6' wall |

**Finding:** The buffer area between the subject site and the commercial development lot located at the corner of Pacific Avenue and Highway 47 will meet the C buffer standard of Table 8-3. A hedge meeting the requirements of subsection a above has been provided along the property line. This standard is met.

**OFF-STREET PARKING AND LOADING**

**17.8.510 GENERAL PROVISIONS.**

**A. When site development /design review is not required. Where the provisions of Article 2 for Site Development Review and Design Review do not apply, the Director shall approve, approve with conditions, or deny a parking plan submitted under the provisions of this article by means of a Type I review.**

**B. Parking plan requirements. The parking plan, drawn to scale, shall show all elements necessary to indicate that off-street parking requirements are met. The parking plan shall include but not be limited to:**

1. **Delineation of individual parking and loading spaces and their dimensions;**
2. **Circulation area necessary to serve parking spaces;**
3. **Access to streets, alleys and properties to be served;**
4. **Curb cuts;**
5. **Location and dimensions of all parking area landscaping (does not apply to single-family dwellings and duplexes);**
6. **Grading and drainage (does not apply to single-family dwellings and duplexes); and**
7. **Specifications as to signs and bumper guards (does not apply to single-family dwellings and duplexes).**

**Finding:** A Site Plan (Sheet C200) and Grading and Erosion Control Plan (Sheet C220) have been submitted under Appendix E, which illustrates the requirements listed in subsection B (1-7) above.

**C. Building permit conditions. The provisions and maintenance of off-street vehicle parking and loading spaces are the continuing obligation of the property owner:**

1. **No building or other permit shall be issued until plans are presented to the Director to show that property is and will remain available for exclusive use as off-street vehicle parking and loading space; and**
2. **Required vehicle parking shall:**

a. **Be available for the parking of operable passenger vehicles of residents, patrons and employees only;**
b. **Not be used for storage of vehicles or materials or for the parking of trucks not used in conduct of the business or use; and**
c. **Not be rented, leased or assigned to any other person or organization.**

**Finding:** The applicant acknowledges that the provisions and maintenance of off-street vehicle parking and loading spaces are the continuing obligation of the property owner. The required parking will be available for parking of operable passenger vehicles of residents, patrons and employees only. This standard is met.

**D. Joint use of parking. Owners of two or more uses, structures or parcels of land may agree to jointly use the same parking and loading spaces when the peak hours of operation do not overlap, provided that satisfactory legal evidence is presented to the Director in the form of deeds, leases and/or contracts to establish the joint use.**

**E. Parking area connections. In order to eliminate the need to use public streets for movements between commercial or industrial properties, parking areas shall be designed to connect with parking areas within a project site and on adjacent properties unless not feasible. Access easements between properties shall be required where necessary to provide for parking area connections.**

**F. Walkway connections. In order to facilitate pedestrian and bicycle circulation, access and parking area plans shall provide an efficient sidewalk and/or walkway connection between neighboring developments and land uses.**

**Finding:** The residential parking lot provides both vehicle and pedestrian connection to the commercial property to the north. The properties to the south are developed with single-family residential homes and do not connect to the site. This standard is met.

**G. Standards of measurement. Except as otherwise defined in this Code, "one standard parking space" means a parking stall of nine feet in width and 18 feet in length. To accommodate compact cars more efficiently, up to 50% of the available parking spaces may have a minimum dimension of eight feet in width and 16 feet in length so long as they are identified as compact car stalls and are not readily accessible to large cars. Head-in or angled parking spaces abutting walkways or landscape areas shall be shortened by one and one-half feet and the walkway or landscape area increased by the same measure. No wheel stops shall be required on these spaces.**

**GROSS LEASABLE AREA means all finished floors and excludes elevators, corridors, utility or rest rooms, and interior service areas and all outside service areas, boiler rooms, freight tunnels or corridors and truck docks.**

**GROSS FLOOR AREA means the total square footage including all finished floors. This number is estimated to be 10% greater than Gross Leasable Area.**

**H. Eligible parking. Parking spaces available along the public street frontage or alleys are eligible in fulfilling up to 50% of the off-street parking requirement if the following standards are met:**

1. **The space must be abutting the subject site;**
2. **The space must be in a location where on-street parking is allowed;**
3. **The space must be a minimum 22 feet long; and**

   **On-street parking spaces credited for a specific development or use may not be used exclusively by that development or use but must be available for the general public. Signs or actions limiting general public use of on-street spaces are prohibited.**

**Finding:** All proposed parking stalls meet the dimensional requirements of this section. On-street parking is not proposed. This standard is met.

**I. Where improvements subject to these off-street parking and loading provisions result in hard surfaces, pervious surfaces are encouraged to be used. Where improvements are within the public rights-of-way, such surfaces can be used upon approval by the City Engineer.**

**Finding:** Pervious surfaces are not proposed. All improvements within the public rights-of-way will meet the requirements of the City Engineer. This standard is met.

**17.8.515 OFF-STREET PARKING REQUIREMENTS.**

**A. Multiple uses. In the event several uses occupy a single building or parcel of land, a reduction of 25% of the total required parking is allowed for projects that utilize shared parking on a blended ratio for complementary uses.**

**B. Location of off-street parking. Off-street parking spaces for dwellings shall be located on the same lot with the dwelling. For all other uses, required off-street parking spaces shall be located not farther than 500 feet from the building or use they are required to serve, except as exempted in the Town Center zones.**

**C. Improvements. Required parking spaces shall be improved to the standards as contained in this article and available for use at the time of the final building inspection.**

**D. Carpool and vanpool parking. Commercial, industrial and institutional developments (including but not limited to hospitals, nursing and retirement homes, schools, churches, auditoriums and transit park-and-ride facilities) with 20 or more long-term parking spaces shall designate at least 10% of those spaces for carpool and vanpool parking. These spaces shall be located closer to the primary public or employee entrance than all other parking spaces with the exception of handicapped parking spaces. Carpool and vanpool parking spaces shall be full-sized and clearly designated for use by carpools or vanpools.**

**E. Minimum/maximum parking. Unless specified below or otherwise exempted by this Code, the minimum and maximum number of required parking spaces shall be provided for all uses in accordance with the specifications of Table 8-4.**

**F. Exemptions from maximum parking standards. The following uses shall be exempt from the maximum allowable parking standards of Table 8-4. This exemption does not limit any provision or authority to restrict the size, location or design of such uses. On sites**

**where the following parking is provided, it shall not be included in the parking count used for determining the maximum allowable number of parking spaces:**

1. **Structured parking;**
2. **Valet lots;**
3. **Pay lots;**
4. **Employee carpool parking, when such areas are dedicated by way of on-site reservation;**
5. **Fleet parking;**
6. **Automobile sales lots; and**
7. **Park-and-ride lots and area-wide public parking facilities.**

**G. Unlisted use. Where a use is not specifically listed in Table 8-4, determination of the applicable parking standards shall be made in accordance with the following procedure:**

1. **The Director shall determine the minimum and maximum parking spaces for all uses not listed in Table 8-4, unless an application is under review by the Planning Commission or Design Review Commission, in which case the Commission shall make the determination.**
2. **In all determinations for unlisted uses, the applicant shall be required to submit studies or technical information about the use, parking demand, vehicle trip generation and/or other information as deemed necessary to make a determination. The city may consider testimony and publications of individuals, agencies or institutions experienced in parking and traffic engineering in its determination of parking standards.**

**H. Determination of parking zone classification. Except as provided for in this article or as modified under the variance process outlined in § 17.2.700, parking provided shall not be less than the amount specified in the "Minimum Parking Required" column nor greater than the amount specified in the "Maximum Parking Allowed" column of Table 8-4 based on the appropriate Parking Zone Classification.**

1. **Parking Zone A. All properties located within one-quarter mile walking distance of a transit bus stop that provide 20-minute peak hour service shall be classified as Parking Zone A.**

   **In determining walking distance, the shortest distance measured along sidewalks, improved pedestrian ways or streets, where sidewalks or improved pedestrian ways are not present, shall be used. Walking distance shall be measured from the nearest point of the subject lot located along the nearest street frontage that allows for the shortest walking distance.**

   **The transit provider shall be the official source for transit stop location and peak service availability.**
2. **Parking Zone B. All properties not located within Parking Zone A shall be classified as Parking Zone B.**

| **Table 8-4: Parking Requirements** | | |
|---|---|---|
| **Land Use** | **Minimum Parking Required** | **Maximum Parking Allowed** |
| | | **Parking Zone B** |

| | | |
|---|---|---|
| **Household Living** | | |
| **- Multi-Family Units (outside the Town Center)** | **DU<500 sq. ft: 1.0/DU<br>1 bedroom: 1.25/DU<br>2 bedroom: 1.50/DU<br>3 bedroom: 1.75/DU** | **None** |

**Finding:** Per OAR 660-012-0430(2), cities may not require more than one parking space per unit in residential developments with more than one dwelling unit on a single legally established property. The multi-family residential development will have a total of 362 units and will require 362 parking spaces. 516 parking spaces are provided on the multi-family site. The row house site will have 24 units, requiring 24 parking stalls. Each row house will have an individual garage which will provide 24 parking stalls on site. An additional 24 parking stalls have been provided on the site for a total of 48 stalls.

| **Residential Development:** | | | | |
|---|---|---|---|---|
| **Unit Type** | **Number of Units** | **Parking Factor** | **Minimum Parking Required** | **Parking Provided** |
| **Multifamily** | **362** | **1/DU** | **362** | **516** |
| **Row House** | **24** | **1/DU** | **24** | **48** |
| **Total:** | 386 | 1/DU | 386 | 564 |

The commercial development is proposed to have 152 parking stalls in Phase C-1 and 38 stalls in Phase C-2. The development does not currently have tenants to occupy the site. The parking requirements for each commercial development will be reviewed with parking available on site at the time of building permits.

This standard has been met.

**17.8.525 DESIGN AND MAINTENANCE STANDARDS FOR OFF-STREET PARKING AND LOADING.**

**A. No backing movement. Excluding single-family and duplex residences, groups of more than two parking spaces shall be served by a service drive so that no backing movements or other maneuvering within a street or other public right-of-way would be required.**

**Finding:** The parking areas will be accessed by service drives provided along Sunset Drive. The parking areas have been designed so that no backing movements or other maneuvering within the street or right-of-way is required. This standard is met.

**B. Free flow of traffic. Service drives shall be designed and constructed to facilitate the flow of traffic, provide maximum safety of traffic access and egress, and maximum safety of pedestrians and vehicular traffic on the site.**

**Finding:** All proposed drives have been designed and constructed to facilitate the flow of traffic, provide maximum safety of traffic access and egress and maximum safety of pedestrians and vehicular traffic on site. This standard is met.

**C. Parking accessible from street. Each parking and/or loading space shall be accessible from a street and the access shall be of a width and location as described in §§ 17.8.100 et seq. for Access and Circulation.**

**Finding:** All parking spaces on site will be accessible from the access drives provided on Sunset Drive. The width and location standards of section 17.8.100 have been met. This standard is met.

**D. Parking space, stall and access aisle dimensions. Parking space configuration, stall and access aisle size shall be of sufficient width for all vehicles turning and maneuvering, based on the standards shown in Figures 8-11 and 8-12.**

**Finding:** All of the parking spaces provided on site have been designed to meet the configuration, stall size and access aisle size standards provided in Figures 8-10 and 8-11. This standard is met.

**E. Permanent marking. Except for single-family and duplex residences, any area intended to be used to meet the off-street parking requirements shall have all parking spaces clearly marked using permanent paint. All interior drives and access aisles shall be clearly marked and signed to show direction of traffic flow and maintain vehicular and pedestrian safety.**

**Finding:** All parking spaces provided on site in the parking areas will be marked with permanent paint. All interior drives and access aisles will be clearly marked and signed to show direction of traffic flow and maintain vehicular and pedestrian safety. The requirements of this standard have been met.

**F. Surfacing.**

1. **Except for single-family and duplex residences, all areas used for the parking and/or storage and/or maneuvering of any vehicle, boat and/or trailer shall be improved with asphalt or concrete surfaces according to the same standards required for the construction and acceptance of city streets.**
2. **Off-street parking spaces for single-family and duplex residences shall be improved with an asphalt or concrete surface to specifications as approved by the Building Official.**
3. **Where possible, pervious surfacing should be used for off-street parking areas.**
4. **The uses and operations listed below may provide alternative surfacing, such as gravel or other similar semi-pervious surfaces, from the above requirements for vehicular parking or storage areas. Driveways and access aprons which connect to any paved access road and/or public street shall meet the surfacing requirements listed above.**

a. **Community recreation;**
b. **Agriculture/horticulture;**
c. **Outdoor storage.**
    i. **Allowed as an accessory use to a primary use and limited to uses located in the Light Industrial (LI) and General Industrial (GI) zones;**
    ii. **Any outdoor storage that would otherwise be visible at the property line shall be screened from view at the abutting property line by a sight obscuring fence or planting not less than six feet in height;**

iii. **The property owner shall maintain a gravel storage area to ensure continued drainage and dust control; and**

iv. **Does not include self-service storage provided for rental of storage space to the public for personal vehicles, recreational vehicles, boats or other personal property. Self-service storage shall be subject the surfacing requirements of § 17.8.525.F.1 above.**

**Finding:** All areas used for parking, storage and maneuvering of any vehicle will be improved with asphalt or concrete. Pervious paving is not proposed. This standard is met.

G. **Wheel stops. Parking spaces along the boundaries of a parking lot or adjacent to interior landscaped areas or sidewalks shall be provided with a wheel stop at least four inches high located one and one-half feet back from the front of the parking stall as defined in Figure 8-7.**

**Finding:** All parking spaces along the boundaries of the parking lot or adjacent to interior landscape areas or sidewalks have been provided with wheel stops at least four inches high, located one and one-half feet back from the front of the parking stall. This standard is met.

H. **Drainage. Off-street parking and loading areas shall provide stormwater drainage in accordance with specifications approved by the City Engineer. Off-street parking and loading facilities shall be drained to avoid flow of water across public sidewalks.**

**Finding:** The stormwater drainage system has been provided in accordance with specifications approved by the City Engineer. The proposed system has been shown on the Composite Utility Plan, submitted under Appendix E and within the Preliminary Drainage Report submitted under Appendix D. This standard is met.

I. **Lighting. Artificial lighting on all off-street parking facilities shall be designed to deflect all light away from surrounding residences and so as not to create a glare hazard to the public use of any road or street.**

**Finding:** All proposed lighting within the parking area has been designed to deflect all light away from the surrounding residences, as shown on the Lighting Plan, submitted under Appendix E. This standard is met.

J. **Maintenance. All parking lots shall be kept clean and in good repair at all times. Breaks in paved surfaces shall be repaired promptly and broken or splintered wheel stops shall be replaced so that their function will not be impaired.**

**Finding:** The applicant acknowledges that it is the responsibility of the property owner to maintain the parking lot. This standard is met.

K. **Parking lots over three acres in size. Parking lots over three acres in size shall be designed to incorporate curbs and sidewalks along major drive aisles.**

**Finding:** The parking lot has been designed to incorporate curbs and sidewalks along the major drive aisles. This standard is met.

**17.8.535 OFF-STREET LOADING SPACE.**

**A. Required. Buildings or structures to be built or substantially altered which receive and distribute material or merchandise by truck shall provide and maintain off-street loading and maneuvering space in accordance with the requirements of Table 8-6.**

**B. Separation from off-street parking area. Any area to be used for the maneuvering of delivery vehicles and the unloading or loading of materials shall be separated from designated off-street parking areas and appropriately designed to prevent the encroachment of delivery vehicles into off-street parking areas or into public streets.**

**C. Loading area for schools. A driveway designed for continuous forward flow of passenger vehicles for the purpose of loading and unloading children shall be located on the site of any school having a capacity greater than 25 students.**

**D. Reduction of loading space. Minimum loading berths may be decreased based on the following criteria:**

1. **Will not result in undue site congestion;**
2. **Will not result in traffic hazards on the site or adjoining streets; and**
3. **Will not result in undue reduction in the availability of on-site or on-street parking.**

**E. Modifications. The Director may grant modifications to this section; unless the application is under review by the Planning Commission or the Design Review Commission, in which case the Planning Commission or the Design Review Commission shall consider the request for modification.**

**Article 2 procedures and criteria for Adjustments and Variances shall apply, depending on the magnitude of the adjustment requested.**

| Table 8-6: Minimum On-Site Loading Requirement | | |
|---|---|---|
| **Land Use** | **Gross Floor Area at Which 1st Berth is Required** | **Gross Floor Area at Which 2nd Berth is Required** |
| **Commercial** | | |
| **Wholesale** | **10,000 Square Feet** | **40,000 Square Feet** |
| **Retail** | **10,000 Square Feet** | **20,000 Square Feet** |
| **Service Establishments** | **10,000 Square Feet** | **40,000 Square Feet** |
| **Commercial Recreation (including bowling alleys)** | **10,000 Square Feet** | **100,000 Square Feet** |
| **Restaurants** | **5,000 Square Feet** | **25,000 Square Feet** |
| **Laundry** | **10,000 Square Feet** | **25,000 Square Feet** |
| **Office Building** | **10,000 Square Feet** | **100,000 Square Feet** |
| **Hotel** | **10,000 Square Feet** | **100,00 Square Feet** |

**Finding:** The commercial development does not currently have tenants. The minimum on-site loading requirements will be reviewed for future uses at the time of building permits. This standard is met.

**17.8.540 BICYCLE PARKING.**

**A. When required. Bicycle parking shall be provided on-site in conjunction with the following uses:**

1. **Multi-family housing;**
2. **Retail and office development;**
3. **Industrial development;**
4. **Institutional development; and**
5. **Transit stations, park-and-ride lot and automobile parking structures.**

**B. Required number of spaces. The number of bicycle parking spaces required shall be at least 20% of the required automobile parking for the use, but not less than two spaces.**

**C. Location and design standards. Bicycle parking facilities shall be:**

1. **Located within 75 feet of a primary building entrance and dispersed for multiple entrances;**
2. **Designed to provide direct access to a public right-of-way, but not to obstruct sidewalks or walkways. Public sidewalks may be utilized for bicycle parking when parking can't be reasonably accommodated on-site and the location is convenient to the building 's primary entrance. If a public sidewalk is used for bicycle parking, a minimum of six feet of clear and unobstructed sidewalk must be maintained;**
3. **In a location visible to building occupants or from the main parking lot;**
4. **Thoroughly illuminated during working hours. Bicycle parking areas shall be at least as well lit as automobile parking areas;**
5. **Bicycle parking facilities shall offer security in the form of either a lockable enclosure in which the bicycle can be stored or a stationary rack to which the bicycle can be locked. All bicycle racks, lockers or other facilities shall be securely anchored to the ground or to a structure. Bicycle racks shall be designed so that bicycles may be securely locked to them without undue inconvenience. Such racks shall be designed to hold bicycles securely by means of the frame, with the frame supported so that the bicycle cannot be pushed or fall to one side in a manner that will damage the wheels; and**
6. **Bicycle parking spaces shall be at least six feet long and two feet wide with an overhead clearance of at least seven feet. An access aisle of at least five feet shall be provided and maintained beside or between each row of bicycle parking. Each required bicycle parking space shall be accessible without moving another bicycle.**

**Finding:** The proposed 362-unit multi-family residential development requires 362 parking stalls. Based on 362 parking stalls, 72 bicycle parking stalls are required. Bicycle parking will be provided, which exceeds the minimum requirement of 72 stalls. The required bicycle parking for the row houses will be provided in individual garages. The required bicycle parking for the commercial development will be reviewed when tenants are proposed for the development. Bicycle parking racks will be lockable and anchored to the ground. Stalls will be at least six feet long and two feet wide with an overhead clearance of at least seven feet and an access aisle of five feet. This standard is met.

**17.8.545 LANDSCAPING AND SCREENING OF PARKING AND LOADING AREAS.**

**A. Purpose. The purpose of this section is to improve the appearance of off-street parking and open lot sales and service areas in Forest Grove and to protect and preserve the appearance, character and value of the surrounding neighborhoods. It is also the purpose of this section to**

**allow for increased seepage by providing openings in impervious surface; increased safety by breaking up large expanses of pavement; and increased shading to reduce overheating of car interiors, and reduce glare and radiation from large number of vehicles.**

**B. Applicability. This section is applicable to all areas used for the display or parking of any and all types of vehicles, boats or heavy construction equipment, whether such vehicles, boats or equipment are self-propelled or not, and all land upon which vehicles traverse the property as a function of the primary use , hereinafter referred to as "other vehicular uses," including but not limited to activities of a drive-in nature such as, but not limited to, filling stations, grocery and dairy stores, banks, restaurants and the like. Screening and landscaping of parking and loading areas is required, with the exception of parking areas serving single-family dwellings and duplexes, and parking areas that are under or within buildings. The interior landscaping requirements do not apply to parking areas for industrial uses in the industrial zones.**

**C. Required landscaping for parking lots adjacent to public rights-of-way. A minimum five-foot landscaped strip is required between the abutting right-of-way and the off-street parking area or vehicle use area.**

**Finding:** A minimum five-foot landscaped strip has been provided between the abutting right-of-way and the off-street parking areas. This standard is met.

**D. Perimeter parking lot landscaping. When the off-street parking area or other vehicular use area is not visually screened from an abutting property by an intervening building or structure, a minimum five-foot landscaped strip shall be installed between the common property line and the off-street parking area or other vehicular use area that is visually exposed.**

**Finding:** A minimum five-foot landscaped strip will be installed between the common property line and the off-street parking area where the parking area is not visually screened by a building. This standard is met.

**E. Interior parking lot landscaping. Landscaped areas shall be appropriately distributed to break up large expanses of pavement, improve the appearance and climate of the site, improve safety and delineate pedestrian walkways and traffic lanes. For the purpose of this section, interior parking lot area is defined as the hard surface parking area (parking stalls and aisles). Such area does not include loading and unloading zones or perimeter landscaping around the lot.**

1. **At least 8% of the interior parking lot area shall be landscaped. Landscaped areas should include water quality features such as bio-swales or wetlands, trees, grass, shrubs and other material when possible so as to cover the landscape area.**

**Finding:** The table below provides the total parking area, required landscaping, and provided landscaping for each parking lot on site.

| | Parking Lot Area | Required Landscaping | Provided Landscaping |
|---|---|---|---|
| Multi-family Residential Site | 203,300 sq.ft. | 16,264 sq.ft. | 17,092 sq.ft. |

| | | | |
|---|---|---|---|
| Commercial Site | 61,170 sq.ft. | 5,182 sq.ft. | 11,153 sq.ft. |
| Row House Site | 4,811 sq.ft. | 385 sq.ft. | 912 sq.ft. |

This standard is met.

2. **A required landscaped area shall have a minimum interior dimension of six feet and be no less than 48 square feet in area. Landscaping shall be protected from vehicular damage by some form of wheel guard or curb.**

**Finding:** All landscape islands have a minimum interior dimension of six feet and a minimum area of 48 square feet. This standard is met.

3. **One tree shall be required for every 1,600 square feet of interior parking lot area. Trees shall have a minimum two-inch caliper and six-foot branch height at the time of planting.**

**Finding:** The table below provides the number of required trees and provided trees for each parking lot on site.

| | Parking Lot Area | Required Trees | Provided trees |
|---|---|---|---|
| Multi-family Residential Site | 203,300 sq.ft. | 127 | 128 |
| Commercial Site | 61,170 sq.ft. | 41 | 41 |
| Row House Site | 4,811 sq.ft. | 3 | 5 |

This standard is met.

4. **Interior parking area landscaping and trees must be dispersed throughout the parking area. Some trees may be grouped, but the groups must be dispersed.**

**Finding:** The interior parking area landscaping and trees have been dispersed throughout the parking area. This standard is met.

5. **Perimeter landscaping may not substitute for interior landscaping. However, interior landscaping may join perimeter landscaping as long as it extends four feet or more into the parking area from the perimeter landscape line.**

**Finding:** Perimeter landscaping has not been included in the interior landscaping area calculation. This standard is met.

**F. Landscaping within clear vision areas. All landscaping of parking lots within clear vision areas shall provide unobstructed cross-visibility at a level between three to ten feet above the curb line. With the exception of grass or groundcover, no landscaping shall be located closer than three feet from the edge of any accessway pavement.**

**Finding:** The proposed landscaping within the clear vision areas will meet the requirements of this section.

**PUBLIC IMPROVEMENTS**

**17.8.605 GENERAL PROVISIONS.**

**A. When standards apply. Unless otherwise provided, the standard specifications for construction, reconstruction or repair of streets, sidewalks, curbs and other public improvements within the city shall occur in accordance with the standards of this article. No development may occur unless the public facilities related to development comply with the public facility requirements established in this section.**

**B. Standard specifications. The City Engineer shall establish standard specifications consistent with the application of engineering principles.**

**C. Adjustments. Adjustments to the provisions in this chapter related to street improvements may be granted by means of a Type II procedure, as governed by § 17.2.100.**

**D. Use of pervious surfaces. Where improvements subject to these off-street parking and loading provisions result in hard surfaces, previous surfaces should be used where possible. Where improvements are within the public rights-of-way, such surfaces can be used upon approval by the City Engineer.**

**E. Open drainage facilities. Where public storm sewer lines are proposed, drainage swales and other open drainage facilities may be used with the approval of the City Engineer.**

**Finding:** All proposed public improvements will be provided in accordance with the City's standard specifications. This standard is met.

**17.8.610 STREETS.**

**A. Improvements. No development shall occur unless the development has frontage or approved access to a public street:**

1. **Streets within a development and streets adjacent shall be improved in accordance with this article;**
2. **Any new street or additional street width planned as a portion of an existing street shall be dedicated and improved in accordance with this Code;**
3. **New development shall be connected to a collector or arterial by a paved street;**
4. **Where transportation-related improvements are required as a result of a transportation study pursuant to § 17.1.225D., the developer shall install said improvements to the satisfaction of the City Engineer, or participate in the financing of said improvement where the impacts are beyond the responsibility of one project; and**
5. **The City Engineer may accept a future improvement guarantee in lieu of street or other transportation related improvements if one or more of the following conditions exist:**
   a. **A partial improvement is not feasible due to the inability to achieve proper design standards;**
   b. **A partial improvement may create a potential safety hazard to motorists or pedestrians;**
   c. **Due to the nature of existing development on adjacent properties it is unlikely that street improvements would be extended in the foreseeable future and the**

**improvement associated with the project under review does not, by itself, provide a significant improvement to street safety or capacity;**

**d. The improvement would be in conflict with an adopted capital improvement plan;**

**e. The improvement is associated with an approved land partition on property zoned residential and the proposed land partition does not create any new streets; or**

**f. Additional planning work is required to define the appropriate design standards for the street and the application is for a project that would contribute only a minor portion of the anticipated future traffic on the street.**

**6. Improvements to streets shall be made according to adopted city standards, unless the approval authority determines that the standards will result in an unacceptable adverse impact on existing development or on the proposed development or on natural features such as wetlands, steep slopes or existing mature trees.**

**B. Creation of rights-of-way for streets and related purposes. Rights-of-way shall be created through the approval of a final subdivision plat or major partition; however, the Council may approve the creation of a street by acceptance of a deed, provided that such street is deemed essential by the Council for the purpose of general traffic circulation:**

**1. The Council may approve the creation of a street by deed of dedication without full compliance with the regulations applicable to subdivisions or major partitions if any one or more of the following conditions are found by the Council to be present:**

**a. Establishment of a street is initiated by the Council and is found to be essential for the purpose of general traffic circulation, and partitioning or subdivision of land has an incidental effect rather than being the primary objective in establishing the road or v for public use; or**

**b. The tract in which the road or street is to be dedicated is an isolated ownership of one acre or less and such dedication is recommended by the Commission to the Council based on a finding that the proposal is not an attempt to evade the provisions of this title governing the control of subdivisions or major partitions.**

**2. With each application for approval of a road or street right-of-way not in full compliance with the regulations applicable to the standards, the proposed dedication shall be made a condition of subdivision and major partition approval:**

**a. The applicant shall submit such additional information and justification as may be necessary to enable the Commission in its review to determine whether or not a recommendation for approval by the Council shall be made;**

**b. The recommendation, if any, shall be based upon a finding that the proposal is not in conflict with the purpose of this title;**

**c. The Commission in submitting the proposal with a recommendation to the Council may attach conditions which are necessary to preserve the standards of this title; and d. All deeds of dedication shall be in a form prescribed by the city and shall name "the public" as grantee.**

**Finding:** The proposed development does not require new streets. The streets surrounding the property are improved in accordance with City Standards. Frontage improvements are not proposed as part of the development, except where new driveways will be installed. This standard is met.

**C. Creation of access easements. The approval authority may approve an access easement established by deed without full compliance with this title provided such an easement is the only reasonable method by which a lot large enough to develop can be created:**

1. **Access easements shall be provided and maintained in accordance with the Uniform Fire Code;**
2. **Access shall be in accordance with §§ 17.8.100 et seq.**

**Finding:** An access easement has been provided on Lot 3 which will provide access to Lot 2 and the property to the east. The access easement will be provided and maintained in accordance with the Uniform Fire Code and section 17.8.100. This standard is met.

**D. Street location, width and grade. Except as noted below, the location, width and grade of all streets shall conform to an approved street plan and shall be considered in their relation to existing and planned streets, to topographic conditions, to public convenience and safety, and in their appropriate relation to the proposed use of the land to be served by such streets:**

1. **Street grades shall be approved by the City Engineer in accordance with subsection M. below; and**
2. **Where the location of a street is not shown in an approved street plan, the arrangement of streets in a development shall either:**
   a. **Provide for the continuation or appropriate projection of existing streets in the surrounding areas; or**
   b. **Conform to a plan adopted by the Commission, if it is impractical to conform to existing street patterns because of particular topographical or other existing conditions of the land. Such a plan shall be based on the type of land use to be served, the volume of traffic, the capacity of adjoining streets and the need for public convenience and safety.**
3. **The City Engineer may require slope easements due to topography, the size and shape of the tract, or other conditions.**

**Finding:** New streets are not proposed as part of this development. The requirements of this section are not applicable.

**E. Minimum rights-of-way and street widths. Unless otherwise indicated on an approved street plan, or as needed to continue an existing improved street, street right-of-way and roadway widths shall not be less than the minimum width described below. Where a range is indicated, the width shall be determined by the appropriate decision-making authority based upon anticipated average daily traffic (ADT) on the new street segment. These are presented in Table 8-7.**

1. **The decision-making body shall make its decision about desired right-of-way width and pavement width of the various street types within the subdivision or development after consideration of the following:**
    a. **The type, design and location of the road as set forth in the Transportation System Plan. Standards for specific streets identified in the Transportation System Plan shall apply;**
    b. **Anticipated traffic generation;**
    c. **On-street parking needs;**
    d. **Sidewalk and bikeway requirements;**
    e. **Requirements for placement of utilities;**
    f. **Street lighting;**
    g. **Drainage and slope impacts;**
    h. **Street tree location;**
    i. **Planting and landscape areas;**
    j. **Safety and comfort for motorists, bicyclists and pedestrians; and**
    k. **Access needs for emergency vehicles.**

**F. Future street plan and extension of streets.**

1. **A future street plan shall:**
    a. **Be filed by the applicant in conjunction with an application for a subdivision or partition. The plan shall show the pattern of existing and proposed future streets from the boundaries of the proposed land division and shall include other parcels within 500 feet surrounding and adjacent to the proposed land division. At the applicant 's request, the city shall prepare a future streets proposal. A street proposal may be modified when subsequent subdivision proposals are submitted; and**
    b. **Identify existing or proposed bus routes, pullouts or other transit facilities, bicycle routes and pedestrian facilities on or within 530 feet of the site.**
2. **For new residential and mixed-use development t, possible local street connections to contiguous vacant or primary undeveloped land must be identified in conformance with street projections outlined on the Local Street Connectivity Plan, as shown on the Comprehensive Plan Map.**
3. **Where necessary to give access or permit a satisfactory future division of adjoining land, streets shall be extended to the boundary lines of the tract to be developed; and**
    a. **These extended streets or street stubs to adjoining properties are not considered to be cul-de-sacs since they are intended to continue as through streets at such time as the adjoining property is developed.**
    b. **A barricade shall be constructed at the end of the street by the property owners which shall not be removed until authorized by the City Engineer, the cost of which shall be included in the street construction cost.**
    c. **Temporary hammerhead turnouts or temporary cul-de-sac bulbs shall be constructed for stub streets in excess of 150 feet in length.**

**G. Street alignment and connections.**

1. **Staggering of streets making "T" intersections at collectors and arterials shall not be designed so that jogs of less than 300 feet on such streets are created, as measured from the centerline of such street.**
2. **Spacing between local street intersections shall have a minimum separation of 125 feet.**
3. **All local and minor collector streets that abut a development site shall be extended within the site to provide through circulation when not precluded by environmental or topographical constraints, existing development patterns or strict adherence to other standards in this Code. A street connection or extension is considered precluded when it is not possible to redesign or reconfigure the street pattern to provide required extensions. Land is considered topographically constrained if the slope is greater than 15% for a distance of 250 feet or more. In the case of environmental or topographical constraints, the mere presence of a constraint is not sufficient to show that a street connection is not possible. The applicant must show why the constraint precludes some reasonable street connection.**
4. **Proposed street or street extensions shall be located to provide direct access to existing or planned transit stops, commercial services and other neighborhood facilities, such as schools, shopping areas and parks.**
5. **All developments should provide an internal network of connecting streets that provide short, direct travel routes and minimize travel distances within the development.**

**H. Intersection angles. Streets shall be laid out so as to intersect at an angle as near to a right angle as practicable, except where topography requires a lesser angle, but in no case shall the angle be less than 75o unless there is special intersection design, and:**

1. **Streets shall have at least 25 feet of tangent adjacent to the right-of-way intersection unless topography requires a lesser distance;**
2. **Intersections which are not at right angles shall have a minimum corner radius of 20 feet along the right-of-way lines of the acute angle; and**
3. **Right-of-way lines at intersection with arterial streets shall have a corner radius of not less than 20 feet.**

**I. Existing rights-of-way. Whenever existing rights-of-way adjacent to or within a tract are of less than standard width, additional rights-of-way shall be provided at the time of subdivision or development.**

**J. Partial street improvements. Partial street improvements resulting in a pavement width of less than 20 feet; while generally not acceptable may be approved where essential to reasonable development when in conformity with the other requirements of these regulations, and when it will be practical to require the improvement of the other half when the adjoining property developed.**

**K. Cul-de-sacs. A cul-de-sac shall be no more than 200 feet long, shall not provide access to greater than 20 dwelling units, and shall only be used when environmental or**

**topographical constraints, existing development pattern, or strict adherence to other standards in this Code preclude street extension and through circulation.**

1. **All cul-de-sacs shall terminate with a turnaround. Use of turnaround configurations other than circular shall be approved by the City Engineer.**
2. **The length of the cul-de-sac shall be measured along the centerline of the roadway from the near side of the intersecting street to the farthest point of the cul-de-sac.**
3. **If a cul-de-sac is more than 300 feet long, a lighted direct pathway to an adjacent street may be required to be provided and dedicated to the city.**

**Finding:** The proposed development does not require new public streets. The streets surrounding the property are improved in accordance with City Standards. Frontage improvements are not proposed as part of the development, except where new driveways will be installed. This standard is met.

**L. Street names. No street name shall be used which will duplicate or be confused with the names of existing streets in Washington County, except for extensions of existing streets. Street names and numbers shall conform to the established pattern in the surrounding area.**

**Finding:** The proposed development does not include new public streets which require names. The requirements of this section are not applicable.

**M. Grades and curves. Grades shall not exceed 10% on arterials, 12% on collector streets, or 12% on any other street (except that local or residential access streets may have segments with grades of up to 15% for distances of no greater than 250 feet), and:**

1. **Centerline radii of curves shall not be less than 700 feet on arterials, 500 feet on major collectors, 350 feet on minor collectors, or 100 feet on other streets; and**
2. **Streets intersecting with a minor collector or greater functional classification street, or streets intended to be posted with a stop sign or signalization shall provide a landing averaging 5% or less. Landings are that portion of the street within 20 feet of the edge of the intersecting street at full improvement.**

**Finding:** The proposed development does not require new public streets. The requirements of this section are not applicable.

**N. Curbs, curb cuts, ramps and driveway approaches. Concrete curbs, curb cuts, wheelchair, bicycle ramps and driveway approaches shall be constructed in accordance with standards specified in this chapter; and:**

1. **Concrete curbs and driveway approaches are required; except**
2. **Where no sidewalk is planned, an asphalt approach may be constructed with City Engineer approval; and**
3. **Asphalt and concrete driveway approaching the property line shall be built to city configuration standards.**

**Finding:** All curbs, curb cuts, wheelchair, bicycle ramps and driveway approaches will be constructed in accordance with the standards specified in this chapter, as shown on the Site Plan. This standard is met.

**O. Streets adjacent to railroad right-of-way. Wherever the proposed development contains or is adjacent to a railroad right-of-way, provision shall be made for a street approximately parallel to and on each side of such right-of-way at a distance suitable for the appropriate use of the land. The distance shall be determined with due consideration at cross streets or the minimum distance required for approach grades and to provide sufficient depth to allow screen planting along the railroad right-of-way in nonindustrial areas.**

**Finding:** The subject site is not located adjacent to a railroad right-of-way. The requirements of this section are not applicable.

**P. Access control. Access control as described for each classification of street within the transportation element (Transportation System Plan (TSP), shall be implemented when a new street or street extension is built.**

**Finding:** The proposed development will take access from the existing collector street. Access control is not required or proposed for the development.

**Q. Access to arterials and major collectors. Where a development abuts or is traversed by an existing or proposed arterial or major collector street, the development design shall provide adequate protection for residential properties and shall separate residential access and through traffic, or if separation is not feasible, the design shall minimize the traffic conflicts. The design shall include any of the following:**

1. **A parallel access street along the arterial or major collector;**
2. **Lots of suitable depth abutting the arterial or major collector to provide adequate buffering with frontage along another street;**
3. **Screen planting at the rear or side property line to be contained in a non-access reservation along the arterial or major collector; or**
4. **Other treatment suitable to meet the objectives of this subsection;**
5. **If a lot has access to two streets with different classifications, primary access should be from the lower classification street.**

**Finding:** The proposed development is located along Sunset Drive, a collector, and Highway 47, a principal arterial. The proposed buildings have been located to provide suitable depth to provide adequate buffering and screening plantings. This standard is met.

**R. Alleys, public or private.**

1. **Alleys shall be no less than 15 feet in width. In commercial and industrial districts, alleys shall be provided unless other permanent provisions for access to off-street parking and loading facilities are made.**
2. **While alley intersections and sharp changes in alignment shall be avoided, the corners of necessary alley intersections shall have a radius of not less than 12 feet.**

**Finding:** Alleys are not proposed for this development. The requirements of this section are not applicable.

**S. Survey monuments. Upon completion of a street improvement and prior to acceptance by the city, it shall be the responsibility of the developer's registered professional land**

**surveyor to provide certification to the city that all boundary and interior monuments shall be reestablished and protected.**

**Finding:** The proposed development does not require public street improvements. The requirements of this section are not applicable.

**T. Private streets.**

1. **Design standards for private streets shall be established by the City Engineer; and**
2. **The city shall require legal assurances for the continued maintenance of private streets, such as a recorded maintenance agreement.**
3. **Private streets serving more than six dwelling units are permitted only within planned developments, mobile home parks and multi-family residential developments.**

**Finding:** Private Streets are not proposed for this development. The requirements of this section are not applicable.

**U. Railroad crossings. Where an adjacent development results in a need to install or improve a railroad crossing, the cost for such improvements may be a condition of development approval, or another equitable means of cost distribution shall be determined by the Public Works Director and approved by the Commission.**

**Finding:** The subject site is not located adjacent to a railroad crossing. The requirements of this section are not applicable.

**V. Street signs. The city shall install all street signs, relative to traffic control and street names, as specified by the City Engineer for any development. The cost of signs shall be the responsibility of the developer.**

**Finding:** The proposed development does not require new streets. New street signs are not required for the development.

**W. Traffic signals. The location of traffic signals shall be noted on approved street plans. Where a proposed street intersection will result in an immediate need for a traffic signal, a signal meeting approved specifications shall be installed. The cost shall be included as a condition of development.**

**Finding:** The proposed development does not require new traffic signals. The requirements of this section are not applicable to this development.

**X. Street light standards. Street lights shall be installed in accordance with regulations adopted by the city 's direction.**

**Finding:** Street lights are not proposed along Sunset Drive or Highway 47, as they have existing street lights along each frontage. The requirements of this section are not applicable.

**Y. Street name signs. Street name signs shall be installed at all street intersections. Stop signs and other signs may be required.**

**Finding:** The proposed development does not require new streets. New street signs are not required for the development.

**Z. Street cross-sections. The final lift of asphalt concrete pavement shall be placed on all new constructed public roadways prior to final city acceptance of the roadway and within one year of the conditional acceptance of the roadway unless otherwise approved by the City Engineer. The final lift shall also be placed no later than when 90% of the structures in the new development are completed or three years from the commencement of initial construction of the development, whichever is less.**

**Finding:** The proposed development does not require street improvements. The requirements of this section are not applicable.

**17.8.615 EASEMENTS.**

**A. Easements. Easements for sewers, drainage, water mains, electric lines or other public utilities shall be either dedicated or provided for in the deed restrictions, and where a development traversed by a watercourse, or drainageway, there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of the watercourse.**

**B. Utility easements. A property owner proposing a development shall make arrangements with the city, the applicable district and each utility franchise for the provision and dedication of utility easements necessary to provide full services to the development. The city 's standard width for public main line utility easements shall be 15 feet unless otherwise specified by the utility company, applicable district, or City Engineer.**

**C. Where the alignment of a utility easement (other than those required perimeter easements) is such that it would also serve as a suitable easement for originating or continuing a pedestrian/bicycle path, the Community Development Director may require that such easement be designated as serving both functions. The walkway shall be designed and improved consistent with the requirements of § 17.8.100 Access and Circulation.**

**Finding:** All utility easements will be determined through the development of the site and recorded on the final plat. This standard is met.

**17.8.620 SIDEWALKS.**

**A. Sidewalks required. Sidewalks shall be constructed, replaced or repaired to city design standards as set forth in the standard specifications manual and located as follows:**

**1. On both sides of arterial and collector streets to be built at the time of street construction;**

**2. On both sides of all other streets and in pedestrian easements and rights-of-way, except as provided further in this section, to be constructed along all portions of the property designated for pedestrian ways in conjunction with development of the property; and**

**3. On one side of any industrial street to be constructed at the time of street construction or after determination of curb cut locations.**

**B. Parkway requirements. A parkway at least five feet between the curb and the sidewalk shall be required in the design of any arterial or collector street where parking is**

**prohibited adjacent to the curb, except where the following conditions exist: there is inadequate right-of-way; the curbside sidewalks already exist on predominant segments of the street; or it would conflict with the utilities.**

**C. Sidewalks in Town Center District. In the Town Center District, sidewalks shall be ten feet in width, and:**

1. **All sidewalks shall provide a continuous unobstructed path; and**
2. **The width of curbside sidewalks shall be measured from the back of the curb.**

**D. Maintenance. Maintenance of sidewalks, curbs and planter strips is the continuing obligation of the adjacent property owner.**

**E. Application for permit and inspection. If the construction of a sidewalk is not included in a performance bond of an approved subdivision or the performance bond has lapsed, then every person, firm or corporation desiring to construct sidewalks as provided by this chapter, shall, before entering upon the work or improvement, apply for a street opening permit to the Engineering department to so build or construct:**

1. **An occupancy permit shall not be issued for a development until the provisions of this section are satisfied.**
2. **The City Engineer may issue a permit and certificate allowing temporary noncompliance with the provisions of this section to the owner, builder or contractor when, in his or her opinion, the construction of the sidewalk is impractical for one or more of the following reasons:**
    a. **Sidewalk grades have not and cannot be established for the property in question within a reasonable length of time;**
    b. **Forthcoming installation of public utilities or street paving would be likely to cause severe damage to the new sidewalk;**
    c. **Street right-of-way is insufficient to accommodate a sidewalk on one or both sides of the street; or**
    d. **Topography or elevation of the sidewalk base area makes construction of a sidewalk impractical or economically infeasible; and**
3. **The City Engineer shall inspect the construction of sidewalks for compliance with the provision set forth in the standard specification manual.**

**F. Council initiation of construction. In the event one or more of the following situations are found by the Council to exist, the Council may adopt a resolution to initiate construction of a sidewalk in accordance with city ordinances:**

1. **A safety hazard exists for children walking to or from school and sidewalks are necessary to eliminate the hazard;**
2. **A safety hazard exists for pedestrians walking to or from a public building, commercial area, place of assembly or other general pedestrian traffic, and sidewalks are necessary to eliminate the hazard; and**
3. **Fifty percent or more of the area in a given block has been improved by the construction of dwellings, multiple dwellings, commercial buildings or public buildings and/or parks.**

**Finding:** The site has frontage on Sunset Drive and Highway 47, which are both improved with sidewalks along the property frontage. New public sidewalks are not proposed. This standard is met.

**17.8.625 SANITARY SEWERS.**

**A. Sewers required. Sanitary sewers shall be installed to serve each new development and to connect developments to existing mains in accordance with the provisions set forth in Design and Construction Standards for Sanitary and Surface Water Management (as adopted by Clean Water Services in 1996 and including any future revisions or amendments) and the adopted policies of the Comprehensive Plan and the City 's Master Sewer Plan.**

**B. Sewer plan approval. The City Engineer shall approve all sanitary sewer plans and proposed systems prior to issuance of development permits involving sewer service.**

**C. Over-sizing. Proposed sewer systems shall include consideration of additional development within the area as projected by the Comprehensive Plan.**

**D. Permits denied. Development permits may be restricted by the Commission or Hearings Officer where a deficiency exists in the existing sewer system or portion thereof which cannot be rectified within the development and which if not rectified will result in a threat to public health or safety, surcharging of existing mains, or violations of state or federal standards pertaining to operation of the sewage treatment system.**

**Finding:** The proposed sanitary sewer configuration has been shown on the Composite Utility Plan. This standard is met.

**17.8.630 WATER FACILITIES.**

**A. Water facilities required. Water facilities shall be installed to serve each new development and to connect developments to existing mains in accordance with the provisions set forth in the adopted policies of the Comprehensive Plan and the city 's Master Water Plan.**

**B. Water plan approval. The City Engineer shall approve all plans for water facilities and proposed systems prior to issuance of development permits involving water service.**

**C. Over-sizing. Proposed water facilities shall include consideration of additional development within the area as projected by the Comprehensive Plan.**

**D. Permits denied. Development permits may be restricted by the Planning Commission or Hearings Officer where a deficiency exists in the existing water system or portion thereof which cannot be rectified within the development and which, if not rectified, will result in a threat to public health or safety or violations of local, state or federal standards pertaining to the operation of the water system.**

**Finding:** The proposed water facility configuration has been shown on the Composite Utility Plan. This standard is met.

**17.8.635 STORM DRAINAGE.**

**G. General provisions. The Director and City Engineer shall issue a development permit only where adequate provisions for stormwater and flood water runoff have been made, and:**

1. **The stormwater drainage system shall be separate and independent of any sanitary sewerage system; and**
2. **Where possible, inlets shall be provided so surface water is not carried across any intersection or allowed to flood any street; and 3. Surface water drainage patterns shall be shown on every development proposal plan.**

**B. Easements. Where a watercourse, drainageway, channel or stream traverses a development, there shall be provided a stormwater easement or drainage right-of-way conforming substantially to the lines of such watercourse and such further width as will be adequate for conveyance and maintenance.**

**C. Accommodation of upstream drainage.**

1. **A culvert or other drainage facility shall be large enough to accommodate runoff from its entire upstream drainage area, whether inside or outside the development; and**
2. **The City Engineer shall approve the necessary size of the facility, based on the provisions of Design and Construction Standards for Sanitary and Surface Water Management (as adopted and amended by Clean Water Services) and the city 's Master Stormwater Sewer Plan.**

**D. Effect on downstream drainage. Where it is anticipated by the City Engineer that the additional runoff resulting from the development will overload an existing drainage facility, the Director and Engineer shall withhold approval of the development until provisions have been made for improvement of the potential condition or until provisions have been made for storage of additional runoff caused by the development in accordance with the Design and Construction Standards for Sanitary and Surface Water Management (as adopted by Clean Water Services and including any future revisions or amendments).**

**Finding:** The proposed stormwater facility configuration has been shown on the Composite Utility Plan. A preliminary drainage report has been submitted detailing the proposed stormwater treatment and detention system. This standard is met.

**17.8.640 BIKEWAYS.**

**A. Bikeway extension. Developments adjoining proposed bikeways identified on the city 's adopted pedestrian/bikeway plan shall include provisions for the future extension of such bikeways through the dedication of easements or rights-of-way.**

**B. Cost of construction. Development permits issued for planned unit developments, conditional use permits, subdivisions and other developments which will principally benefit from such bikeways shall be conditioned to include the cost or construction of bikeway improvements.**

**C. Minimum width. Minimum width for bikeways within the roadway is five feet per bicycle travel lane. Minimum width for two-way bikeways separated from the road is eight feet.**

**Finding:** The development site does not abut an existing bikeway. The requirements of this section are not applicable.

**17.8.645 UTILITIES.**

**A. Underground utilities. All utility lines in new developments shall be placed underground, and:**

1. **The developer shall make all necessary arrangements with the serving utility to provide the underground services;**
2. **The city reserves the right to approve location of all surface mounted facilities;**
3. **All underground utilities, including sanitary sewers and storm drains installed in streets by the developer, shall be constructed prior to the surfacing of the streets; and**
4. **Stubs for service connections shall be long enough to avoid disturbing the street improvements when service connections are made.**

**B. Information on development plans. The applicant for a development shall show on the development plan or in the explanatory information, easements for all underground utility facilities, and:**

1. **Plans showing the location of all underground facilities as described herein shall be submitted to the City Engineer for review and approval; and**
2. **Care shall be taken in all cases to ensure that above ground equipment does not obstruct vision clearance areas for vehicular traffic.**

**C. Exception to under-grounding requirement for infill development. An applicant for infill development, which is served by above ground utilities, may be exempt from the requirement for undergrounding utilities. This exception shall apply only to existing utility lines.**

**Finding:** A Composite Utility Plan showing all proposed utilities has been submitted under Appendix E.

**17.8.650 AGREEMENT.**

**For projects involving public improvements, the applicant shall enter into an agreement with the City Engineer prior to any site preparation or, where there is a partition or subdivision, prior to approval of the final map. The agreement shall be in a form as approved by the City Engineer. At a minimum, it shall include detailed plans for public improvements and provide adequate assurance to guarantee the installation of the improvements (known as Performance Assurance) and the workmanship and material of the installation (known as Maintenance Assurance). The agreement may be waived by the City Engineer is the level of work is considered minor. However, the assurances shall be required for any public improvements. The assurance shall be based on the following requirements.**

**A. Maintenance assurance. All improvements installed by the developer shall be guaranteed as to workmanship and material for a period of one-year following acceptance by the City Engineer.**

**B. Form of assurance. All assurances shall be secured by cash deposit, bond or irrevocable letter of credit in the amount of 100% of the cost to complete the project as set by the City Engineer.**

**Finding:** The applicant acknowledges that a maintenance assurance is required for the proposed public improvements.

**BUILDING DESIGN AND DEVELOPMENT STANDARDS**

**17.8.710 STANDARDS.**

**A. Building design standards for multi-unit development except within Town Center zones.**

**6. Massing and form.**

**a. On lots with an average cross slope of 15% or more, no more than 60% of the site shall be re-graded.**

**Finding:** The subject site does not have an average cross slope of 15% or more. The requirements of this section are not applicable to the proposed development.

**b. No building shall have a dimension greater than 150 feet without a minimum three feet off-set of the exterior wall.**

**Finding:** The residential site will have three multi-family building types, A2, A4, A5 as well as a fieldhouse and garages. The building façade dimensions have been provided in the table below.

| | Façade Dimensions |
|---|---|
| Building A2 | L: 134′ 0″<br>W: 57′ 2″ |
| Building A4 | L: 127′ 2″<br>W: 76′ |
| Building A5 | **L: 189′ 6″**<br>W: 93′ 10″ |
| Fieldhouse | L: 100′<br>W: 69′ 10″ |
| Garage | L: 55′ 9.5″<br>W: 40′ |

The requirements of this section are applicable only to Building A5. Articulation has been provided on all sides of Building A5 with a three-foot offset of the exterior wall.

This standard is met.

**c. At a minimum, every two dwelling units shall be offset from the next dwelling unit by at least four feet in depth.**

**Finding:** All proposed buildings will be designed with two-unit bays with circulation corridors between each bay. The proposed circulation corridors will provide an offset of at least four feet in depth.

**d. All habitable rooms shall incorporate at least one window when facing parking lots and common areas.**

**Finding:** As shown on the submitted building floor plans, all habitable rooms will have at least one window when facing parking lots. This standard is met.

**7. Compatibility.**

a. **All buildings shall incorporate a porch or architecturally defined entry space for each ground level dwelling unit with a minimum area of 16 square feet per dwelling unit, with no dimension less than four feet.**
b. **Shared porches or entry spaces are permitted. All grade level porches shall include hand-railing, half-walls or shrubs to define their outside perimeter.**

**Finding:** The buildings will feature shared entry and circulation corridors which will be architecturally defined on the elevation of the buildings. Each ground floor unit will feature a private patio with an area of at least 16 square feet. This standard is met.

8. **Privacy.**
   a. **Front entryways into dwelling units shall be separated vertically or horizontally a minimum of three feet from sidewalks used by more than one dwelling unit.**
   b. **Bedroom and bathroom windows shall be offset a minimum of four feet from windows on adjacent buildings (unless window glazing is frosted, diffused or glass block).**

**Finding:** The proposed buildings will feature shared entry and circulation corridors which will be separated from the adjacent sidewalks by at least three feet horizontally. Where buildings are located adjacent to each other, bedroom and bathroom windows will be offset by at least four feet. This standard is met.

9. **Building relationship with adjacent arterials.**
   a. **Buildings shall be setback at least ten feet from arterials.**
   b. **Buildings shall be oriented away from arterials and no front or main entries shall be facing the arterials.**
   c. **The setback area shall be landscaped consistent with the buffering requirements of § 17.8.425, except that chain link fence shall not be allowed.**

**Finding:** All buildings have been located at least ten feet from arterials. None of the proposed buildings have front or main entries facing the arterials. The setback areas along arterials will be landscaped consistent with the buffering requirements of 17.8.425. This standard is met.

**B. Building design standards for commercial development in Community Commercial and Mixed Use zones.**

1. **Building orientation.**
   a. **Design and construct buildings so that at least one facade is within 60 feet of a dedicated public street right-of-way line.**
   b. **Design and construct a minimum of one primary building entrance for each building ground floor use or tenant along a public right-of-way or internal roadway built to city public street engineering standards.**
2. **Massing and form.**
   a. **Provide changes in the depth of the facade plane in excess of two feet for all building walls more than 75 feet in length.**
   b. **Maximum length of building facades shall be 200 feet.**

c. **Roofline heights must be varied a minimum of two feet for building facades greater than 75 feet in length.**
d. **Provide vertical partitioning of facades by using columns, pilasters and other vertical elements a minimum of every 25 feet.**
e. **Articulation of building fronts through changes in depth or building relief (e.g. windows, doors, cornices, columns, a change in materials) shall occur a minimum of every 15 feet in the horizontal or vertical dimensions.**

**Finding:** The commercial development has been designed so that at least one façade on each site is within 60 feet of a public street right-of-way line. At least one building entrance will be oriented towards a public right of way.

The proposed commercial buildings will be designed to meet the massing and form requirements. The proposed designs will be confirmed at the time of building permit submittal. This standard is met.

3. **Design elements.**
   a. **Every building elevation adjacent to a street with a horizontal dimension of more than 100 feet shall have a building entrance.**
   b. **Building facades adjacent to sidewalks or pedestrian connections must include weather protection canopies or awnings along at least 75% of the length of the ground floor facade.**
   c. **Incorporate a minimum of 50% transparency/window openings on the ground floor facades of buildings that are 5,000 square feet or less, or 20% transparency/window openings for buildings greater than 5,000 square feet facing the public right-of-way. For a building that faces two streets, the requirement shall apply to the predominant street or as determined by the Director where both streets are considered similar.**
   d. **Windows shall not be reflective, tinted or treated in such a way as to block views into or out of windows unless for energy or security purposes.**
   e. **Windows must be recessed a minimum of four inches from building facades.**
   f. **Materials such as synthetic stucco (EIFS, Dryvit, etc.) are prohibited at ground floor.**
   g. **Vinyl cladding of building facade is prohibited at ground floor.**

4. **Compatibility.**
   a. **Any building or portion of a building that is less than 50 feet from existing residential dwellings must not be higher than 15 feet above the top of the roofline of the nearest existing dwelling.**
   b. **When adjacent to existing residential development, all commercial structures with floor areas less than 20,000 square feet of total building area must provide a gabled element to the parapet or roof.**
5. **Safety.**

a. **Security gates or bars on windows or doors are prohibited along ground floors of commercial buildings, excluding loading and storage areas.**
b. **Motion activated security lighting is prohibited along building facades that front onto public rights-of-way.**
c. **Public access shall be provided to all commercial uses that provide plazas, squares or courts intended for food, beverage or entertainment uses.**
d. **Parking lots or roadways shall not be gated or secured excluding loading and storage areas or residential parking areas.**

6. **Single-family and duplexes in the NMU zone shall comply with § 17.8.710F.**

**Finding:** The applicant provided a preliminary site plan and Design Guidebook for the proposed commercial development located within the Village Center of the MUPD. The applicant is not proposing specific building plans for the commercial development as part of the MUPD, instead a Design Guidebook has been provided which will guide the design of the commercial site at the time of development. All development requirements listed above will be met at the time of building permit submittal for the commercial development.

This standard is met.

**LIGHTING STANDARDS**

**17.8.755 GENERAL PROVISIONS.**

**A. When standards apply. Unless otherwise provided, the provisions of this subarticle apply to lighting that is part of a multi-family or commercial project, or lighting within one of the Town Center zoning districts.**

**Finding:** The requirements of this section are applicable to the proposed development.

**B. Adjustments. Adjustments to the provisions in this section may be considered as part of the Adjustment, Design Review, Conditional or Planned Development Process.**

**Finding:** Adjustments to this section are not proposed.

**C. Luminous standards. Light intensity standards shall be as follows:**

1. **Outdoor lighting shall be provided in a manner that enhances security, is appropriate for the use, and avoids adverse impacts on surrounding properties. Glare shall not cause illumination on other properties in excess of a measurement of 0.5 foot-candles of light.**

**Finding:** As shown on the Lighting Plan (Sheet C410), the proposed lighting plan will not cause illumination on other properties in excess of a measurement of 0.5 foot-candles of light. This standard is met.

2. **Street lights shall meet the lighting requirements of the Public Works Director upon consultation with the Light and Power Director.**

**Finding:** Street lights are not proposed along Sunset Drive or Highway 47, as they have existing street lights along each frontage. The requirements of this section are not applicable.

3. **Pedestrian lighting standards:**

e. **Lighting for on-site pedestrian circulation system shall be lighted to a minimum level of 0.5 foot-candles, a 1.5 foot-candle average, and a maximum to minimum ratio of seven-to-one to enhance pedestrian safety and allow employees, residents, customers or the public to use the walkways at night.**

f. **Pedestrian walkway lighting through parking lots shall be lighted to a 0.5 foot-candle average and a maximum to minimum ratio of ten-to-one to light the walkway and enhance pedestrian safety. Artificial lighting which may be provided shall enhance security, be appropriate for the use, and avoid adverse impacts on surrounding properties and the night sky through appropriate shielding. The lighting shall not cause a measurement in excess of 0.5 foot-candles of light on other properties.**

**Finding:** As shown on the Lighting Plan (Sheet C410), all on-site pedestrian circulation systems will be lighted to a minimum level of 0.5 foot-candles, with a 1.5 foot-candle average and a maximum to minimum ratio of seven-to-one. This standard is met.

**D. Lighting standards for multi-unit development.**

1. **All exterior dwelling unit entrances and pedestrian walkways shall be lighted.**
2. **Poles outside of the public right-of-way shall be a maximum of 14 feet in height if the lot is less than 20,000 square feet and 18 feet for lots larger than 20,000 square feet.**
3. **Concrete light fixture bases taller than eight inches are prohibited.**
4. **Area lighting shall be directed downward with no splay of light off the site. Any light source over ten feet high shall incorporate cut-off shield.**
5. **Plastic signs with internal light source are prohibited.**

**Finding:** All dwelling unit entrances and pedestrian walkways will be lighted. Poles located outside of the public right-of-way will have a maximum height of 18 feet. Concrete lighting fixture bases taller than eight inches are not proposed. All area lighting will be directed downward with no splay of light off the site. All light sources over ten feet in height will incorporate cut-off shields. Plastic signs are not proposed. This standard is met.

**E. Lighting standards for commercial development.**

1. **Exterior building lighting. Building lighting shall be directed downward with no splay of light off the site. Any light source over ten feet high shall incorporate cut-off shield.**
2. **Parking lot lighting.**
    a. **Lights shall not obstruct vehicular or pedestrian traffic.**
    b. **Poles outside of the public right-of-way shall be a maximum of 14 feet in height if the lot is less than 20,000 square feet and 18 feet for lots larger than 20,000 square feet.**
    c. **Concrete light fixture bases taller than eight inches are prohibited.**
    d. **Lights shall be equipped with cut-off fixture to ensure that light does not spill onto adjacent residential property.**
3. **Sidewalk and landscape lighting.**
    a. **All bollard, wall or stairway lighting shall be directed exclusively downward.**

**b. All up-lighting fixtures shall be screened by landscaping or concealed within structures or located below or flush with grade.**

**c. No walkway lighting shall exceed 14 feet in height.**

**4. Sign lighting.**

**a. Interior lighted plastic signs are prohibited.**

**b. Moving or flashing signs are prohibited.**

**Finding:** The applicant has provided a Lighting Plan (Sheet C410) for the commercial development. The proposed lighting will meet the requirements of this section. This standard is met.

**SUMMARY AND CONCLUSION**

Based upon the materials submitted herein, the Applicant respectfully requests approval from the Forest Grove's City Council for this a Preliminary Plan Mixed-Use Planned Unit Development ("MUPD"), Text Amendment, Adjustment, and Preliminary Partition.

KITTELSON & ASSOCIATES
851 SW 6th Avenue, Suite 600
Portland, OR 97204
P 503.228.5230

# Technical Memorandum

**October 23, 2023**

Project# 28251.0

To: Nick Kelsay
City of Forest Grove
1924 Council Street
Forest Grove, OR 97116

From: Matt Bell and Chris Brehmer, PE

RE: Brown's Farm Transportation Impact Study

## INTRODUCTION

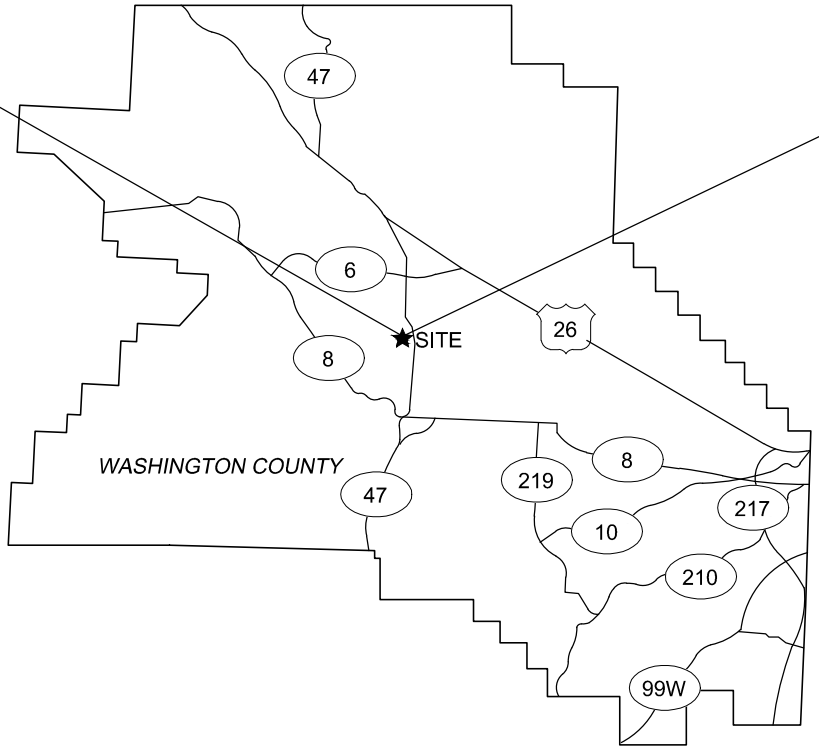
JT Smith is proposing to develop the 24.88-acre site located in the southeast and southwest corners of the OR 47/Sunset Drive intersection in Forest Grove. Figure 1 illustrates the site vicinity map. The proposed development plan includes five phases: Phase R1, R2, and R3 include construction of a 360-unit apartment complex on the east side of Sunset Drive; Phase C1 includes construction of a 48,850 square-foot retail center on the east side of Sunset Drive; and Phase C2 includes construction of 24 townhomes on the west side of Sunset Drive. Access to the apartments and retail center is planned to be provided by three new driveways on the east side of Sunset Drive, including two full-movement driveways and one driveway (the northernmost) with right-in/right-out only movement restrictions. Access to the townhomes is planned to be provided by one full-movement driveway on the west side of Sunset Drive. Figure 2 illustrates the preliminary site plan. Construction of the proposed townhomes is expected to be complete in 2024 while construction of the proposed apartments and retail center is expected to be complete in 2026.

The results of this study indicate that the proposed Brown's Farm development can be constructed while maintaining acceptable traffic operations at the study intersections. No capacity-based mitigation measures were identified. Study recommendations include:

- Landscaping, above ground utilities, and signing should be located and maintained along site frontages and throughout the site in a manner that preserves adequate intersection sight distance per City requirements.
- Regardless of the development, we recommend that the City work with ODOT to review and modify the signal timing plan at the OR 47/Sunset Drive intersection to optimize intersection operations and minimize queuing in light of planned/pending developments, anticipated connectivity changes, and the new roundabout being constructed to the east on OR 47 at Martin Road.
- Pursuant to recommendations from City staff, JT Smith should collaborate with the City to design and construct a marked crossing at the Sunset Drive/Bonnie Lane intersection in conjunction with site development. The types of enhanced crossing treatments could include ADA accessible curb ramps, raised median islands, high visibility pavement markings and signs, rectangular rapid flashing beacons, and lighting.

## Scope of the Report

This report summarizes the transportation-related impacts associated with the proposed Brown's Farm development and was prepared in accordance with City of Forest Grove Development Code Section 17.1.225.A.D and Oregon Department of Transportation (ODOT) requirements for a Transportation Impact Study (TIS). The study intersections for the TIS were selected based on discussions with City and ODOT staff and are summarized below.




# Study Intersection

# Site Driveway

Site Vicinity Map
Forest Grove, Oregon

Figure
1

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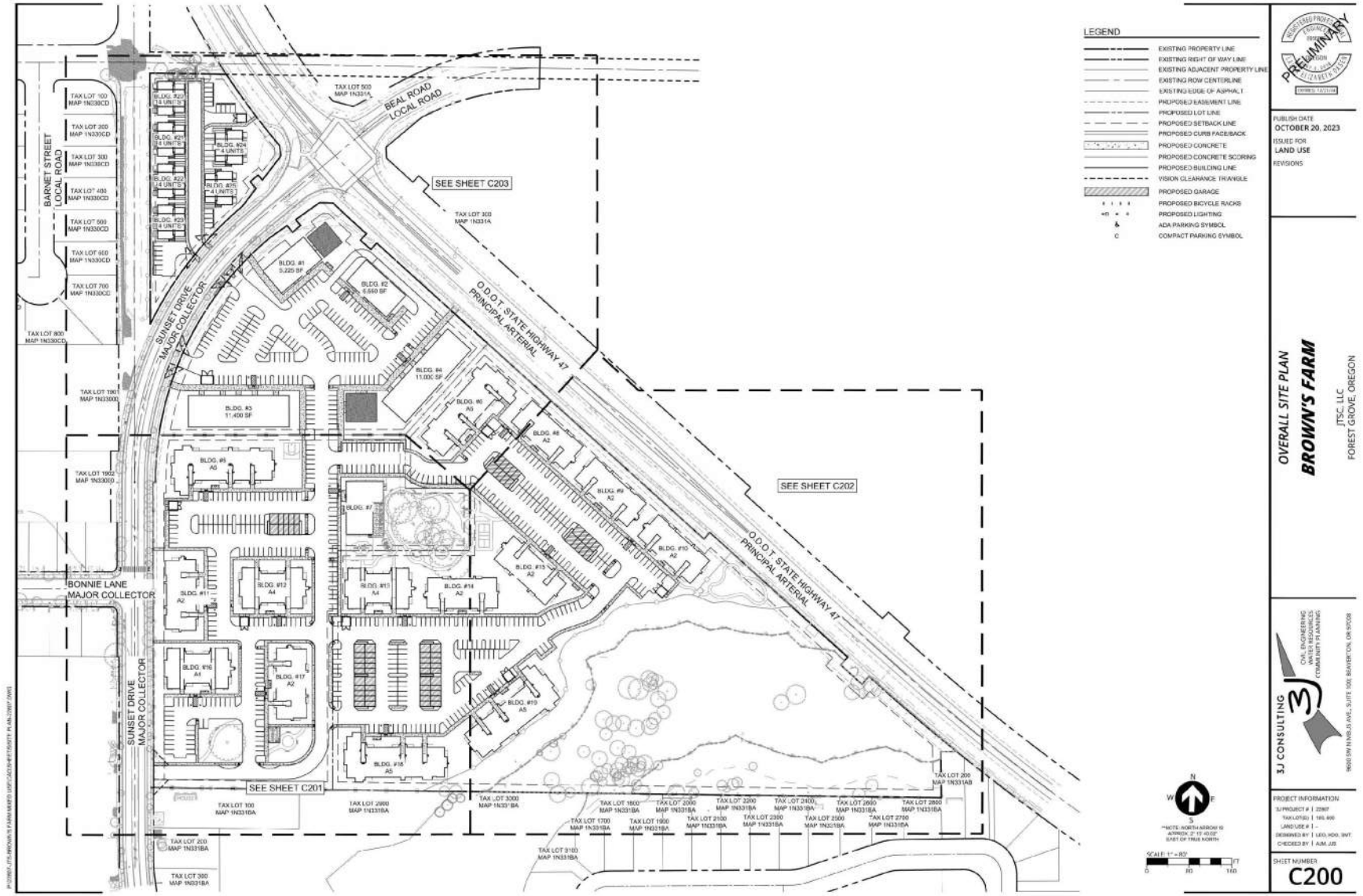


Conceptual Site Plan
Forest Grove, Oregon

Figure
2

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KITTELSON & ASSOCIATES

The study intersection include:

1. OR 47/Sunset Drive
2. Sunset Drive/Bonnie Lane
3. Sunset Drive/NW Willamina Avenue
4. Main Street/Bonnie Lane

This report evaluates these transportation issues:

- Existing land-use and transportation-system conditions at the study intersections during the weekday AM and PM peak hours;
- Approved but not yet constructed developments and transportation improvements planned in the study area;
- Year 2024 background traffic conditions (without the proposed development) at the study intersections during the weekday AM and PM peak hours;
- Trip generation and distribution estimates for the proposed townhomes;
- Year 2024 total traffic conditions (with the proposed townhomes) at the study intersections during the weekday AM and PM peak hours;
- Year 2026 background traffic conditions (with the proposed townhomes, but not the proposed apartments or retail center) at the study intersections during the weekday AM and PM peak hours;
- Trip generation and distribution estimates for the proposed apartments and retail center;
- Year 2026 total traffic conditions (with full build-out of the proposed Brown's Farm development) during the weekday AM and PM peak hours;
- On-site circulation and site-access operations.

## Performance Measures and Mobility Targets

Traffic operations at the OR 47/Sunset Drive intersection were evaluated based on the applicable mobility targets identified in Table 7 of the Oregon Highway Plan (OHP – Reference 1). The OHP identifies mobility targets for all signalized and unsignalized intersections along OR 47 as well as policies that provide guidance on the application of the mobility targets. Per Table 7 of the OHP, ODOT defines a maximum volume-to-capacity ratio for the OR 47/Sunset Drive intersection of 0.99.

Traffic operations at the remaining study intersections and site access driveways were evaluated based on the applicable performance measures identified in the Forest Grove Transportation System Plan (TSP – Reference 2). Per the TSP, Level-of-Service (LOS) "D" is acceptable at the worst approach to two-way stop-controlled intersections and intersection LOS "D" is acceptable at signalized intersections.

## Analysis Tools and Methodology

All analyses described in this report were performed in accordance with the procedures stated in the *Highway Capacity Manual, 6th Edition* (HCM – Reference 3). Synchro 11 was used to conduct the analysis. Synchro 11 is a software tool that provides operations analysis in accordance with HCM methodologies. All analyses used the peak 15-minute flow rates that occurred during the weekday morning and evening peak hours.

# EXISTING CONDITIONS

The existing conditions analysis identifies the site conditions and current physical and operational characteristics of key roadways within the study area. These conditions will be compared with future conditions later in this report.

# Site Conditions and Adjacent Land Uses

The proposed development site is located within the Forest Grove city limits and is zoned Neighborhood Mixed Use (NMU) per the *City of Forest Grove Zoning Map* (Reference 4). Construction of the proposed Brown's Farm development is permitted within the NMU zoning.

While the majority of the site is open fields today, there is a single-family residence located on the southern portion of the site east of Sunset Drive. The site area located east of Sunset Drive has one full movement access located approximately 265 feet south of OR 47 (as measured from the nearest northbound approach crosswalk stripe) and a second serving the residential home. Adjacent zoning includes Single Family Residential (R-7) to the south and west and adjacent land uses are consistent with the underlying zoning. Forest Grove High School is located further west along Bonnie Lane and Pacific University is located further south along Sunset Drive.

# Transportation Facilities

Table 1 summarizes the characteristics of key transportation facilities within the site vicinity.

**Table 1: Existing Transportation Facilities**

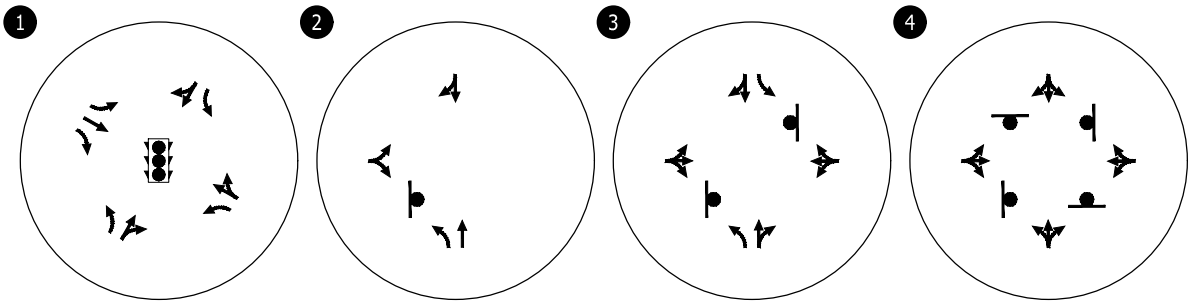
| Roadway | Functional Classification[1] | Number of Lanes | Posted Speed (mph) | Sidewalks | Bicycle Lanes | On-Street Parking |
|---|---|---|---|---|---|---|
| OR 47 | Principal Arterial | 2/3 | 50 | Yes[2] | Yes | No |
| Sunset Drive | Collector | 3 | 35 | Yes | Yes | No |
| Bonnie Lane | Collector | 2 | 25 | Yes | No | Yes |
| Willamina Avenue | Collector | 2 | 25 | No | No | No |

1. Per City of Forest Grove Transportation System Plan (TSP – Reference 2).
2. Sidewalks are provided along the south side of OR 47.

## Roadways Facilities

Sunset Drive bisects the proposed development site, forming the western frontage of the larger site parcel. Sunset Drive has a three-lane cross section adjacent to the site frontage, with a striped left turn lane at the northbound approach to OR 47. Sunset Drive connects the site to OR 47 to the north and downtown Forest Grove to the south via University Avenue and Main Street.

OR 47 is located along the north side of the proposed development site. OR 47 has a two-lane cross section adjacent to the site frontage, with striped left-turn lanes at the eastbound and westbound approaches to Sunset Drive, and a separate striped right-turn lane at the eastbound approach. OR 47 connects the site to rural Washington County to the north as well as Pacific Avenue to the southeast. Figure 3 illustrates the existing lane configurations and traffic control devices at the study intersections.




- LANE MOVEMENT
- STOP SIGN
- TRAFFIC SIGNAL

Existing Lane Configurations & Traffic Control Devices
Forest Grove, Oregon

Figure 3

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## Pedestrian and Bicycle Facilities

Sidewalks with landscape strips are provided on both sides of Sunset Drive and Bonnie Lane and on the south side of OR 47. Marked crosswalks are provided at the OR 47/Sunset Drive intersection, which includes a pedestrian-actuated signal complete with pedestrian signal heads and pedestrian pushbuttons. Marked crosswalks are also provided at the south leg of the Sunset Drive/Willamina Avenue intersection and the north, south, and east legs of the Main Street/Bonnie Lane intersection. On-street bike lanes are provided on both sides of Sunset Drive and OR 47.

## Transit Facilities

Local transit service is not provided in the site vicinity (considered to be within ¼ mile walking distance for the purposes of this study). However, service is provided further to the south along Pacific Avenue by TriMet. TriMet Line 57 (TV Hwy/Forest Grove) connects Forest Grove, Cornelius, Hillsboro, Aloha, and Beaverton via Pacific Avenue, Baseline Road, TV Highway, and Canyon Road. Line 57 operates seven days a week, 24 hours a day, and on approximately 15-minute headways most of the day. The stops closest to the site are located on Pacific Avenue at Cedar Street and College Way, nearly a mile walking distance from the site.

# Traffic Volumes and Peak Hour Operations

Turning movement counts were conducted at the study intersections in November 2022 when school was in-session and no inclement weather was present that affected typical traffic patterns. The counts were conducted on a typical mid-week day during the morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak time periods. The system-wide morning and evening peak hours were found to occur from 7:20 to 8:20 AM and 4:15 to 5:15 PM, respectively. Figure 4 summarizes the turning movement counts for the weekday AM and PM peak hours. *Appendix "A" contains the traffic count worksheets used in this study.*

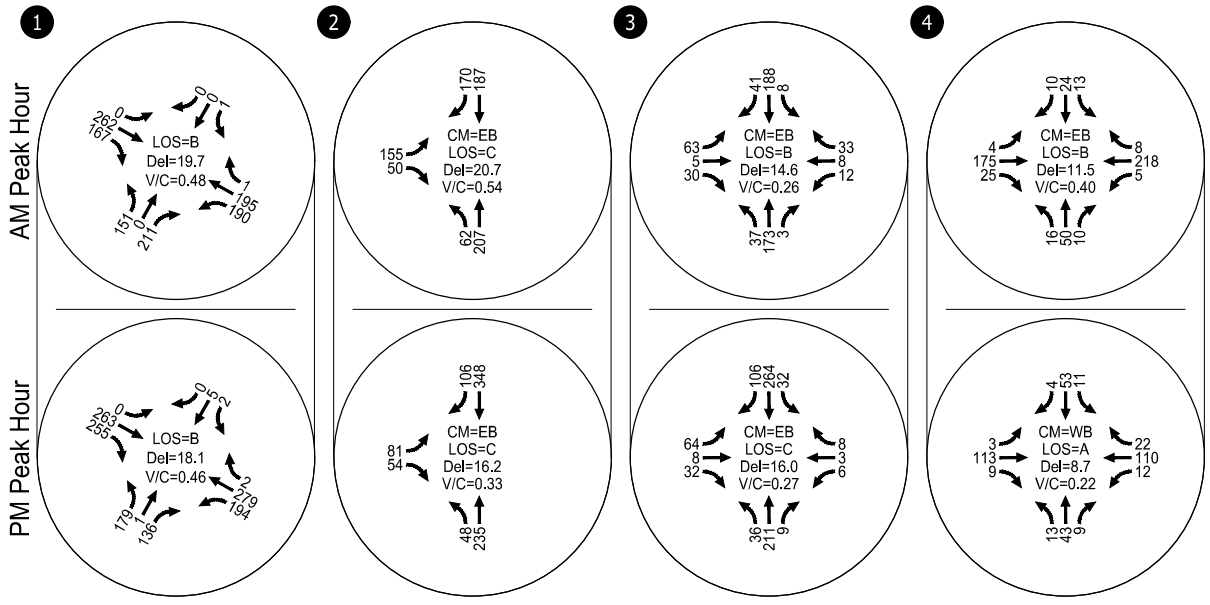
The traffic volumes shown along OR 47 were seasonally adjusted to 30th Highest Hour Design Volumes (30 HV) in accordance with the Seasonal Trend Table methodology identified in the ODOT Analysis Procedures Manual (APM – Reference 5). The commuter trend values were used as a basis for the adjustment consistent with the Forest Grove TSP and subsequent planning efforts. Following the methods in the APM, a seasonal adjustment factor of 1.06 was applied to through volumes on OR 47. All other traffic volumes shown on City streets were not adjusted.

## Traffic Operations

Figure 4 summarizes the results of the existing traffic conditions analysis. As shown, all the study intersections currently operate acceptably during the weekday AM and PM peak hours per their respective mobility standards and targets. *Appendix "B" contains the existing traffic conditions worksheets.*

## Traffic Safety

The crash history of the study intersections was reviewed to identify potential safety issues that could impact access to the site. Crash data was obtained from ODOT for the five-year period from January 1, 2016 through December 31, 2020. Table 2 summarizes the crash data for the study intersections, including the number, type and severity of crashes over the five-year period. Crash rates per million entering vehicles (MEV) were developed for each study intersection. The crash rates were compared to the 90th percentile rates for similar facilities provided in Table 4-1 of the ODOT APM. Per the APM, an intersection with a crash rate equal to or greater than the corresponding 90th percentile rate is recommended for further review.




CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = LEVEL OF SERVICE (INTERSECTION LOS - SIGNAL, CM LOS - UNSIGNALIZED)
V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

## Existing Traffic Conditions
## Weekday AM and PM Peak Hours
## Forest Grove, Oregon

Figure
4

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**Table 2: Study Intersection Crash Summary (January 1, 2016 through December 31, 2020)**

| Intersection | Crash Type | | | | | Crash Severity | | | Total | Crash Rates (Crashes/ MEV) | ODOT 90th Percentile Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rear -End | Turn | Angle | Ped/ Bike | Fixed | PDO | Injury | Fatal | | | |
| Sunset Drive/OR 47 | 3 | 4 | | | 1 | 3 | 5 | | 8 | 0.33 | 0.860 |
| Sunset Drive/ Bonnie Lane | | 2 | | | | 1 | 1 | | 2 | 0.13 | 0.293 |
| Sunset Drive/ Willamina Avenue | | 3 | 2 | 1 | | 3 | 3 | 0 | 6 | 0.42 | 0.408 |
| Main Street/ Bonnie Lane | | | | | | | | | 0 | 0.0 | 0.408 |

PDO=Property Damage Only
MEV=Million Entering Vehicles

As shown in Table 2, the Sunset Drive/Willamina Avenue intersection crash rate (0.42) exceeds the ODOT 90th percentile crash rate (0.41). Of the six crashes reported at the intersection, five involved the westbound approach, including two of the crashes reported as turn movement, two as angle, and one as ped/bike. The westbound approach is stop controlled and sight distance appears to be adequate facing north and south. However, there may be times throughout the year when vegetation impacts the view of motorists traveling north and south on Sunset Drive. Given the existing configuration of the intersection and limited crash history, no mitigation measures are recommended at this time. However, the City should continue to monitor the intersection and identify potential safety treatments as necessary. No other trends or patterns in the crash history were identified that require mitigation associated with the proposed development. *Appendix "C" contains the detailed crash summary worksheets.*

The ODOT Safety Priority Index System (SPIS) was also reviewed to identify potential sites along OR 47 where safety issues warrant further investigation. The SPIS was developed by ODOT to identify hazardous sites on state highways through consideration of crash frequency, crash rate, and crash severity. Sites identified within the top 5 percent are investigated by ODOT and reported to the Federal Highway Administration (FHWA). Per the ODOT SPIS list (2017-2019), there are no sites within the study area in the top 5, 10, or 15%.

The Washington County SPIS list was also reviewed to identify potential sites within the study area. Per the most recent Washington County SPIS list (2018-2020), there are no sites within the study area.

# TRAFFIC IMPACT ANALYSIS

The traffic impact analysis identifies how the study intersections will operate in the year each phase of the proposed development is expected to be fully built, 2024 and 2026. The impact of traffic generated by the proposed development was examined as follows:

- Developments and transportation improvements planned in the site vicinity were identified and reviewed in coordination with City staff;
- Year 2024 background traffic conditions (without the proposed development) were analyzed at the study intersections during weekday AM and PM peak hours;
- Trip generation and distribution estimates were developed for the proposed townhomes; and
- A trip distribution pattern was developed, and the site-generated trips were distributed to the study area roadways and assigned to the study intersections;

- Year 2024 total traffic conditions (with the proposed townhomes) were analyzed at the study intersections and site driveway during the weekday AM and PM peak hours;
- Year 2026 background traffic conditions (with the proposed townhomes, but not the proposed apartments or retail center) were analyzed at the study intersections during the weekday AM and PM peak hours;
- Trip generation and distribution estimates were developed for the proposed apartments and retail center;
- Year 2026 total traffic conditions (with full build-out and occupancy of the proposed Brown's Farm development) were analyzed at the study intersections and site driveways during the weekday AM and PM peak hours; and
- On-site circulation issues and site-access operations were evaluated.

# Year 2024 Background Traffic Conditions

The year 2024 background traffic conditions analysis identifies how the study intersections will operate in 2024 without the proposed Brown's Farm development. This analysis includes traffic attributed to general growth in the region but does not include traffic from the proposed development.

## Planned Developments and Transportation Improvements

Kittelson identified and reviewed the approved developments and planned transportation improvements expected to be built within the study area by 2024. Per discussions with ODOT and City staff, one planned development is expected to be complete within the study period as described below.

### Davis Estates Subdivision

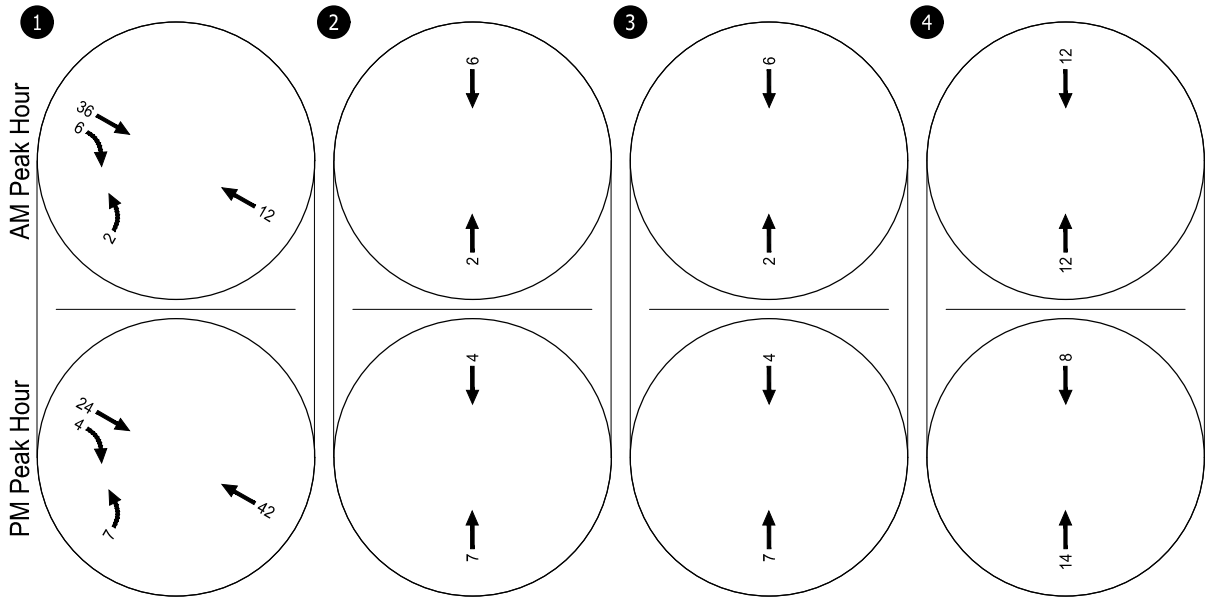
The Davis Estates Subdivision is to be located on the north side of NW David Hill Road, west of OR 47. The 219-unit residential subdivision will have access from NW David Hill Road via an extension of Main Street near the center of subdivision. Figure 5 illustrates the weekday AM and PM peak hour in-process trips from the approved subdivision at the study intersections based on the Davis Estates Subdivision TIS.

## Traffic Volumes

The Forest Grove TSP identifies regional traffic growth rates that vary from 1.74 percent per year to 1.84 percent per year; therefore, a 2.0 percent annual growth was used to ensure a conservative analysis. The year 2024 background traffic volumes were developed by applying a 4% growth rate (2% per year for two years) to the existing traffic volumes shown in Figure 4 and by adding the in-process traffic volumes shown in Figure 5. Figure 6 illustrates the forecast year 2024 background traffic volumes during the weekday AM and PM peak hours.

## Traffic Operations

Figure 6 summarizes the results of the year 2024 background traffic conditions analysis. As shown, all the study intersections are forecast to continue to operate acceptably during the weekday AM and PM peak hours per their respective mobility standards and targets. *Appendix "D" contains the year 2024 background traffic conditions worksheets.*




In-Process Traffic Volumes
Weekday AM and PM Peak Hours
Forest Grove, Oregon

Figure
5

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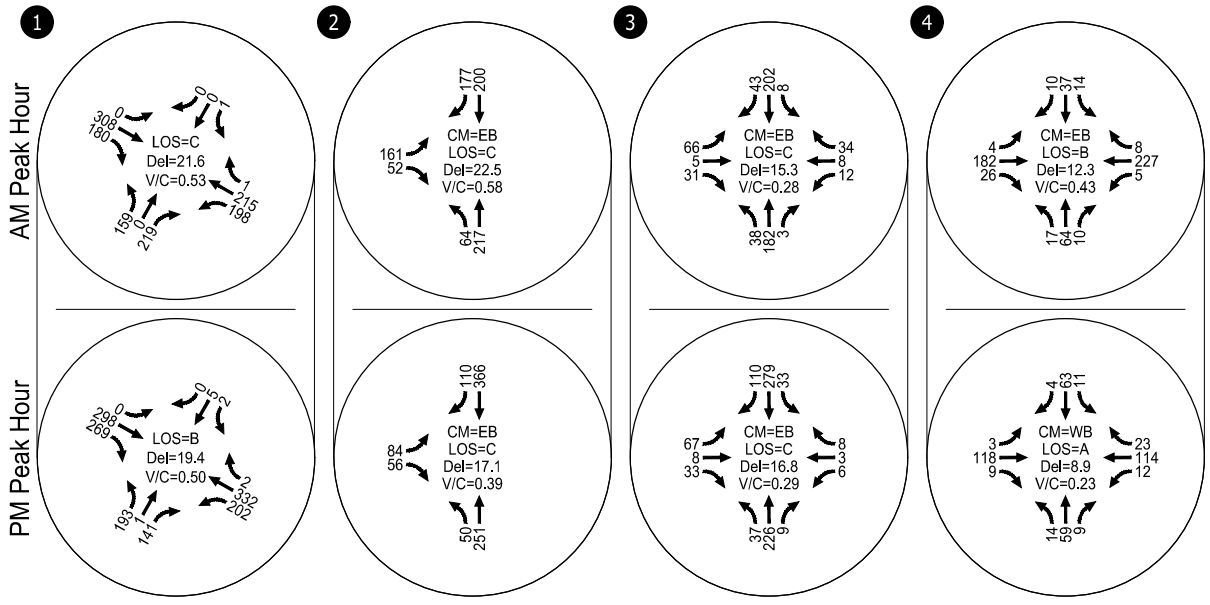


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V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
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# Year 2024 Background Traffic Volumes Weekday AM and PM Peak Hours Forest Grove, Oregon

Figure 6

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# Year 2024 Proposed Development Plan

As indicated above, the proposed development plan includes five phases. Phase C2 includes construction of 24 townhomes on the west side of Sunset Drive. Access to the proposed townhomes is planned to be provided by one full-movement driveway on the west side of Sunset Drive. Construction of the proposed townhomes is expected to be complete in 2024.

## Trip Generation

A trip generation estimate was prepared for the proposed townhomes based on information provided in the standard reference, *Trip Generation Manual, 11th Edition,* published by the Institute of Transportation Engineers (ITE – Reference 6). ITE land use code 215 (Single-Family Attached Housing) was used as a basis for the proposed townhomes. Table 3 summarizes the trip generation estimates for the daily, weekday AM and weekday PM peak hours. The trip estimates reflect the fitted curve rates per *Trip Generation Manual* guidance.

**Table 3: Trip Generation Estimate**

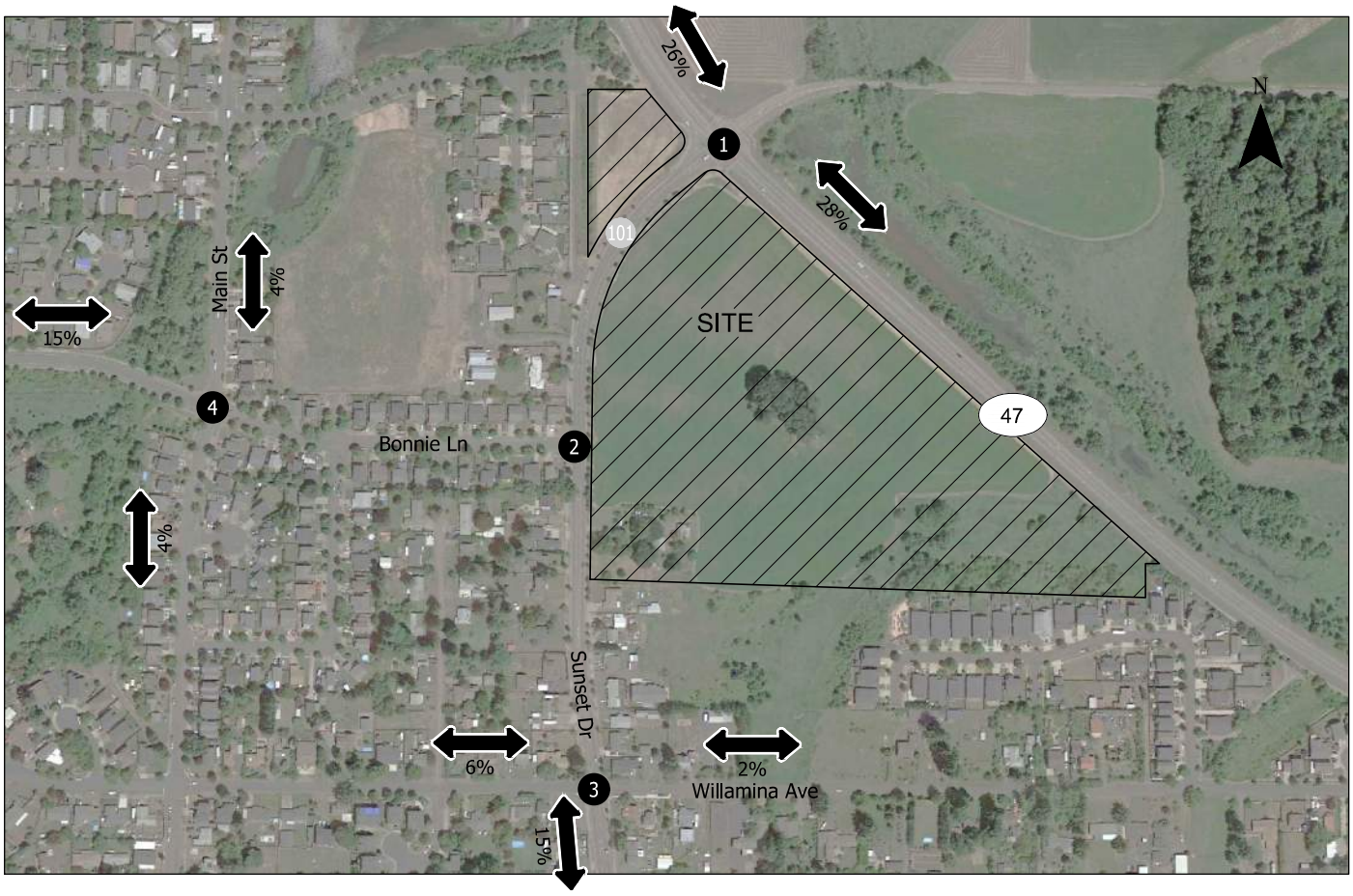
| Land Use | ITE Code | Size | Daily Trips | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total | In | Out | Total | In | Out |
| Single-Family Attached Housing | 215 | 24 units | 132 | 7 | 2 | 5 | 10 | 6 | 4 |

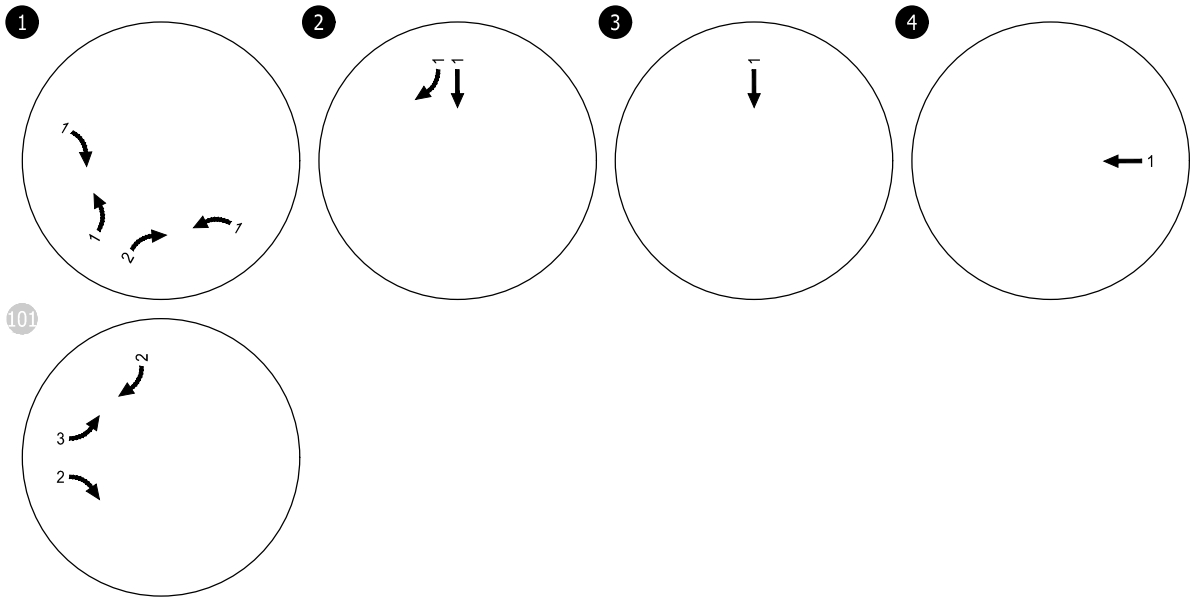
## Trip Distribution/Trip Assignment

The site-generated trips shown in Table 3 were assigned to the study intersections based on a review of existing traffic patterns and the location of major trip origins and destinations in Forest Grove and the greater Washington County area. Figures 7 and 8 illustrate the estimated trip distribution pattern for the proposed townhomes. Figures 7 and 8 also illustrate the site-generated trips that are expected to use the study intersections and site-access driveway during the weekday AM and PM peak hours.

# Year 2024 Total Traffic Conditions

The year 2024 total traffic conditions analysis forecasts how the study intersections operate with traffic generated by the proposed townhomes. The year 2024 background traffic volumes shown in Figure 6 were added to the site-generated traffic shown in Figures 7 and 8 to arrive at the year 2024 total traffic volumes that are shown in Figures 9 and 10.




Estimated Trip Distribution Pattern & Site-Generated Trips
Weekday AM Peak Hour
Forest Grove, Oregon

Figure
7

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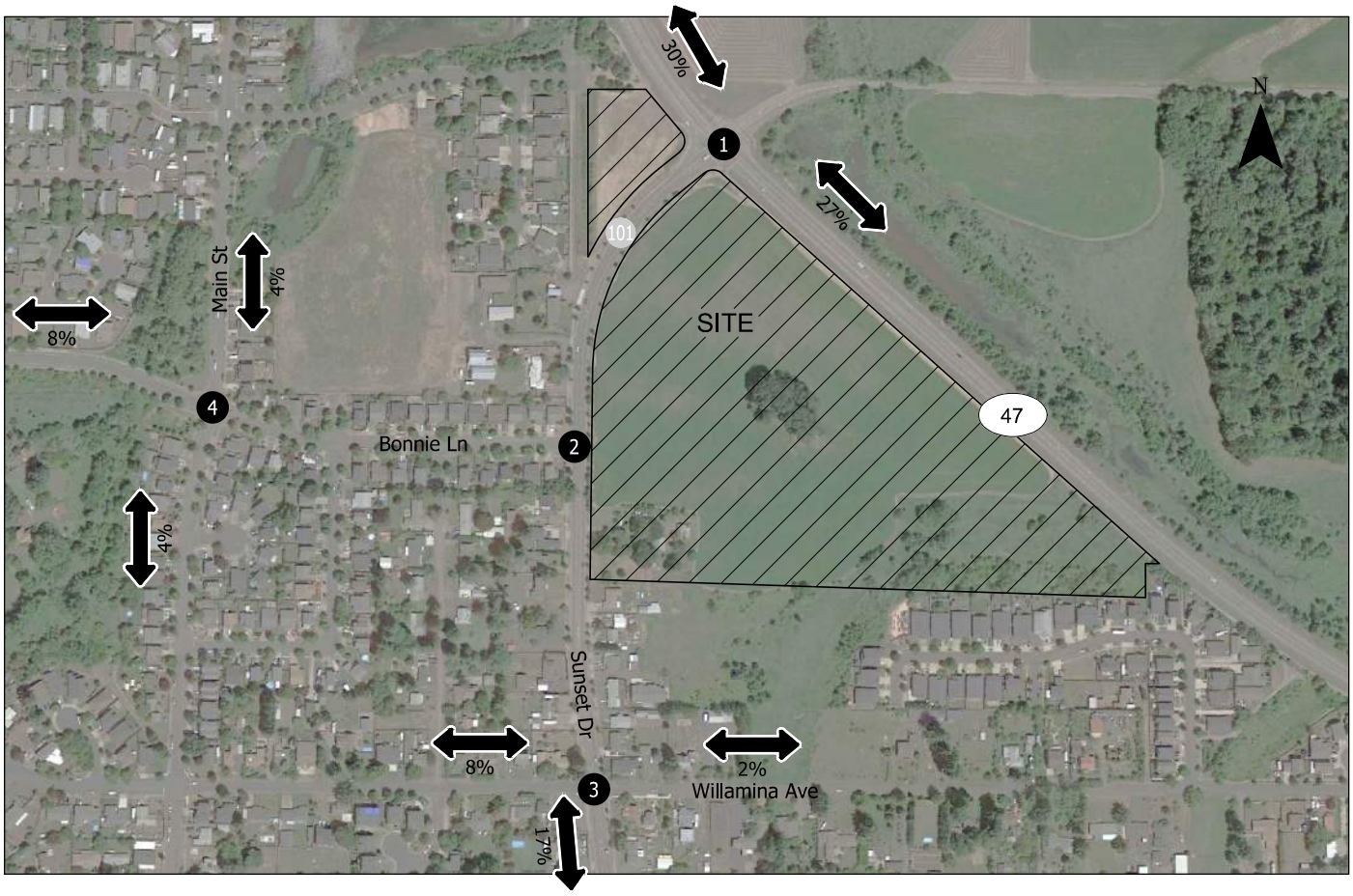


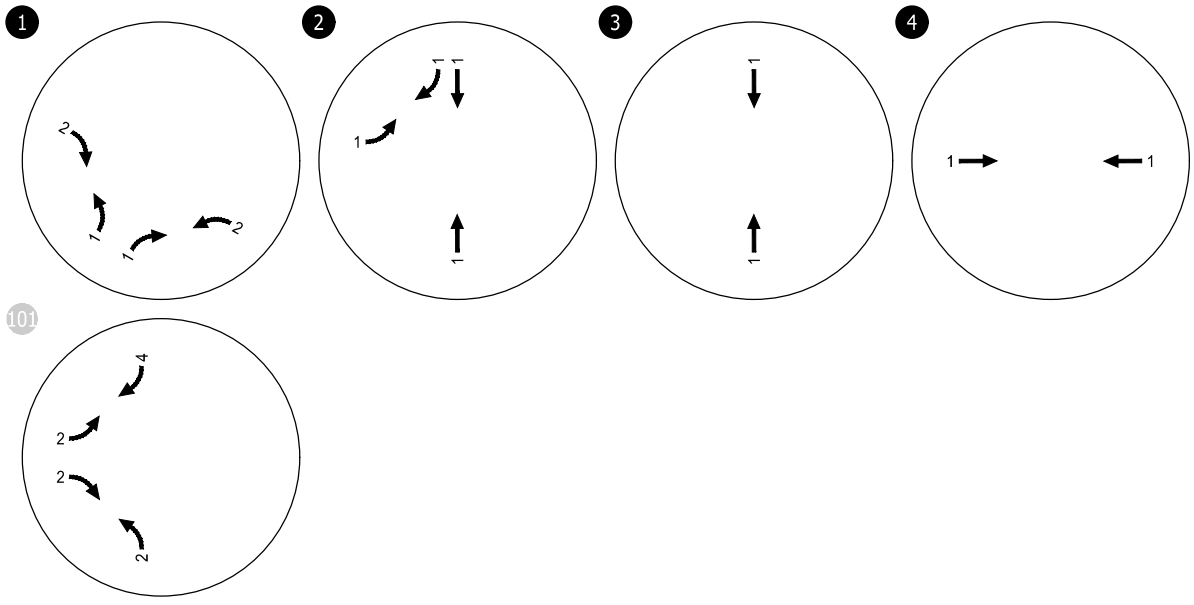


Estimated Trip Distribution Pattern & Site-Generated Trips
Weekday PM Peak Hour
Forest Grove, Oregon

Figure
8

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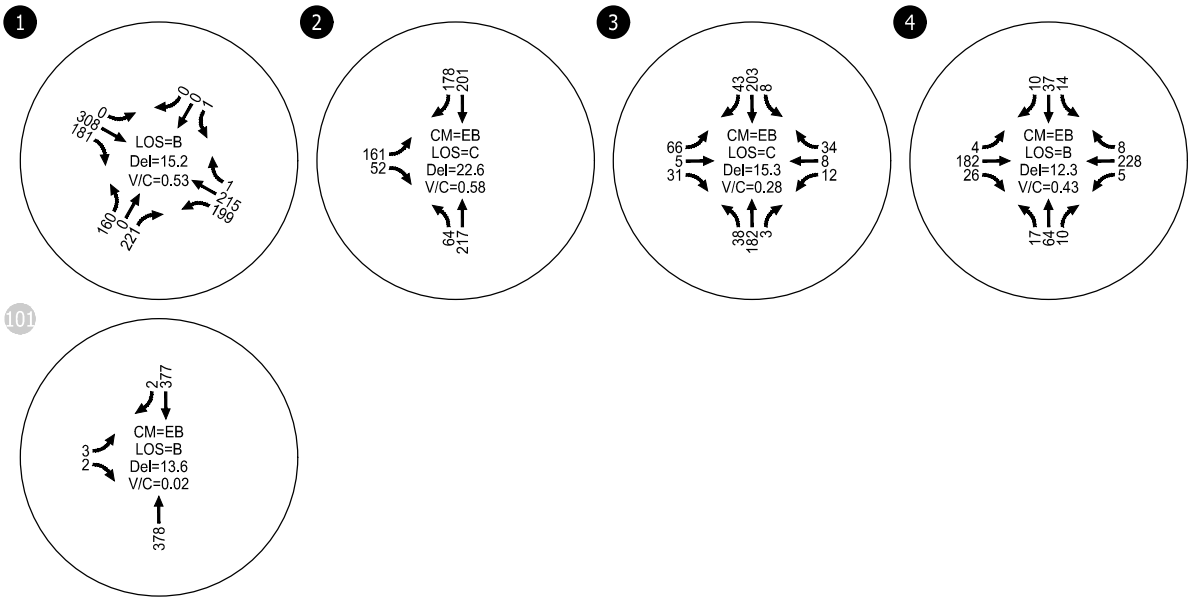


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LOS = LEVEL OF SERVICE (INTERSECTION LOS - SIGNAL, CM LOS - UNSIGNALIZED)
V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

# Year 2024 Total Traffic Operations Weekday AM Peak Hour Forest Grove, Oregon

Figure 9

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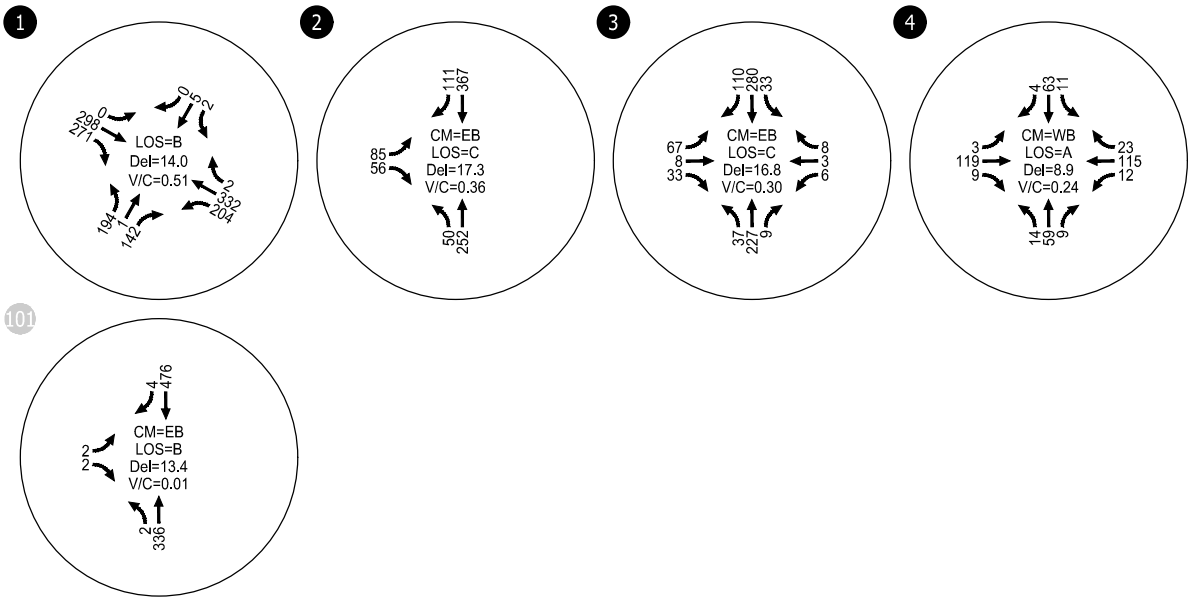


CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = LEVEL OF SERVICE (INTERSECTION LOS - SIGNAL, CM LOS - UNSIGNALIZED)
V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

# Year 2024 Total Traffic Operations Weekday PM Peak Hour Forest Grove, Oregon

Figure 10

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## Traffic Operations

The weekday AM and PM peak hour turning movement volumes shown in Figures 9 and 10 were used to conduct an operational analysis at the study intersections to determine year 2024 total traffic conditions. Figures 9 and 10 summarize the results of the year 2024 total traffic conditions analysis. As shown, all the study intersections and the site-access driveway are forecast to operate acceptably during the weekday AM and PM peak hours. *Appendix "E" contains the year 2024 total traffic conditions worksheets.*

## Queuing Analysis

A queuing analysis was conducted at the OR 47/Sunset Drive intersection under existing, year 2024 background, and year 2024 total traffic conditions using Synchro. Table 4 summarizes the results of the analysis and indicates if existing storage lengths are adequate to accommodate 95th percentile queues. Storage lengths reflect the striped storage for left-turn lanes or the distance to the nearest upstream intersection. Storage lengths and vehicles queues are rounded to the nearest 25-feet, or one vehicle length.

**Table 4: Queuing Analysis – OR 47/Sunset Drive Intersection 95th Percentile Queues**

| Approach | Movement | Storage (ft) | Existing Traffic Conditions | | Year 2024 Background Traffic Conditions | | Year 2024 Total Traffic Conditions | | Adequate? |
|---|---|---|---|---|---|---|---|---|---|
| | | | AM (ft) | PM (ft) | AM (ft) | PM (ft) | AM (ft) | PM (ft) | |
| Eastbound | Left | 150 | 0 | 0 | 0 | 0 | 0 | 0 | Yes |
| | Thru | >500 | 225 | 225 | 275 | 250 | 275 | 250 | Yes |
| | Right | 450 | 50 | 75 | 50 | 75 | 50 | 75 | Yes |
| Westbound | Left | 475 | 200 | 200 | 225 | 225 | 225 | 225 | Yes |
| | Thru/right | >500 | 100 | 125 | 100 | 150 | 100 | 150 | Yes |
| Northbound | Left | 100 | 175 | 175 | 200 | 225 | 200 | 225 | Yes[1] |
| | Thru/right | >500 | 0 | 50 | 0 | 50 | 0 | 50 | Yes |
| Southbound | Left | 75 | 25 | 25 | 25 | 25 | 25 | 25 | Yes |
| | Thu/right | >500 | 0 | 25 | 0 | 25 | 0 | 25 | Yes |

# 95th percentile volume exceeds capacity, queue may be longer.
[1] Additional storage is available within the striped two-way center turn lane.

As shown in Table 4, the northbound left-turn queue at the OR 47/Sunset Drive intersection is expected to exceed the 100 feet of striped dedicated left-turn lane storage under existing, background, and total traffic conditions during the weekday AM and PM peak hours. However, additional storage is available within the two-way center left-turn lane and the queue is not expected to reach the proposed site driveway located approximately 250 feet south of the traffic signal. Accordingly, no capacity-based queuing mitigation needs were identified in conjunction with the proposed townhomes. *Appendix "F" contains the queuing analysis worksheets for existing, year 2024 background, and year 2024 total traffic conditions.*

# Year 2026 Background Traffic Conditions

The year 2026 background traffic conditions analysis identifies how the study intersections will operate in 2026 with the proposed townhomes, but without the proposed apartments or village retail center. This analysis includes traffic attributed to general growth in the region and to the townhomes but does not include traffic from the proposed apartments or village retail center.

## Traffic Volumes

The year 2026 background traffic volumes were developed by applying an 8% growth rate (2% per year for four years) to the existing traffic volumes shown in Figure 4 and by adding the in-process traffic volumes shown in Figure 5 and the added traffic volumes shown in Figures 7 and 8. Figures 11 and 12 illustrate the forecast year 2026 background traffic volumes during the weekday AM and PM peak hours.

## Traffic Operations

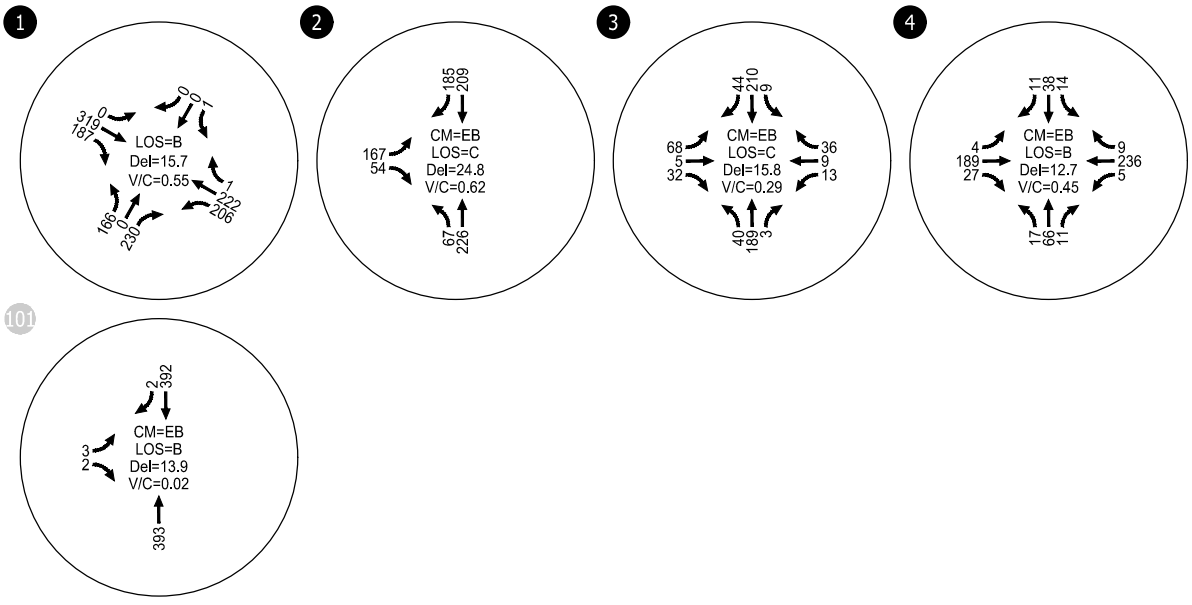
Figures 11 and 12 summarize the results of the year 2026 background traffic conditions analysis. As shown, all the study intersections are forecast to continue to operate acceptably during the weekday AM and PM peak hours per their respective mobility standards and targets. *Appendix "G" contains the year 2026 background traffic conditions worksheets.*

# Year 2026 Proposed Development Plan

As indicated above, the proposed development plan includes five phases. Phase R1, R2, and R3 include construction of a 360-unit apartment complex and Phase C1 includes construction of a 48,850 square-foot retail center on the east side of Sunset Drive. Access to the apartments and retail center is planned to be provided by three new driveways on the east side of Sunset Drive, including two full-movement driveways and one driveway (the northernmost) with right-in/right-out movement restrictions. The two existing driveways to the site on the east side of Sunset Drive will be closed with site development and the existing single-family home will be removed. Construction of the apartments and retail center is expected to be complete in 2026.

## Trip Generation

A trip generation estimate was prepared for the proposed apartments and retail center based on information provided in ITE. ITE land use code 220 (Low-Rise Apartments) was used as a basis for the apartments and 821 (Shopping Plaza – 40-150K without a supermarket) was used as a basis for the retail center. Information from ITE's *Trip Generation Handbook, 3rd Edition* was used to estimate internal trips between the apartments and village retail center only (no internalization was assumed to the townhomes), and information from ITE's *Trip Generation Manual* appendices was used to estimate pass-by trips. Table 5 summarizes the trip generation estimates for the daily, weekday AM, and weekday PM peak hours. The apartment trip estimates reflect fitted curve equation rates while the shopping plaza used average rates per *Trip Generation Manual* guidance (no fitted curve equation rates are available for the Shopping Plaza use).

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V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

# Year 2026 Background Traffic Conditions
# Weekday AM Peak Hour
# Forest Grove, Oregon

Figure
11

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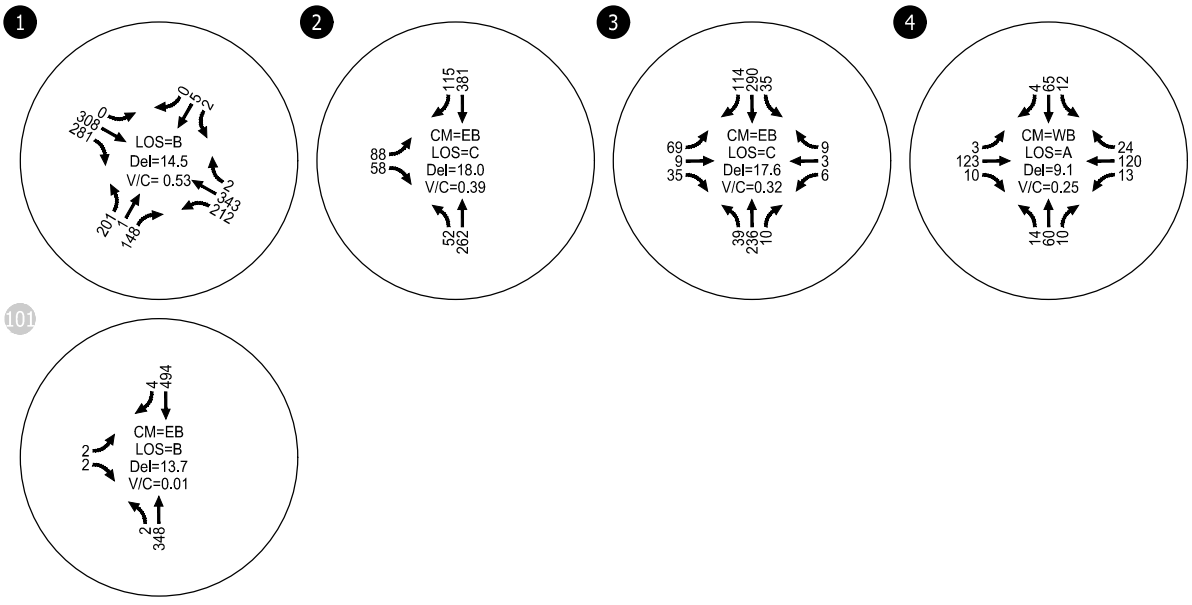


CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = LEVEL OF SERVICE (INTERSECTION LOS - SIGNAL, CM LOS - UNSIGNALIZED)
V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

## Year 2026 Background Traffic Conditions
## Weekday PM Peak Hour
## Forest Grove, Oregon

Figure
12

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**Table 5: Trip Generation Estimate**

| Land Use | ITE Code | Size | Daily Trips | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Total | In | Out | Total | In | Out |
| Low-Rise Apartments | 220 | 360 units | 2,383 | 134 | 32 | 102 | 175 | 110 | 65 |
| *Internalization (1.49% AM, 29.14% PM)* | | | (365) | (2) | (0) | (1) | (51) | (32) | (19) |
| Shopping Plaza (40-150K) | 821 | 53,735 sq ft[1] | 3,628 | 93 | 58 | 35 | 279 | 137 | 142 |
| *Internalization (2.15% AM, 18.28% PM)* | | | (371) | (2) | (1) | (1) | (51) | (25) | (26) |
| *Pass-by Trips (40% PM)* | | | (1,303) | (36) | (18) | (18) | (90) | (45) | (45) |
| **Total Trips** | | | **3,972** | **187** | **71** | **116** | **262** | **145** | **117** |

[1] The assumed size of the retail center was increased by approximately 10% for the analysis to accommodate potential changes to the site plan as it is further refined.

## Trip Distribution/Trip Assignment

The site-generated trips shown in Table 5 were assigned to the study intersections following the same trip distribution pattern as described above. Figures 13 and 14 illustrate the estimated trip distribution pattern and the site-generated trips that are expected to use the study intersections and site-access driveways during the weekday AM and PM peak hours. *Figure G1 in Appendix G illustrates the pass-by trips.*

# Year 2026 Total Traffic Conditions

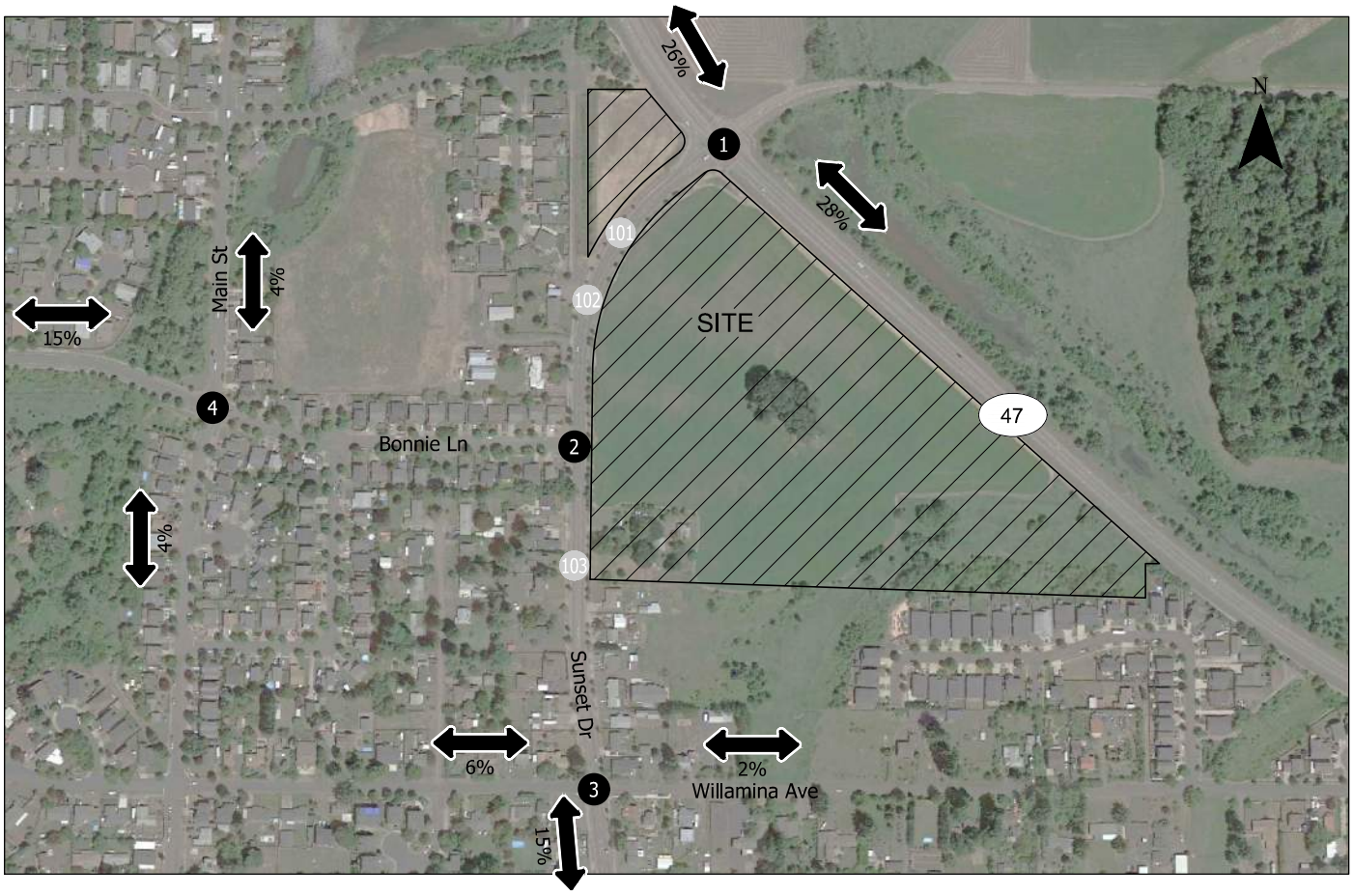
The year 2026 total traffic conditions analysis forecasts how the study intersections operate with traffic generated by full build-out and occupancy of the proposed Brown's Farm development. The year 2026 background traffic volumes shown in Figures 11 and 12 were added to the site-generated traffic shown in Figures 13 and 14 to arrive at the year 2026 total traffic volumes that are shown in Figures 15 and 16.

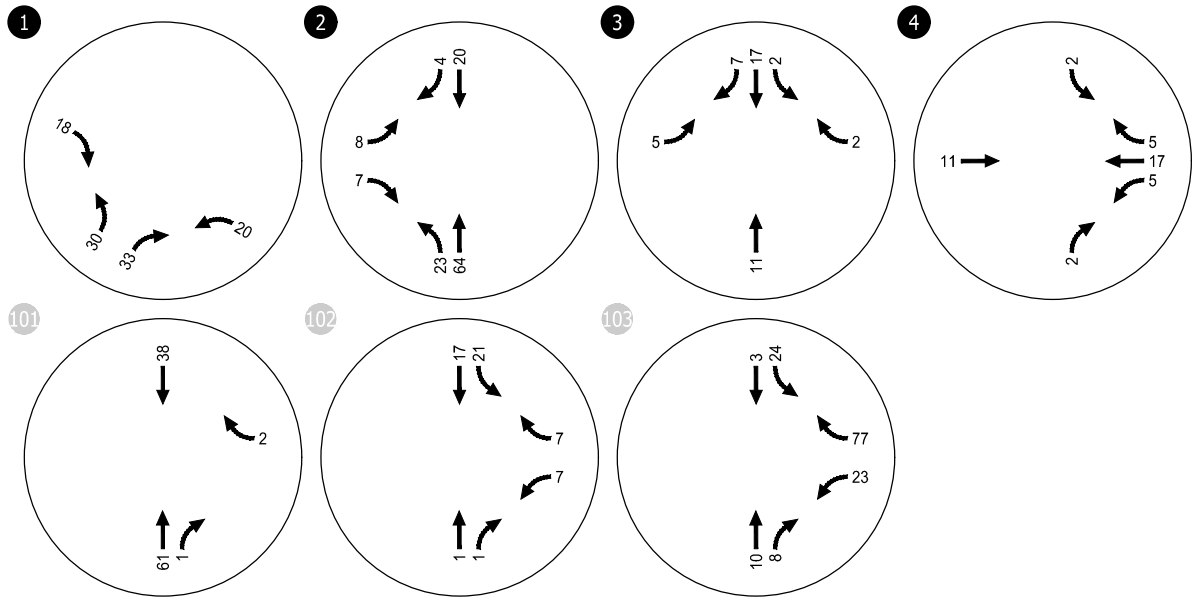
## Traffic Operations

The weekday AM and PM peak hour turning movement volumes shown in Figures 15 and 16 were used to conduct an operational analysis at the study intersections to determine year 2026 total traffic conditions. Figures 15 and 16 summarize the results of the year 2026 total traffic conditions analysis. As shown, all the study intersections and site-access driveways are forecast to operate acceptably during the weekday AM and PM peak hours except the Sunset Drive/Bonnie Lane intersection. *Appendix "H" contains the year 2026 total traffic conditions worksheets.*

### Sunset Drive/Bonnie Lane

The stop controlled eastbound approach to the Sunset Drive/Bonnie Lane intersection is projected to operate at LOS E under year 2026 total traffic conditions (assuming full build-out and occupancy of the proposed development) during the weekday AM peak hour. This forecast LOS E is primarily due to the delay associated with the westbound left-turn movement that occurs during the peak 15-minute period of the morning peak hour. Major street turning and through movements along Sunset Drive are projected to operate at LOS A or better during the same period. Given that the intersection is forecast to operate below capacity (v/c=0.76) and it is not expected to meet traffic signal warrants, no vehicle capacity-based mitigation measures are recommended at this time. However, City staff have identified a desire for an enhanced pedestrian crossing at the Sunset Drive/Bonnie Lane intersection in conjunction with site development to facilitate movement of persons walking and biking.




Estimated Trip Distribution Pattern & Site-Generated Trips
Weekday AM Peak Hour
Forest Grove, Oregon

Figure
13

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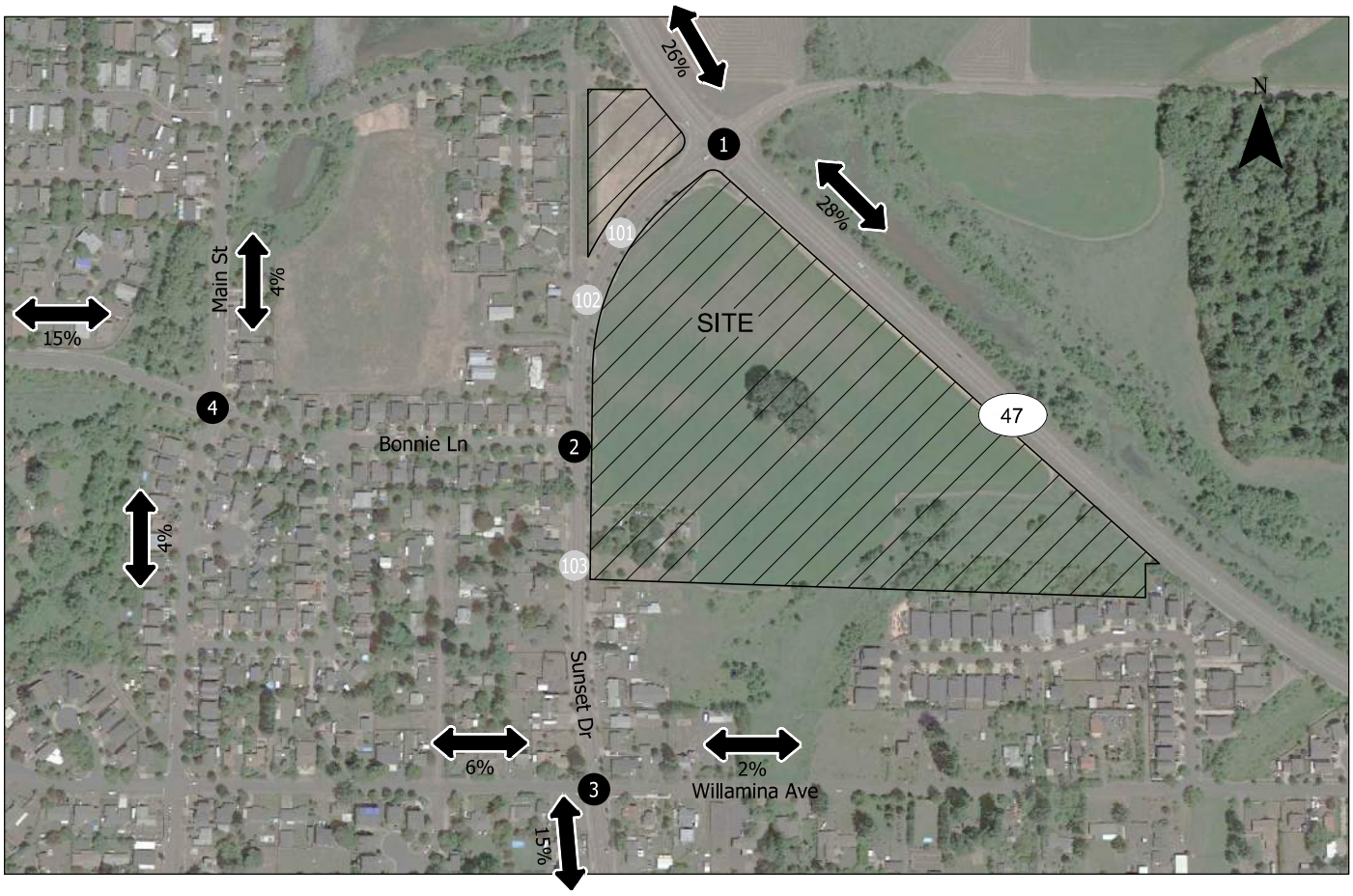


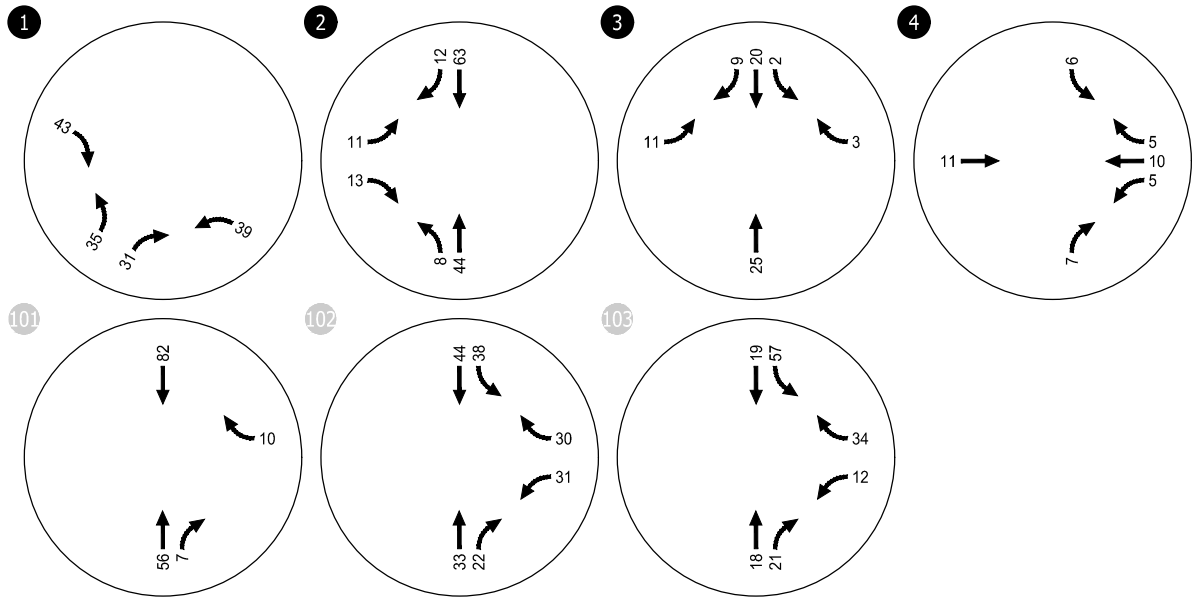


Estimated Trip Distribution Pattern & Site-Generated Trips
Weekday PM Peak Hour
Forest Grove, Oregon

Figure
14

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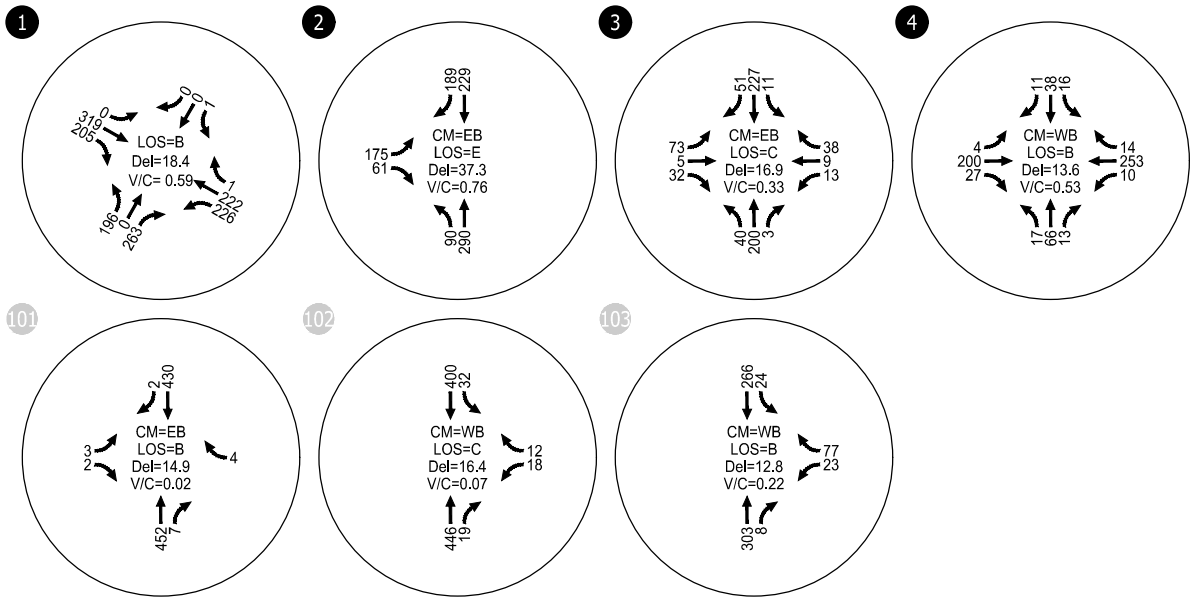


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V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

## Year 2026 Total Traffic Conditions
## Weekday AM Peak Hour
## Forest Grove, Oregon

Figure
15

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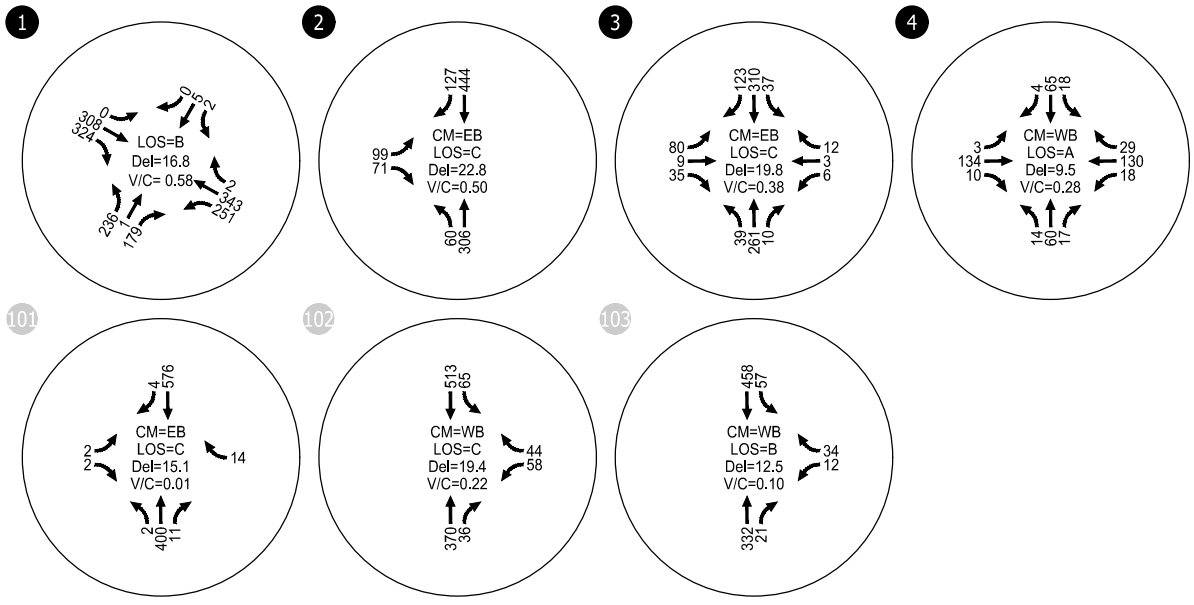


CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = LEVEL OF SERVICE (INTERSECTION LOS - SIGNAL, CM LOS - UNSIGNALIZED)
V/C = VOLUME-TO-CAPACITY (INTERSECTION V/C - SIGNAL, CM V/C UNSIGNALIZED)
Del = DELAY (INTERSECTION AVERAGE APPROACH DELAY - SIGNAL, CM DELAY - (UNSIGNALIZED)

# Year 2026 Total Traffic Conditions
# Weekday PM Peak Hour
# Forest Grove, Oregon

Figure 16

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## Queuing Analysis

A queuing analysis was conducted at the OR 47/Sunset Drive intersection under existing, year 2026 background, and year 2026 total traffic conditions using Synchro. Table 6 summarizes the results of the analysis and indicates if existing storage lengths are adequate to accommodate 95th percentile queues. Storage lengths reflect the striped storage for left-turn lanes or the distance to the nearest upstream intersection. Storage lengths and vehicles queues are rounded to the nearest 25-feet, or one vehicle length.

**Table 6: Queuing Analysis – OR 47/Sunset Drive Intersection 95th Percentile Queues**

| Approach | Movement | Storage (ft) | Existing Traffic Conditions | | Year 2026 Background Traffic Conditions | | Year 2026 Total Traffic Conditions | | Adequate? |
|---|---|---|---|---|---|---|---|---|---|
| | | | AM (ft) | PM (ft) | AM (ft) | PM (ft) | AM (ft) | PM (ft) | |
| Eastbound | Left | 150 | 0 | 0 | 0 | 0 | 0 | 0 | Yes |
| | Thru | >500 | 225 | 225 | 300 | 275 | 300 | 275 | Yes |
| | Right | 450 | 50 | 75 | 50 | 75 | 50 | 75 | Yes |
| Westbound | Left | 475 | 200 | 200 | 225 | 225 | 250 | 275 | Yes |
| | Thru/right | >500 | 100 | 125 | 100 | 150 | 100 | 150 | Yes |
| Northbound | Left | 100 | 175 | 175 | 200 | 225 | #275 | #325 | No[1] |
| | Thru/right | >500 | 0 | 50 | 0 | 75 | 0 | 75 | Yes |
| Southbound | Left | 75 | 25 | 25 | 25 | 25 | 25 | 25 | Yes |
| | Thu/right | >500 | 0 | 25 | 0 | 25 | 0 | 25 | Yes |

# 95th percentile volume exceeds capacity, queue may be longer.
[1] Additional storage is available within the center turn lane.

As shown in Table 6, the northbound left-turn queue at the OR 47/Sunset Drive intersection is expected to exceed the striped storage under existing, background, and total traffic conditions during the weekday AM and PM peak hours. The queue is also expected to extend past the townhomes driveway under year 2026 total traffic conditions during the weekday AM and PM peak hours. During these time periods, turning movements at the driveway may be effectively limited to right-in/right out by standing queues. *Appendix "I" contains the queuing analysis worksheets for existing, year 2026 background, and year 2026 total traffic conditions.*

Based on our review of near-term and long-term conditions, no capacity-based mitigations are recommended at the OR 47/Sunset Drive intersection to address queuing, however, the queuing could be addressed through signal timing and/or phasing changes. We offer these considerations:

- From a systemic perspective, the OR 47/Sunset Drive intersection is currently constructed to its ultimate planned footprint/lane configuration as identified in the City's Transportation System Plan.
- In the future, 26th Avenue is planned to extend east to OR 47 at an approach aligned with Martin Road. This new east-west connection can be expected to reduce northbound left-turn demand on Sunset Drive at OR 47 as a function of the new connectivity.
  - We note that the projected near-term volumes at OR 47/Sunset Drive are higher than the long-term volumes projected in the City's Transportation System Plan, in part due to the current lack of neighborhood roadway connectivity south of and parallel to OR 47 east to Martin Road.

- Subject to ODOT approval, modifications to the current traffic signal timing plan could be implemented to address the queuing issues identified in Table 6 while not degrading overall intersection operations (LOS, V/C, etc.).
  - For example, shortening the cycle length to 90 seconds and reallocating the green time could reduce the queue while maintaining acceptable intersection operations during the PM peak hour when queues are longest. Subject to coordination with ODOT, an alternative approach to reducing queuing could be implementation of protected-permissive phasing on OR 47. *Appendix J contains intersection operations analysis worksheets with potential signal timing and phasing modifications and the corresponding queueing results.*
  - The next major intersection to the west (north) on OR 47 is a roundabout at David Hill Road while the next major intersection to the east (south) is Martin Road where a roundabout is currently under construction. As such, there are no traffic signals to coordinate Sunset Drive with and no progression bands that need to be maintained along OR 47.
- ODOT and the City have been working to manage access along OR 47 and, based on those plans, no site access connection to OR 47 is proposed.

While signal timing is not typically used to mitigate transportation issues associated with private development, recent changes to the planned transportation network that limit connectivity to OR 47 southeast of the study area and continued local growth suggest a review and modest adjustment to the existing signal timing plan is worthy of consideration. We recommend that the City work with ODOT to review and modify the signal timing plan as appropriate.

# SITE-ACCESS OPERATIONS

Figure 2 illustrates the preliminary site plan. As shown, access to the apartments and retail center is planned to be provided by three new driveways on the east side of Sunset Drive, including two full-movement driveways and one driveway (the northernmost) with right-in/right-out only movement restrictions. An internal access drive is proposed connecting the retail center with the apartments to the south, affording both the apartments and the retail center with two alternative full movement connections to Sunset Drive.

Also shown, access to the townhomes is planned to be provided by one full-movement driveway on the west side of Sunset Drive. Per the year 2026 total traffic conditions analysis described above, all driveways are expected to operate acceptably under stop control with the proposed development during the weekday AM and PM peak hours. Vehicle queues at the driveways are expected to be less than one vehicle exiting the site.

Sight distance at the driveways will be documented in the project civil engineering plans. Landscaping, above ground utilities, and signing should be located and maintained along the site frontages and throughout the site in a manner that provides adequate intersection sight distance in accordance with City requirements.

# FINDINGS AND RECOMMENDATIONS

The results of this study indicate that the proposed Brown's Farm development can be constructed while maintaining acceptable traffic operations at the study intersections, assuming provision of the recommended mitigation measures. The findings of this analysis and our recommendations are discussed below.

## Findings

- All the study intersections currently operate acceptably during the weekday AM and PM peak hours per their respective mobility standards and targets.
- A review of historical crash data indicates that the crash rate at the Sunset Drive/Willamina Avenue intersection exceeds statewide averages.
  - A total of six crashes were reported at the intersection over the five-year period, including three that resulted in minor injuries and three in property damage only. Given the existing configuration of the intersection and limited crash history, no mitigation measures are recommended at this time. However, the City should continue to monitor the intersection and identify potential safety treatments as necessary.
- No other trends or patterns were identified in the crash data that require mitigation and a review of the ODOT and Washington County SPIS lists did not reveal any sites in the site vicinity.
- All the study intersections are forecast to continue to operate acceptably under year 2024 background and total traffic conditions (with and without the proposed townhomes) during the weekday AM and PM peak hours.
  - The northbound left-turn queue at the OR 47/Sunset Drive intersection can be accommodated within the existing two-way center left-turn lane and is not expected to extend beyond the proposed site driveway.
- All the study intersections are forecast to continue to operate acceptably under year 2026 background and total traffic conditions during the weekday AM and PM peak hours with full build-out and occupancy of the proposed Brown's Farm development except the Sunset Drive/Bonnie Lane intersection.
  - The stop controlled eastbound approach to the Sunset Drive/Bonnie Lane intersection is projected to operate at LOS E under year 2026 total traffic conditions (assuming full build-out and occupancy of the proposed development) during the weekday AM peak hour. This forecast LOS E is primarily due to the delay associated with the westbound left-turn movement that occurs during the peak 15-minute period of the morning peak hour. Major street turning and through movements along Sunset Drive are projected to operate at LOS A or better during the same period. Given that the intersection is forecast to operate below capacity (v/c=0.76) and it is not expected to meet traffic signal warrants, no vehicle capacity-based mitigation measures are recommended at this time. However, City staff have identified a desire for an enhanced pedestrian crossing at the Sunset Drive/Bonnie Lane intersection in conjunction with site development to facilitate movement of persons walking and biking.
  - The northbound left-turn queue at the OR 47/Sunset Drive intersection is expected to exceed the striped storage under year 2026 background and total traffic conditions during the weekday AM and PM peak hours. The queue is also expected to extend past the townhomes driveway under year 2026 total traffic conditions during the weekday AM and PM peak hours. During these time periods, turning movements at the driveway may be limited to right-in/right out.

  - Given recent changes to the planned transportation network that limit connectivity to OR 47 southeast of the study area and the new roundabout being constructed to the east on OR 47 at Martin Road, we recommend that the City work with ODOT to review and modify the signal timing plan to optimize intersection operations and minimize queueing.
- The site-access driveways are expected to meet City LOS requirements under year 2026 total traffic conditions.
- Vehicle queues at the site-access driveways are expected to be less than one vehicle entering the site.

# Recommendations

- Landscaping, above ground utilities, and signing should be located and maintained along site frontages and throughout the site in a manner that preserves adequate intersection sight distance in accordance with City requirements.
- Regardless of the development, we recommend that the City work with ODOT to review and modify the signal timing plan at the OR 47/Sunset Drive intersection to optimize intersection operations and minimize queuing in light of planned/pending developments, anticipated connectivity changes, and the new roundabout being constructed to the east on OR 47 at Martin Road.
- Pursuant to recommendations from City staff, JT Smith should collaborate with the City to design and construct a marked crossing at the Sunset Drive/Bonnie Lane intersection in conjunction with site development. The types of enhanced crossing treatments could include ADA accessible curb ramps, raised median islands, high visibility pavement markings and signs, rectangular rapid flashing beacons, and lighting.

# REFERENCES

1. Oregon Department of Transportation. *Oregon Highway Plan*. 2015.
2. City of Forest Grove *City of Forest Grove Transportation System Plan*. January 2014.
3. Transportation Research Board. *Highway Capacity Manual, 6th Edition*. 2016.
4. City of Forest Grove. *City of Forest Grove Zoning Map*. May 2009.
5. Oregon Department of Transportation. *Analysis Procedures Manual, 2nd Edition*. April 2023.
6. Institute of Transportation Engineers. *Trip Generation Manual, 11th Edition*. 2021.

# APPENDIX

A. Traffic Count Worksheets
B. Existing Traffic Conditions Analysis Worksheets
C. ODOT Crash Data
D. Year 2024 Background Traffic Conditions Analysis Worksheets
E. Year 2024 Total Traffic Conditions Analysis Worksheets
F. Queuing Analysis Worksheets Under Existing, 2024 Background, and 204 Total Traffic Conditions
G. Year 2026 Background Traffic Conditions Analysis Worksheets
H. Year 2026 Total Traffic Conditions Analysis Worksheets
I. Queuing Analysis Worksheets Under Existing, 2026 Background, and 2026 Total Traffic Conditions
J. Example Intersection Operations Analysis and Queuing Worksheets

# Appendix A: Traffic Count Worksheets

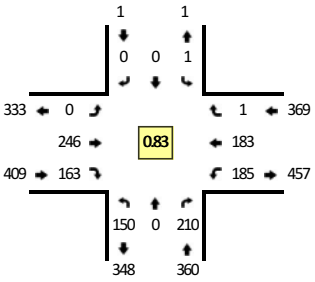
Type of peak hour being reported: Intersection Peak

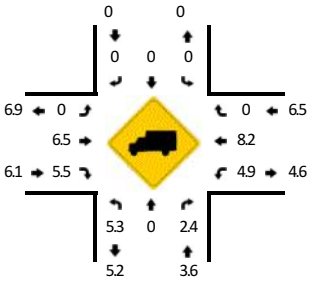
Method for determining peak hour: Total Entering Volume

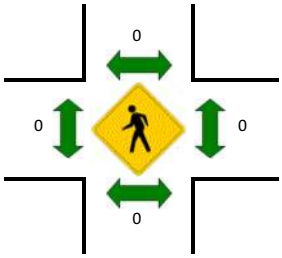
**LOCATION:** Sunset Dr/Beal Rd -- OR-47
**CITY/STATE:** Forest Grove, OR

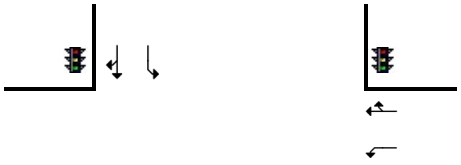
**QC JOB #:** 15993801
**DATE:** Tue, Nov 1 2022

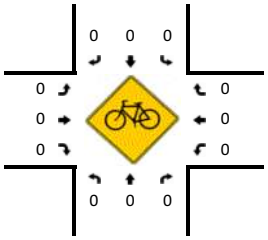
**Peak-Hour: 7:20 AM -- 8:20 AM**
**Peak 15-Min: 7:50 AM -- 8:05 AM**

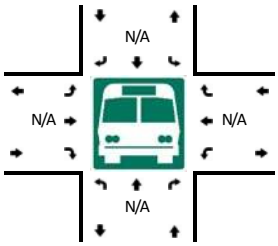


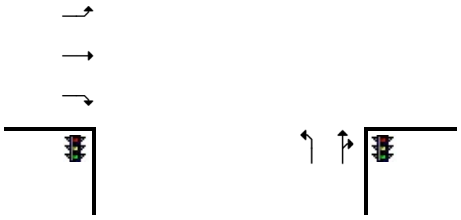


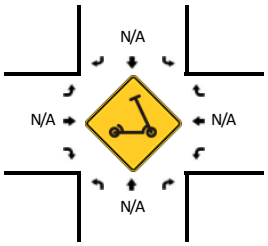








| 5-Min Count Period Beginning At | Sunset Dr/Beal Rd (Northbound) | | | | Sunset Dr/Beal Rd (Southbound) | | | | OR-47 (Eastbound) | | | | OR-47 (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 7:00 AM | 24 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 6 | 0 | 2 | 5 | 0 | 0 | 74 | |
| 7:05 AM | 14 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 5 | 0 | 1 | 10 | 0 | 0 | 53 | |
| 7:10 AM | 9 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 8 | 0 | 9 | 8 | 0 | 0 | 64 | |
| 7:15 AM | 9 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 10 | 0 | 7 | 11 | 0 | 0 | 66 | |
| 7:20 AM | 9 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 10 | 0 | 10 | 9 | 0 | 0 | 89 | |
| 7:25 AM | 12 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 9 | 0 | 7 | 16 | 0 | 0 | 80 | |
| 7:30 AM | 14 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 4 | 0 | 15 | 10 | 0 | 0 | 74 | |
| 7:35 AM | 12 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 9 | 0 | 19 | 16 | 0 | 0 | 81 | |
| 7:40 AM | 14 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 0 | 16 | 14 | 0 | 0 | 84 | |
| 7:45 AM | 13 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 15 | 0 | 20 | 9 | 0 | 0 | 94 | |
| 7:50 AM | 10 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 27 | 0 | 21 | 28 | 0 | 0 | 125 | |
| 7:55 AM | 17 | 0 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 19 | 0 | 18 | 22 | 0 | 0 | 104 | 988 |
| 8:00 AM | 14 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 11 | 0 | 34 | 20 | 0 | 0 | 115 | 1029 |
| 8:05 AM | 16 | 0 | 17 | 0 | 1 | 0 | 0 | 0 | 0 | 20 | 23 | 0 | 8 | 18 | 0 | 0 | 103 | 1079 |
| 8:10 AM | 11 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 11 | 0 | 12 | 9 | 0 | 0 | 99 | 1114 |
| 8:15 AM | 8 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 10 | 0 | 5 | 12 | 1 | 0 | 91 | 1139 |
| 8:20 AM | 8 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 12 | 0 | 4 | 10 | 0 | 0 | 54 | 1104 |
| 8:25 AM | 5 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 15 | 0 | 4 | 11 | 0 | 0 | 69 | 1093 |
| 8:30 AM | 11 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 15 | 0 | 5 | 12 | 0 | 0 | 73 | 1092 |
| 8:35 AM | 9 | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 28 | 15 | 0 | 7 | 14 | 0 | 0 | 81 | 1092 |
| 8:40 AM | 12 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 25 | 0 | 2 | 14 | 0 | 0 | 72 | 1080 |
| 8:45 AM | 10 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 8 | 0 | 7 | 21 | 0 | 0 | 73 | 1059 |
| 8:50 AM | 12 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 9 | 0 | 5 | 11 | 0 | 0 | 55 | 989 |
| 8:55 AM | 12 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 17 | 0 | 5 | 15 | 0 | 0 | 75 | 960 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 164 | 0 | 224 | 0 | 0 | 0 | 0 | 0 | 0 | 188 | 228 | 0 | 292 | 280 | 0 | 0 | 1376 |
| Heavy Trucks | 12 | 0 | 0 | | 0 | 0 | 0 | | 0 | 24 | 12 | | 24 | 28 | 0 | | 100 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

**LOCATION:** Sunset Dr/Beal Rd -- OR-47
**CITY/STATE:** Forest Grove, OR

**QC JOB #:** 15993802
**DATE:** Tue, Nov 1 2022

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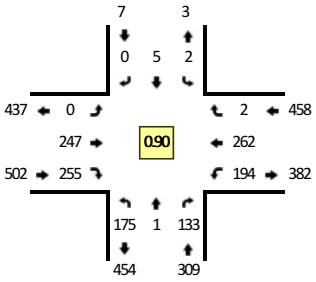
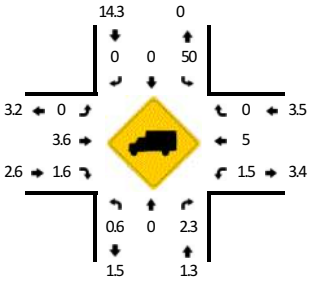
**Peak 15-Min: 4:35 PM -- 4:50 PM**




Quality Counts
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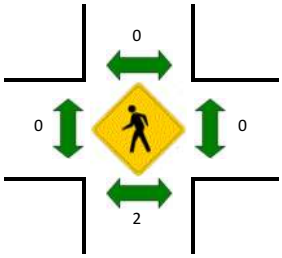


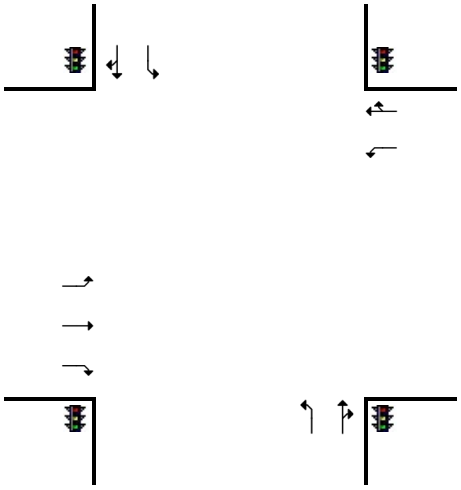

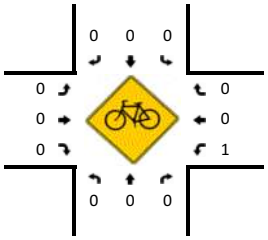


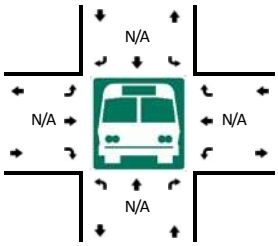




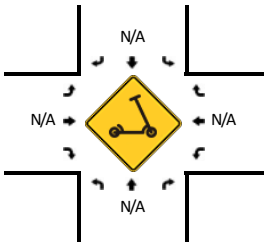


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| 4:15 PM | 12 | 0 | 15 | 0 | 0 | 1 | 0 | 0 | 0 | 18 | 21 | 0 | 19 | 25 | 0 | 0 | 111 | |
| 4:20 PM | 15 | 0 | 14 | 0 | 0 | 1 | 0 | 0 | 0 | 28 | 21 | 0 | 19 | 14 | 0 | 0 | 112 | |
| 4:25 PM | 9 | 0 | 9 | 0 | 1 | 1 | 0 | 0 | 0 | 20 | 17 | 0 | 18 | 13 | 0 | 0 | 88 | |
| 4:30 PM | 14 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 10 | 0 | 14 | 25 | 0 | 0 | 90 | |
| 4:35 PM | 21 | 1 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 25 | 0 | 19 | 24 | 0 | 0 | 137 | |
| 4:40 PM | 20 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 26 | 0 | 26 | 19 | 1 | 0 | 120 | |
| 4:45 PM | 16 | 0 | 12 | 0 | 0 | 1 | 0 | 0 | 0 | 16 | 20 | 0 | 13 | 20 | 0 | 0 | 98 | |
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| 5:45 PM | 8 | 0 | 11 | 0 | 0 | 1 | 0 | 0 | 0 | 17 | 28 | 0 | 18 | 30 | 0 | 0 | 113 | 1201 |
| 5:50 PM | 12 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 21 | 0 | 11 | 16 | 0 | 0 | 80 | 1169 |
| 5:55 PM | 9 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 17 | 0 | 13 | 23 | 0 | 0 | 80 | 1157 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 228 | 4 | 164 | 0 | 0 | 4 | 0 | 0 | 0 | 248 | 284 | 0 | 232 | 252 | 4 | 0 | 1420 |
| Heavy Trucks | 4 | 0 | 8 | | 0 | 0 | 0 | | 0 | 4 | 0 | | 0 | 12 | 0 | | 28 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

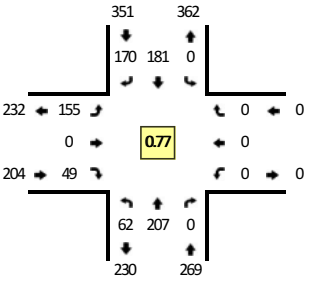
Report generated on 11/9/2022 4:55 PM

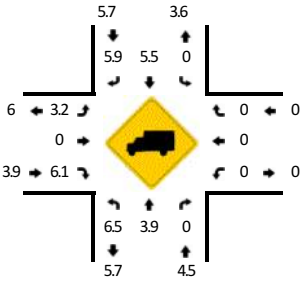
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

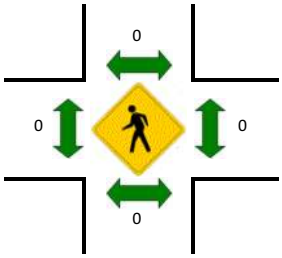
**LOCATION:** Sunset Dr -- Bonnie Ln | **QC JOB #:** 15993803
**CITY/STATE:** Forest Grove, OR | **DATE:** Tue, Nov 1 2022

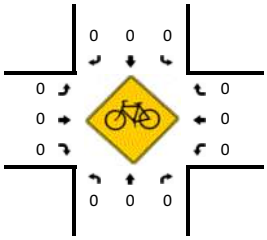
**Peak-Hour: 7:20 AM -- 8:20 AM**
**Peak 15-Min: 7:50 AM -- 8:05 AM**

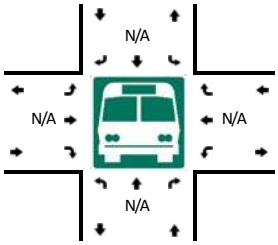


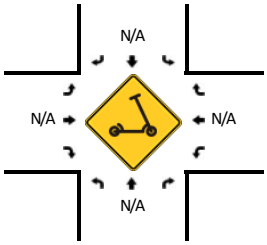




Quality Counts
DATA THAT DRIVES COMMUNITIES








| 5-Min Count Period Beginning At | Sunset Dr (Northbound) | | | | Sunset Dr (Southbound) | | | | Bonnie Ln (Eastbound) | | | | Bonnie Ln (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 7:00 AM | 1 | 28 | 0 | 0 | 0 | 9 | 1 | 0 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 50 | |
| 7:05 AM | 3 | 22 | 0 | 0 | 0 | 5 | 1 | 0 | 8 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 40 | |
| 7:10 AM | 1 | 12 | 0 | 0 | 0 | 8 | 5 | 0 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 33 | |
| 7:15 AM | 0 | 20 | 0 | 0 | 0 | 14 | 5 | 0 | 6 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 47 | |
| 7:20 AM | 1 | 18 | 0 | 0 | 0 | 11 | 12 | 0 | 11 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 56 | |
| 7:25 AM | 0 | 12 | 0 | 0 | 0 | 10 | 7 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | |
| 7:30 AM | 6 | 24 | 0 | 0 | 0 | 8 | 10 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 53 | |
| 7:35 AM | 6 | 18 | 0 | 0 | 0 | 10 | 15 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 61 | |
| 7:40 AM | 1 | 19 | 0 | 0 | 0 | 16 | 17 | 0 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 60 | |
| 7:45 AM | 7 | 17 | 0 | 0 | 0 | 17 | 20 | 0 | 12 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 75 | |
| 7:50 AM | 10 | 13 | 0 | 0 | 0 | 24 | 17 | 0 | 13 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 83 | |
| 7:55 AM | 12 | 21 | 0 | 0 | 0 | 24 | 19 | 0 | 14 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 95 | 691 |
| 8:00 AM | 4 | 22 | 0 | 0 | 0 | 14 | 25 | 0 | 16 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 89 | 730 |
| 8:05 AM | 9 | 17 | 0 | 0 | 0 | 23 | 12 | 0 | 16 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 81 | 771 |
| 8:10 AM | 5 | 14 | 0 | 0 | 0 | 14 | 11 | 0 | 20 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 70 | 808 |
| 8:15 AM | 1 | 12 | 0 | 0 | 0 | 10 | 5 | 0 | 27 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 63 | 824 |
| 8:20 AM | 1 | 12 | 0 | 0 | 0 | 14 | 1 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 34 | 802 |
| 8:25 AM | 6 | 11 | 0 | 0 | 0 | 16 | 0 | 0 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 40 | 804 |
| 8:30 AM | 7 | 18 | 0 | 0 | 0 | 18 | 6 | 0 | 8 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 60 | 811 |
| 8:35 AM | 2 | 17 | 0 | 0 | 0 | 14 | 4 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 47 | 797 |
| 8:40 AM | 1 | 14 | 0 | 0 | 0 | 30 | 1 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 51 | 788 |
| 8:45 AM | 0 | 15 | 0 | 0 | 0 | 12 | 5 | 0 | 6 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 41 | 754 |
| 8:50 AM | 0 | 14 | 0 | 0 | 0 | 9 | 3 | 0 | 6 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 36 | 707 |
| 8:55 AM | 3 | 19 | 0 | 0 | 0 | 20 | 1 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 49 | 661 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 104 | 224 | 0 | 0 | 0 | 248 | 244 | 0 | 172 | 0 | 76 | 0 | 0 | 0 | 0 | 0 | 1068 |
| Heavy Trucks | 12 | 16 | 0 | | 0 | 16 | 24 | | 0 | 0 | 8 | | 0 | 0 | 0 | | 76 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

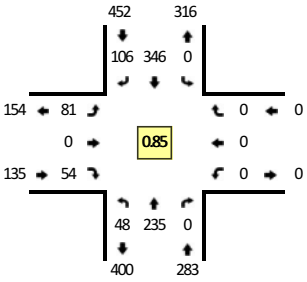
Type of peak hour being reported: Intersection Peak

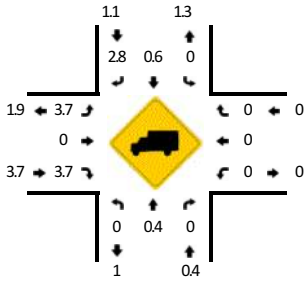
Method for determining peak hour: Total Entering Volume

**LOCATION:** Sunset Dr -- Bonnie Ln
**CITY/STATE:** Forest Grove, OR

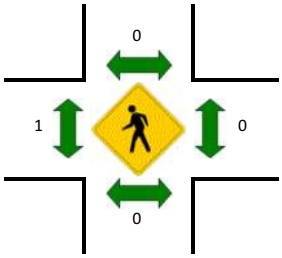
**QC JOB #:** 15993804
**DATE:** Tue, Nov 1 2022

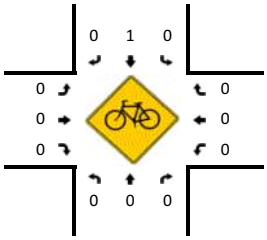
**Peak-Hour: 4:15 PM -- 5:15 PM**
**Peak 15-Min: 4:35 PM -- 4:50 PM**

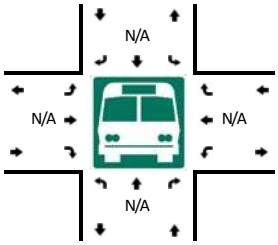


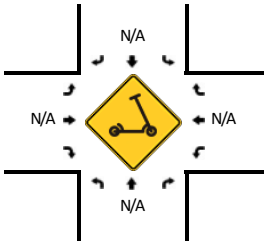




Quality Counts
DATA THAT DRIVES COMMUNITIES








| 5-Min Count Period Beginning At | Sunset Dr (Northbound) | | | | Sunset Dr (Southbound) | | | | Bonnie Ln (Eastbound) | | | | Bonnie Ln (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 4:00 PM | 4 | 16 | 0 | 0 | 0 | 31 | 11 | 0 | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 72 | |
| 4:05 PM | 7 | 23 | 0 | 0 | 0 | 7 | 5 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 54 | |
| 4:10 PM | 4 | 18 | 0 | 0 | 0 | 23 | 4 | 0 | 6 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 57 | |
| 4:15 PM | 8 | 18 | 0 | 0 | 0 | 31 | 10 | 0 | 14 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 83 | |
| 4:20 PM | 3 | 21 | 0 | 0 | 0 | 32 | 6 | 0 | 7 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 73 | |
| 4:25 PM | 4 | 10 | 0 | 0 | 0 | 27 | 12 | 0 | 5 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 62 | |
| 4:30 PM | 5 | 17 | 0 | 0 | 0 | 17 | 7 | 0 | 6 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 59 | |
| 4:35 PM | 2 | 29 | 0 | 0 | 0 | 34 | 11 | 0 | 12 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 93 | |
| 4:40 PM | 4 | 28 | 0 | 0 | 0 | 39 | 12 | 0 | 5 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 99 | |
| 4:45 PM | 3 | 23 | 0 | 0 | 0 | 21 | 8 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 65 | |
| 4:50 PM | 6 | 17 | 0 | 0 | 0 | 28 | 10 | 0 | 7 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 74 | |
| 4:55 PM | 0 | 14 | 0 | 0 | 0 | 30 | 9 | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 58 | 849 |
| 5:00 PM | 6 | 16 | 0 | 0 | 0 | 27 | 9 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 63 | 840 |
| 5:05 PM | 2 | 14 | 0 | 0 | 0 | 27 | 4 | 0 | 8 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 57 | 843 |
| 5:10 PM | 5 | 28 | 0 | 0 | 0 | 33 | 8 | 0 | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 84 | 870 |
| 5:15 PM | 4 | 17 | 0 | 0 | 0 | 32 | 10 | 0 | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 70 | 857 |
| 5:20 PM | 4 | 17 | 0 | 0 | 0 | 27 | 7 | 0 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 60 | 844 |
| 5:25 PM | 2 | 14 | 0 | 0 | 0 | 31 | 5 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 56 | 838 |
| 5:30 PM | 5 | 15 | 0 | 0 | 0 | 19 | 8 | 0 | 5 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 56 | 835 |
| 5:35 PM | 3 | 18 | 0 | 0 | 0 | 24 | 3 | 0 | 9 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 61 | 803 |
| 5:40 PM | 5 | 18 | 0 | 0 | 0 | 26 | 7 | 0 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 64 | 768 |
| 5:45 PM | 6 | 14 | 0 | 0 | 0 | 35 | 10 | 0 | 6 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 73 | 776 |
| 5:50 PM | 3 | 15 | 0 | 0 | 0 | 27 | 7 | 0 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 59 | 761 |
| 5:55 PM | 6 | 12 | 0 | 0 | 0 | 25 | 5 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 50 | 753 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 36 | 320 | 0 | 0 | 0 | 376 | 124 | 0 | 88 | 0 | 84 | 0 | 0 | 0 | 0 | 0 | 1028 |
| Heavy Trucks | 0 | 4 | 0 | | 0 | 0 | 0 | | 8 | 0 | 4 | | 0 | 0 | 0 | | 16 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

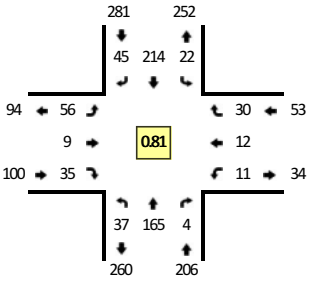
Type of peak hour being reported: Intersection Peak

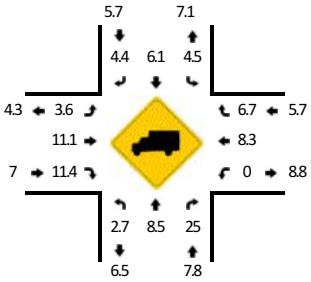
Method for determining peak hour: Total Entering Volume

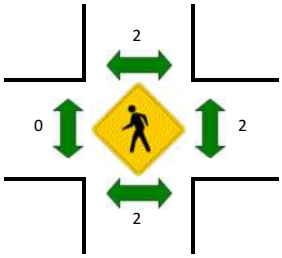
**LOCATION:** Sunset Dr -- NW Willamina Ave
**CITY/STATE:** Forest Grove, OR

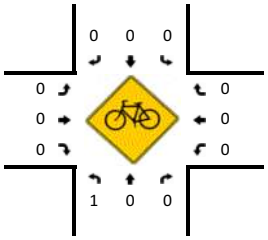
**QC JOB #:** 15993805
**DATE:** Tue, Nov 1 2022

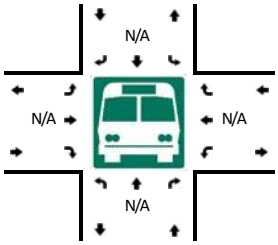
**Peak-Hour: 7:45 AM -- 8:45 AM**
**Peak 15-Min: 7:50 AM -- 8:05 AM**

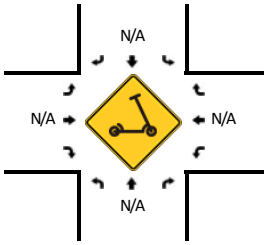









| 5-Min Count Period Beginning At | Sunset Dr (Northbound) | | | | Sunset Dr (Southbound) | | | | NW Willamina Ave (Eastbound) | | | | NW Willamina Ave (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 7:00 AM | 0 | 10 | 0 | 0 | 1 | 7 | 0 | 0 | 12 | 0 | 1 | 0 | 1 | 1 | 8 | 0 | 41 | |
| 7:05 AM | 0 | 14 | 0 | 0 | 2 | 5 | 2 | 0 | 6 | 0 | 4 | 0 | 0 | 0 | 2 | 0 | 35 | |
| 7:10 AM | 1 | 9 | 0 | 0 | 0 | 8 | 3 | 0 | 4 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 29 | |
| 7:15 AM | 1 | 7 | 2 | 0 | 1 | 11 | 4 | 0 | 7 | 1 | 0 | 0 | 0 | 2 | 3 | 0 | 39 | |
| 7:20 AM | 1 | 10 | 0 | 0 | 0 | 10 | 3 | 0 | 9 | 1 | 1 | 0 | 2 | 1 | 0 | 0 | 38 | |
| 7:25 AM | 3 | 9 | 0 | 0 | 0 | 11 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 29 | |
| 7:30 AM | 0 | 18 | 1 | 0 | 0 | 4 | 5 | 0 | 8 | 0 | 2 | 0 | 2 | 0 | 4 | 0 | 44 | |
| 7:35 AM | 2 | 15 | 0 | 0 | 0 | 8 | 4 | 0 | 6 | 0 | 1 | 0 | 1 | 2 | 2 | 0 | 41 | |
| 7:40 AM | 1 | 12 | 0 | 0 | 0 | 17 | 3 | 0 | 7 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 43 | |
| 7:45 AM | 5 | 20 | 1 | 0 | 1 | 16 | 4 | 0 | 3 | 0 | 2 | 0 | 3 | 0 | 1 | 0 | 56 | |
| 7:50 AM | 6 | 21 | 0 | 0 | 0 | 23 | 2 | 0 | 0 | 0 | 5 | 0 | 1 | 1 | 4 | 0 | 63 | |
| 7:55 AM | 5 | 21 | 1 | 0 | 2 | 27 | 4 | 1 | 5 | 0 | 2 | 0 | 1 | 1 | 3 | 0 | 73 | 531 |
| 8:00 AM | 5 | 16 | 0 | 0 | 1 | 17 | 5 | 0 | 9 | 1 | 2 | 0 | 0 | 1 | 4 | 0 | 61 | 551 |
| 8:05 AM | 4 | 15 | 0 | 0 | 1 | 22 | 4 | 0 | 5 | 1 | 6 | 0 | 0 | 0 | 5 | 0 | 63 | 579 |
| 8:10 AM | 5 | 11 | 0 | 0 | 1 | 14 | 6 | 0 | 4 | 1 | 5 | 0 | 0 | 0 | 3 | 0 | 50 | 600 |
| 8:15 AM | 0 | 5 | 0 | 0 | 1 | 19 | 1 | 0 | 6 | 1 | 2 | 0 | 0 | 2 | 3 | 0 | 40 | 601 |
| 8:20 AM | 5 | 9 | 0 | 0 | 3 | 11 | 2 | 0 | 2 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 36 | 599 |
| 8:25 AM | 1 | 13 | 0 | 0 | 0 | 15 | 3 | 0 | 4 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 40 | 610 |
| 8:30 AM | 0 | 17 | 1 | 0 | 8 | 12 | 6 | 0 | 5 | 1 | 2 | 0 | 1 | 0 | 4 | 0 | 57 | 623 |
| 8:35 AM | 1 | 9 | 1 | 0 | 2 | 14 | 1 | 0 | 7 | 1 | 0 | 0 | 2 | 4 | 2 | 0 | 44 | 626 |
| 8:40 AM | 0 | 8 | 0 | 0 | 1 | 24 | 7 | 0 | 6 | 1 | 5 | 0 | 3 | 1 | 1 | 0 | 57 | 640 |
| 8:45 AM | 2 | 7 | 1 | 0 | 0 | 11 | 4 | 0 | 5 | 0 | 2 | 0 | 0 | 2 | 2 | 0 | 36 | 620 |
| 8:50 AM | 1 | 8 | 0 | 0 | 0 | 12 | 2 | 0 | 7 | 0 | 7 | 0 | 0 | 2 | 0 | 0 | 39 | 596 |
| 8:55 AM | 0 | 9 | 0 | 0 | 1 | 19 | 5 | 0 | 9 | 0 | 3 | 0 | 1 | 2 | 0 | 0 | 49 | 572 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 64 | 232 | 4 | 0 | 12 | 268 | 44 | 4 | 56 | 4 | 36 | 0 | 8 | 12 | 44 | 0 | 788 |
| Heavy Trucks | 0 | 32 | 0 | | 4 | 20 | 0 | | 0 | 0 | 4 | | 0 | 0 | 0 | | 60 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 4 | | | | 0 | | | | 0 | | | | 0 | | | 4 |
| Bicycles | 4 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 4 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

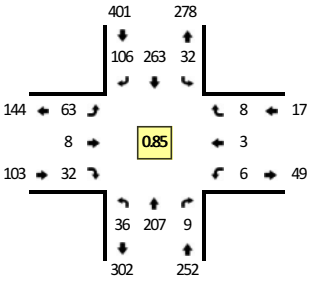
Type of peak hour being reported: Intersection Peak

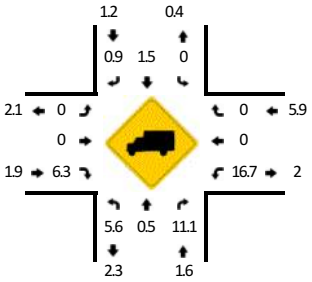
Method for determining peak hour: Total Entering Volume

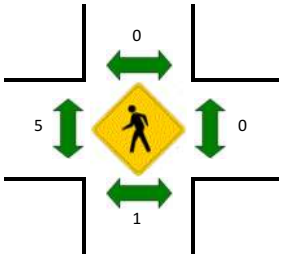
**LOCATION:** Sunset Dr -- NW Willamina Ave
**CITY/STATE:** Forest Grove, OR

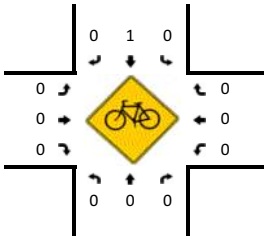
**QC JOB #:** 15993806
**DATE:** Tue, Nov 1 2022

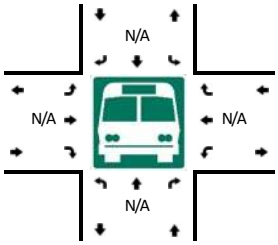
**Peak-Hour: 4:15 PM -- 5:15 PM**
**Peak 15-Min: 4:35 PM -- 4:50 PM**

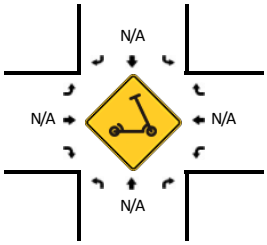









| 5-Min Count Period Beginning At | Sunset Dr (Northbound) | | | | Sunset Dr (Southbound) | | | | NW Willamina Ave (Eastbound) | | | | NW Willamina Ave (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 4:00 PM | 3 | 15 | 1 | 0 | 2 | 25 | 6 | 0 | 4 | 1 | 2 | 0 | 0 | 1 | 0 | 0 | 60 | |
| 4:05 PM | 3 | 24 | 0 | 0 | 0 | 9 | 3 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 46 | |
| 4:10 PM | 5 | 20 | 0 | 0 | 2 | 14 | 8 | 0 | 4 | 0 | 3 | 0 | 0 | 1 | 1 | 0 | 58 | |
| 4:15 PM | 3 | 18 | 2 | 0 | 4 | 22 | 8 | 0 | 4 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 64 | |
| 4:20 PM | 2 | 16 | 1 | 0 | 3 | 18 | 14 | 0 | 6 | 1 | 8 | 0 | 0 | 0 | 1 | 0 | 70 | |
| 4:25 PM | 1 | 12 | 0 | 0 | 2 | 22 | 8 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 51 | |
| 4:30 PM | 4 | 19 | 0 | 0 | 3 | 11 | 10 | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 53 | |
| 4:35 PM | 3 | 20 | 1 | 0 | 4 | 28 | 8 | 0 | 10 | 1 | 3 | 0 | 1 | 0 | 1 | 0 | 80 | |
| 4:40 PM | 3 | 25 | 0 | 0 | 2 | 33 | 11 | 0 | 4 | 1 | 3 | 0 | 1 | 0 | 1 | 0 | 84 | |
| 4:45 PM | 2 | 18 | 2 | 0 | 2 | 27 | 1 | 0 | 7 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 64 | |
| 4:50 PM | 6 | 16 | 0 | 1 | 1 | 23 | 9 | 0 | 5 | 1 | 2 | 0 | 1 | 2 | 1 | 0 | 68 | |
| 4:55 PM | 0 | 7 | 0 | 0 | 2 | 18 | 8 | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 42 | 740 |
| 5:00 PM | 5 | 19 | 2 | 0 | 3 | 26 | 5 | 0 | 4 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 66 | 746 |
| 5:05 PM | 5 | 12 | 0 | 0 | 2 | 14 | 12 | 0 | 3 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 52 | 752 |
| 5:10 PM | 1 | 25 | 1 | 0 | 4 | 21 | 12 | 0 | 9 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 79 | 773 |
| 5:15 PM | 3 | 15 | 2 | 0 | 4 | 21 | 9 | 0 | 1 | 0 | 3 | 0 | 0 | 3 | 2 | 0 | 63 | 772 |
| 5:20 PM | 3 | 14 | 1 | 0 | 2 | 17 | 11 | 0 | 6 | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 58 | 760 |
| 5:25 PM | 1 | 16 | 0 | 0 | 0 | 18 | 11 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 51 | 760 |
| 5:30 PM | 3 | 16 | 1 | 0 | 1 | 17 | 5 | 0 | 5 | 0 | 4 | 0 | 1 | 1 | 1 | 0 | 55 | 762 |
| 5:35 PM | 2 | 14 | 1 | 0 | 3 | 16 | 9 | 0 | 8 | 1 | 3 | 0 | 1 | 1 | 1 | 0 | 60 | 742 |
| 5:40 PM | 6 | 18 | 2 | 0 | 1 | 20 | 10 | 0 | 6 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 67 | 725 |
| 5:45 PM | 2 | 13 | 2 | 0 | 4 | 23 | 8 | 0 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 59 | 720 |
| 5:50 PM | 3 | 16 | 0 | 0 | 3 | 16 | 11 | 0 | 3 | 0 | 4 | 0 | 1 | 2 | 0 | 0 | 59 | 711 |
| 5:55 PM | 4 | 14 | 0 | 0 | 3 | 18 | 11 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 54 | 723 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 32 | 252 | 12 | 0 | 32 | 352 | 80 | 0 | 84 | 8 | 32 | 0 | 12 | 4 | 12 | 0 | 912 |
| Heavy Trucks | 0 | 4 | 0 | | 0 | 8 | 0 | | 0 | 0 | 4 | | 4 | 0 | 0 | | 20 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 0 | | | | 0 | | | | 0 | | | | 0 | | | 0 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

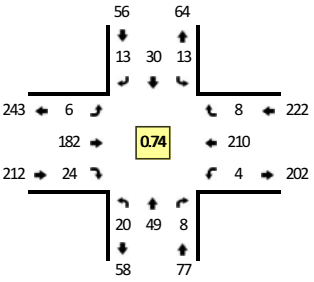
Type of peak hour being reported: Intersection Peak

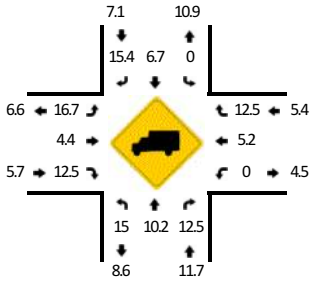
Method for determining peak hour: Total Entering Volume

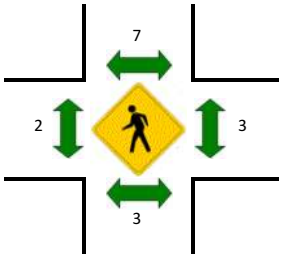
**LOCATION:** Main St -- Bonnie Ln
**CITY/STATE:** Forest Grove, OR

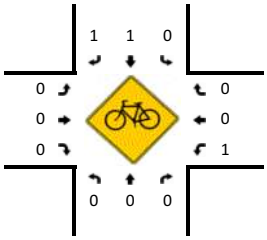
**QC JOB #:** 15993807
**DATE:** Tue, Nov 1 2022

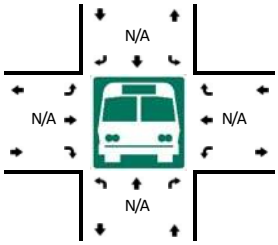
**Peak-Hour: 7:35 AM -- 8:35 AM**
**Peak 15-Min: 7:55 AM -- 8:10 AM**

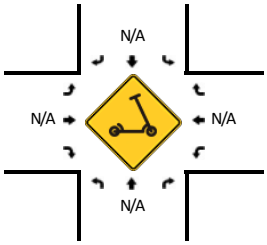







| 5-Min Count Period Beginning At | Main St (Northbound) | | | | Main St (Southbound) | | | | Bonnie Ln (Eastbound) | | | | Bonnie Ln (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 7:00 AM | 0 | 5 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 10 | 2 | 0 | 0 | 0 | 1 | 0 | 20 | |
| 7:05 AM | 0 | 7 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 4 | 1 | 0 | 22 | |
| 7:10 AM | 0 | 3 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 5 | 0 | 0 | 19 | |
| 7:15 AM | 0 | 9 | 0 | 0 | 2 | 4 | 0 | 0 | 1 | 10 | 0 | 0 | 0 | 5 | 0 | 0 | 31 | |
| 7:20 AM | 0 | 0 | 1 | 0 | 2 | 2 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 10 | 1 | 0 | 22 | |
| 7:25 AM | 0 | 4 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 8 | 1 | 0 | 21 | |
| 7:30 AM | 1 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 8 | 2 | 0 | 21 | |
| 7:35 AM | 2 | 8 | 1 | 0 | 2 | 2 | 1 | 0 | 0 | 9 | 2 | 0 | 1 | 22 | 0 | 0 | 50 | |
| 7:40 AM | 3 | 5 | 2 | 0 | 1 | 2 | 1 | 0 | 1 | 7 | 3 | 0 | 0 | 19 | 0 | 0 | 44 | |
| 7:45 AM | 1 | 4 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 12 | 4 | 0 | 1 | 18 | 0 | 0 | 42 | |
| 7:50 AM | 1 | 3 | 0 | 0 | 1 | 3 | 3 | 0 | 1 | 16 | 2 | 0 | 0 | 31 | 0 | 0 | 61 | |
| 7:55 AM | 2 | 6 | 0 | 0 | 1 | 2 | 1 | 1 | 0 | 18 | 3 | 0 | 1 | 33 | 0 | 0 | 68 | 421 |
| 8:00 AM | 3 | 5 | 1 | 0 | 1 | 2 | 2 | 0 | 0 | 20 | 2 | 0 | 0 | 21 | 1 | 0 | 58 | 459 |
| 8:05 AM | 1 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 25 | 0 | 0 | 0 | 29 | 1 | 0 | 65 | 502 |
| 8:10 AM | 2 | 2 | 3 | 0 | 1 | 5 | 1 | 0 | 0 | 26 | 6 | 0 | 1 | 13 | 1 | 0 | 61 | 544 |
| 8:15 AM | 0 | 2 | 0 | 0 | 2 | 3 | 0 | 0 | 1 | 28 | 2 | 0 | 0 | 6 | 1 | 0 | 45 | 558 |
| 8:20 AM | 2 | 2 | 0 | 0 | 2 | 4 | 1 | 0 | 1 | 5 | 0 | 0 | 0 | 4 | 0 | 0 | 21 | 557 |
| 8:25 AM | 1 | 2 | 0 | 0 | 0 | 3 | 2 | 0 | 1 | 7 | 0 | 0 | 0 | 6 | 0 | 0 | 22 | 558 |
| 8:30 AM | 2 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 8 | 4 | 0 | 30 | 567 |
| 8:35 AM | 0 | 1 | 1 | 0 | 2 | 3 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 5 | 1 | 0 | 22 | 539 |
| 8:40 AM | 0 | 5 | 0 | 0 | 1 | 8 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 20 | 515 |
| 8:45 AM | 1 | 5 | 2 | 0 | 2 | 10 | 0 | 0 | 0 | 7 | 0 | 0 | 1 | 5 | 0 | 0 | 33 | 506 |
| 8:50 AM | 1 | 8 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 6 | 2 | 0 | 0 | 3 | 0 | 0 | 26 | 471 |
| 8:55 AM | 1 | 5 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 2 | 1 | 0 | 17 | 420 |

| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 24 | 72 | 8 | 0 | 8 | 16 | 12 | 4 | 4 | 252 | 20 | 0 | 4 | 332 | 8 | 0 | 764 |
| Heavy Trucks | 0 | 8 | 4 | | 0 | 4 | 4 | | 4 | 12 | 4 | | 0 | 20 | 0 | | 60 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 8 | | | | 4 | | | | 4 | | | | 4 | | | 20 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

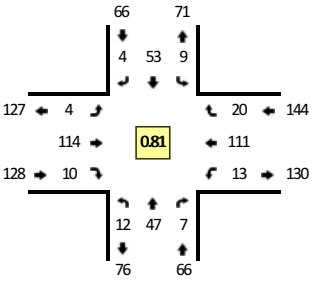
Type of peak hour being reported: Intersection Peak

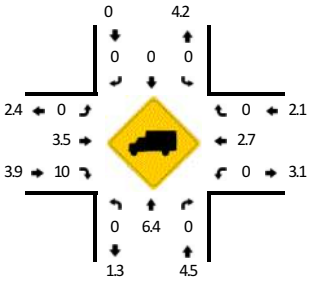
Method for determining peak hour: Total Entering Volume

**LOCATION:** Main St -- Bonnie Ln
**CITY/STATE:** Forest Grove, OR

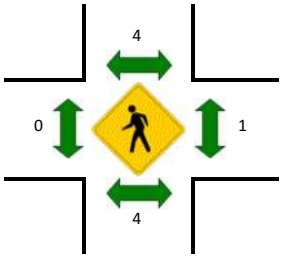
**QC JOB #:** 15993808
**DATE:** Tue, Nov 1 2022

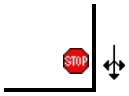
**Peak-Hour: 4:10 PM -- 5:10 PM**
**Peak 15-Min: 4:35 PM -- 4:50 PM**

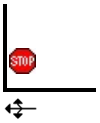


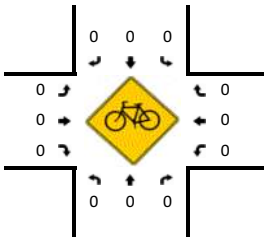



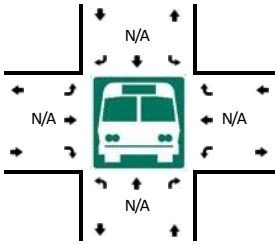

Quality Counts
DATA THAT DRIVES COMMUNITIES

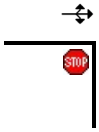


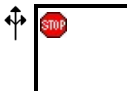



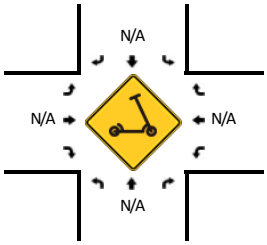




| 5-Min Count Period Beginning At | Main St (Northbound) | | | | Main St (Southbound) | | | | Bonnie Ln (Eastbound) | | | | Bonnie Ln (Westbound) | | | | Total | Hourly Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | | |
| 4:00 PM | 2 | 3 | 0 | 0 | 1 | 5 | 0 | 0 | 1 | 6 | 0 | 0 | 0 | 11 | 3 | 0 | 32 | |
| 4:05 PM | 1 | 3 | 1 | 0 | 3 | 3 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 9 | 0 | 0 | 30 | |
| 4:10 PM | 1 | 6 | 0 | 0 | 1 | 2 | 0 | 0 | 1 | 7 | 1 | 0 | 1 | 7 | 1 | 0 | 28 | |
| 4:15 PM | 2 | 1 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 15 | 1 | 0 | 2 | 10 | 4 | 0 | 41 | |
| 4:20 PM | 0 | 2 | 2 | 0 | 1 | 2 | 1 | 0 | 1 | 7 | 1 | 0 | 0 | 8 | 2 | 0 | 27 | |
| 4:25 PM | 1 | 2 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 7 | 1 | 0 | 1 | 11 | 1 | 0 | 28 | |
| 4:30 PM | 0 | 5 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 14 | 1 | 0 | 1 | 7 | 4 | 0 | 35 | |
| 4:35 PM | 1 | 8 | 1 | 0 | 0 | 9 | 0 | 0 | 0 | 16 | 1 | 0 | 2 | 9 | 1 | 0 | 48 | |
| 4:40 PM | 2 | 2 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 12 | 3 | 0 | 33 | |
| 4:45 PM | 1 | 4 | 2 | 0 | 1 | 6 | 1 | 0 | 1 | 14 | 2 | 0 | 1 | 11 | 0 | 0 | 44 | |
| 4:50 PM | 0 | 3 | 0 | 0 | 0 | 5 | 2 | 0 | 0 | 8 | 0 | 0 | 1 | 11 | 2 | 0 | 32 | |
| 4:55 PM | 1 | 4 | 1 | 0 | 0 | 5 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 6 | 1 | 0 | 22 | 400 |
| 5:00 PM | 1 | 4 | 0 | 0 | 1 | 5 | 0 | 0 | 0 | 4 | 1 | 0 | 3 | 13 | 1 | 0 | 33 | 401 |
| 5:05 PM | 2 | 6 | 1 | 0 | 0 | 6 | 0 | 0 | 0 | 10 | 1 | 0 | 1 | 6 | 0 | 0 | 33 | 404 |
| 5:10 PM | 2 | 2 | 2 | 0 | 3 | 2 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 6 | 3 | 0 | 26 | 402 |
| 5:15 PM | 2 | 6 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 6 | 3 | 0 | 3 | 10 | 1 | 0 | 34 | 395 |
| 5:20 PM | 2 | 4 | 1 | 0 | 1 | 3 | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 9 | 1 | 0 | 27 | 395 |
| 5:25 PM | 1 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 3 | 1 | 0 | 15 | 382 |
| 5:30 PM | 0 | 6 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 8 | 3 | 0 | 34 | 381 |
| 5:35 PM | 2 | 2 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 8 | 2 | 0 | 0 | 8 | 1 | 0 | 28 | 361 |
| 5:40 PM | 0 | 4 | 0 | 0 | 3 | 5 | 0 | 0 | 0 | 6 | 4 | 0 | 0 | 7 | 3 | 0 | 32 | 360 |
| 5:45 PM | 1 | 4 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 5 | 1 | 0 | 0 | 11 | 4 | 0 | 28 | 344 |
| 5:50 PM | 1 | 3 | 0 | 0 | 1 | 7 | 0 | 0 | 0 | 5 | 1 | 0 | 3 | 7 | 1 | 0 | 29 | 341 |
| 5:55 PM | 2 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 2 | 3 | 0 | 1 | 10 | 1 | 0 | 27 | 346 |

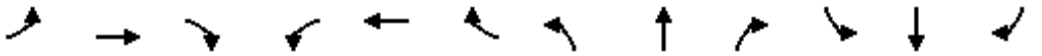
| Peak 15-Min Flowrates | Northbound | | | | Southbound | | | | Eastbound | | | | Westbound | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | Left | Thru | Right | U | |
| All Vehicles | 16 | 56 | 12 | 0 | 12 | 72 | 4 | 0 | 4 | 156 | 12 | 0 | 12 | 128 | 16 | 0 | 500 |
| Heavy Trucks | 0 | 8 | 0 | | 0 | 0 | 0 | | 0 | 8 | 4 | | 0 | 0 | 0 | | 20 |
| Buses | | | | | | | | | | | | | | | | | |
| Pedestrians | | 0 | | | | 8 | | | | 0 | | | | 0 | | | 8 |
| Bicycles | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | | 0 |
| Scooters | | | | | | | | | | | | | | | | | |

*Comments:*

Report generated on 11/9/2022 4:55 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

# Appendix B: Existing Traffic Conditions Analysis Worksheets



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 262 | 167 | 190 | 195 | 1 | 151 | 0 | 211 | 1 | 0 | 0 |
| Future Volume (veh/h) | 0 | 262 | 167 | 190 | 195 | 1 | 151 | 0 | 211 | 1 | 0 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1796 | 1811 | 1826 | 1781 | 1900 | 1826 | 1900 | 1870 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 316 | 38 | 229 | 235 | 1 | 182 | 0 | 19 | 1 | 0 | 0 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 0 | 7 | 6 | 5 | 8 | 0 | 5 | 0 | 2 | 0 | 0 | 0 |
| Cap, veh/h | 4 | 536 | 458 | 304 | 1029 | 4 | 405 | 0 | 272 | 397 | 321 | 0 |
| Arrive On Green | 0.00 | 0.30 | 0.30 | 0.17 | 0.58 | 0.58 | 0.17 | 0.00 | 0.17 | 0.17 | 0.00 | 0.00 |
| Sat Flow, veh/h | 1810 | 1796 | 1535 | 1739 | 1773 | 8 | 1384 | 0 | 1610 | 1416 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 316 | 38 | 229 | 0 | 236 | 182 | 0 | 19 | 1 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1796 | 1535 | 1739 | 0 | 1780 | 1384 | 0 | 1610 | 1416 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 6.3 | 0.7 | 5.2 | 0.0 | 2.7 | 5.3 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 6.3 | 0.7 | 5.2 | 0.0 | 2.7 | 5.3 | 0.0 | 0.4 | 0.4 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 536 | 458 | 304 | 0 | 1034 | 405 | 0 | 272 | 397 | 321 | 0 |
| V/C Ratio(X) | 0.00 | 0.59 | 0.08 | 0.75 | 0.00 | 0.23 | 0.45 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 648 | 2572 | 2198 | 1452 | 0 | 2549 | 997 | 0 | 961 | 664 | 680 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 12.5 | 10.6 | 16.4 | 0.0 | 4.2 | 16.7 | 0.0 | 14.7 | 14.8 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.2 | 0.2 | 3.8 | 0.0 | 0.1 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 3.7 | 0.4 | 3.4 | 0.0 | 0.7 | 2.6 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 14.7 | 10.7 | 20.2 | 0.0 | 4.4 | 17.5 | 0.0 | 14.8 | 14.8 | 0.0 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | A | A |
| Approach Vol, veh/h | | 354 | | | 465 | | | 201 | | | 1 | |
| Approach Delay, s/veh | | 14.3 | | | 12.2 | | | 17.2 | | | 14.8 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 11.8 | 18.5 | | 11.6 | 0.0 | 30.3 | | 11.6 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 7.2 | 8.3 | | 2.4 | 0.0 | 4.7 | | 7.3 | | | | |
| Green Ext Time (p_c), s | 0.6 | 4.2 | | 0.0 | 0.0 | 1.3 | | 0.5 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 13.9 |
| HCM 6th LOS | | B |

Notes

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 5.8 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 155 | 50 | 62 | 207 | 187 | 170 |
| Future Vol, veh/h | 155 | 50 | 62 | 207 | 187 | 170 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 3 | 6 | 6 | 4 | 6 | 6 |
| Mvmt Flow | 201 | 65 | 81 | 269 | 243 | 221 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 785 | 354 | 464 | 0 | - | 0 |
| Stage 1 | 354 | - | - | - | - | - |
| Stage 2 | 431 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.26 | 4.16 | - | - | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.354 | 2.254 | - | - | - |
| Pot Cap-1 Maneuver | 360 | 681 | 1077 | - | - | - |
| Stage 1 | 708 | - | - | - | - | - |
| Stage 2 | 653 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 333 | 681 | 1077 | - | - | - |
| Mov Cap-2 Maneuver | 450 | - | - | - | - | - |
| Stage 1 | 655 | - | - | - | - | - |
| Stage 2 | 653 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 20.7 | 2 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1077 | - | 491 | - | - |
| HCM Lane V/C Ratio | 0.075 | - | 0.542 | - | - |
| HCM Control Delay (s) | 8.6 | - | 20.7 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 3.2 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 63 | 5 | 30 | 12 | 8 | 33 | 37 | 173 | 3 | 8 | 188 | 41 |
| Future Vol, veh/h | 63 | 5 | 30 | 12 | 8 | 33 | 37 | 173 | 3 | 8 | 188 | 41 |
| Conflicting Peds, #/hr | 2 | 0 | 1 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 0 | 6 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| Heavy Vehicles, % | 0 | 0 | 7 | 8 | 0 | 3 | 3 | 7 | 33 | 12 | 5 | 5 |
| Mvmt Flow | 83 | 7 | 39 | 16 | 11 | 43 | 49 | 228 | 4 | 11 | 247 | 54 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 659 | 633 | 281 | 649 | 658 | 233 | 307 | 0 | 0 | 233 | 0 | 0 |
| Stage 1 | 302 | 302 | - | 329 | 329 | - | - | - | - | - | - | - |
| Stage 2 | 357 | 331 | - | 320 | 329 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.27 | 7.18 | 6.5 | 6.23 | 4.13 | - | - | 4.22 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.363 | 3.572 | 4 | 3.327 | 2.227 | - | - | 2.308 | - | - |
| Pot Cap-1 Maneuver | 380 | 400 | 746 | 375 | 387 | 804 | 1248 | - | - | 1278 | - | - |
| Stage 1 | 712 | 668 | - | 672 | 650 | - | - | - | - | - | - | - |
| Stage 2 | 665 | 649 | - | 679 | 650 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 337 | 378 | 741 | 338 | 366 | 802 | 1241 | - | - | 1277 | - | - |
| Mov Cap-2 Maneuver | 438 | 461 | - | 432 | 444 | - | - | - | - | - | - | - |
| Stage 1 | 680 | 658 | - | 645 | 624 | - | - | - | - | - | - | - |
| Stage 2 | 593 | 623 | - | 630 | 640 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 14.6 | 11.7 | 1.4 | 0.3 |
| HCM LOS | B | B | | |

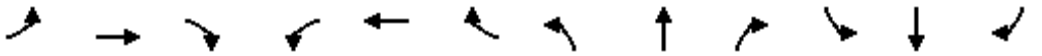
| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1241 | - | - | 502 | 610 | 1277 | - | - |
| HCM Lane V/C Ratio | 0.039 | - | - | 0.257 | 0.114 | 0.008 | - | - |
| HCM Control Delay (s) | 8 | - | - | 14.6 | 11.7 | 7.8 | - | - |
| HCM Lane LOS | A | - | - | B | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1 | 0.4 | 0 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 10.8 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 4 | 175 | 25 | 5 | 218 | 8 | 16 | 50 | 10 | 13 | 24 | 10 |
| Future Vol, veh/h | 4 | 175 | 25 | 5 | 218 | 8 | 16 | 50 | 10 | 13 | 24 | 10 |
| Peak Hour Factor | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| Heavy Vehicles, % | 25 | 5 | 12 | 0 | 7 | 0 | 6 | 8 | 10 | 0 | 8 | 10 |
| Mvmt Flow | 5 | 240 | 34 | 7 | 299 | 11 | 22 | 68 | 14 | 18 | 33 | 14 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 11.5 | 11 | 9.6 | 9.1 |
| HCM LOS | B | B | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 21% | 2% | 2% | 28% |
| Vol Thru, % | 66% | 86% | 94% | 51% |
| Vol Right, % | 13% | 12% | 3% | 21% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 76 | 204 | 231 | 47 |
| LT Vol | 16 | 4 | 5 | 13 |
| Through Vol | 50 | 175 | 218 | 24 |
| RT Vol | 10 | 25 | 8 | 10 |
| Lane Flow Rate | 104 | 279 | 316 | 64 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.158 | 0.394 | 0.412 | 0.098 |
| Departure Headway (Hd) | 5.471 | 5.072 | 4.684 | 5.506 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 649 | 704 | 763 | 655 |
| Service Time | 3.565 | 3.145 | 2.752 | 3.506 |
| HCM Lane V/C Ratio | 0.16 | 0.396 | 0.414 | 0.098 |
| HCM Control Delay | 9.6 | 11.5 | 11 | 9.1 |
| HCM Lane LOS | A | B | B | A |
| HCM 95th-tile Q | 0.6 | 1.9 | 2 | 0.3 |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 263 | 255 | 194 | 279 | 2 | 179 | 1 | 136 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 263 | 255 | 194 | 279 | 2 | 179 | 1 | 136 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 292 | 67 | 216 | 310 | 2 | 199 | 1 | 24 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 4 | 537 | 461 | 290 | 1020 | 7 | 432 | 12 | 287 | 321 | 351 | 0 |
| Arrive On Green | 0.00 | 0.29 | 0.29 | 0.16 | 0.56 | 0.56 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1812 | 12 | 1421 | 65 | 1555 | 859 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 292 | 67 | 216 | 0 | 312 | 199 | 0 | 25 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1620 | 859 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 5.6 | 1.3 | 4.8 | 0.0 | 3.7 | 5.5 | 0.0 | 0.5 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 5.6 | 1.3 | 4.8 | 0.0 | 3.7 | 5.6 | 0.0 | 0.5 | 0.6 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.96 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 537 | 461 | 290 | 0 | 1026 | 432 | 0 | 299 | 321 | 351 | 0 |
| V/C Ratio(X) | 0.00 | 0.54 | 0.15 | 0.74 | 0.00 | 0.30 | 0.46 | 0.00 | 0.08 | 0.01 | 0.02 | 0.00 |
| Avail Cap(c_a), veh/h | 653 | 2658 | 2281 | 1500 | 0 | 2633 | 1024 | 0 | 975 | 472 | 686 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 12.4 | 10.9 | 16.6 | 0.0 | 4.8 | 16.2 | 0.0 | 14.0 | 14.3 | 13.9 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 1.8 | 0.3 | 3.8 | 0.0 | 0.2 | 0.8 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 3.4 | 0.7 | 3.2 | 0.0 | 1.1 | 2.8 | 0.0 | 0.3 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 14.2 | 11.2 | 20.3 | 0.0 | 5.0 | 16.9 | 0.0 | 14.2 | 14.3 | 13.9 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | B | A |
| Approach Vol, veh/h | | 359 | | | 528 | | | 224 | | | 8 | |
| Approach Delay, s/veh | | 13.7 | | | 11.3 | | | 16.6 | | | 14.0 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 11.3 | 18.1 | | 12.2 | 0.0 | 29.4 | | 12.2 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 6.8 | 7.6 | | 2.6 | 0.0 | 5.7 | | 7.6 | | | | |
| Green Ext Time (p_c), s | 0.6 | 4.1 | | 0.0 | 0.0 | 1.8 | | 0.6 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 13.1 |
| HCM 6th LOS | | B |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 3 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 81 | 54 | 48 | 235 | 348 | 106 |
| Future Vol, veh/h | 81 | 54 | 48 | 235 | 348 | 106 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 0 | 0 | 1 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 4 | 4 | 0 | 0 | 1 | 3 |
| Mvmt Flow | 95 | 64 | 56 | 276 | 409 | 125 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 861 | 473 | 535 | 0 | - | 0 |
| Stage 1 | 473 | - | - | - | - | - |
| Stage 2 | 388 | - | - | - | - | - |
| Critical Hdwy | 6.44 | 6.24 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.44 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.44 | - | - | - | - | - |
| Follow-up Hdwy | 3.536 | 3.336 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 323 | 587 | 1043 | - | - | - |
| Stage 1 | 623 | - | - | - | - | - |
| Stage 2 | 681 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 305 | 586 | 1042 | - | - | - |
| Mov Cap-2 Maneuver | 426 | - | - | - | - | - |
| Stage 1 | 589 | - | - | - | - | - |
| Stage 2 | 680 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 16.2 | 1.5 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1042 | - | 478 | - | - |
| HCM Lane V/C Ratio | 0.054 | - | 0.332 | - | - |
| HCM Control Delay (s) | 8.7 | - | 16.2 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 1.4 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 64 | 8 | 32 | 6 | 3 | 8 | 36 | 211 | 9 | 32 | 264 | 106 |
| Future Vol, veh/h | 64 | 8 | 32 | 6 | 3 | 8 | 36 | 211 | 9 | 32 | 264 | 106 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 6 | 17 | 0 | 0 | 6 | 0 | 11 | 0 | 2 | 1 |
| Mvmt Flow | 75 | 9 | 38 | 7 | 4 | 9 | 42 | 248 | 11 | 38 | 311 | 125 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 799 | 798 | 380 | 812 | 855 | 254 | 441 | 0 | 0 | 259 | 0 | 0 |
| Stage 1 | 455 | 455 | - | 338 | 338 | - | - | - | - | - | - | - |
| Stage 2 | 344 | 343 | - | 474 | 517 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.26 | 7.27 | 6.5 | 6.2 | 4.16 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.354 | 3.653 | 4 | 3.3 | 2.254 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 306 | 321 | 658 | 281 | 298 | 790 | 1098 | - | - | 1317 | - | - |
| Stage 1 | 589 | 572 | - | 646 | 644 | - | - | - | - | - | - | - |
| Stage 2 | 676 | 641 | - | 544 | 537 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 284 | 298 | 654 | 247 | 277 | 790 | 1093 | - | - | 1317 | - | - |
| Mov Cap-2 Maneuver | 395 | 394 | - | 344 | 368 | - | - | - | - | - | - | - |
| Stage 1 | 564 | 553 | - | 621 | 620 | - | - | - | - | - | - | - |
| Stage 2 | 639 | 617 | - | 489 | 519 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 16 | 12.9 | 1.2 | 0.6 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1093 | - | - | 450 | 476 | 1317 | - | - |
| HCM Lane V/C Ratio | 0.039 | - | - | 0.272 | 0.042 | 0.029 | - | - |
| HCM Control Delay (s) | 8.4 | - | - | 16 | 12.9 | 7.8 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.1 | 0.1 | 0.1 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.6 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 113 | 9 | 12 | 110 | 22 | 13 | 43 | 9 | 11 | 53 | 4 |
| Future Vol, veh/h | 3 | 113 | 9 | 12 | 110 | 22 | 13 | 43 | 9 | 11 | 53 | 4 |
| Peak Hour Factor | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Heavy Vehicles, % | 0 | 4 | 11 | 0 | 3 | 0 | 8 | 7 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 4 | 141 | 11 | 15 | 138 | 28 | 16 | 54 | 11 | 14 | 66 | 5 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.6 | 8.7 | 8.5 | 8.4 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 20% | 2% | 8% | 16% |
| Vol Thru, % | 66% | 90% | 76% | 78% |
| Vol Right, % | 14% | 7% | 15% | 6% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 65 | 125 | 144 | 68 |
| LT Vol | 13 | 3 | 12 | 11 |
| Through Vol | 43 | 113 | 110 | 53 |
| RT Vol | 9 | 9 | 22 | 4 |
| Lane Flow Rate | 81 | 156 | 180 | 85 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.11 | 0.194 | 0.22 | 0.112 |
| Departure Headway (Hd) | 4.858 | 4.468 | 4.406 | 4.76 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 737 | 803 | 815 | 752 |
| Service Time | 2.894 | 2.495 | 2.434 | 2.795 |
| HCM Lane V/C Ratio | 0.11 | 0.194 | 0.221 | 0.113 |
| HCM Control Delay | 8.5 | 8.6 | 8.7 | 8.4 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.4 | 0.7 | 0.8 | 0.4 |

# Appendix C: ODOT Crash Data

OREGON DEPARTMENT OF TRANSPORTATION - POLICY, DATA AND ANALYSIS DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE



Intersectional Crashes at OR-47, Nehalem Hwy (#102) & Sunset Dr / NW Beal Rd in Washington County, OR.
January 1, 2016 through December 31, 2020

| COLLISION TYPE | FATAL CRASHES | NON-FATAL CRASHES | PROPERTY DAMAGE ONLY | TOTAL CRASHES | PEOPLE KILLED | PEOPLE INJURED | TRUCKS | DRY SURF | WET SURF | DAY | DARK | INTER-SECTION | INTER-SECTION RELATED | OFF-ROAD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR: 2020 | | | | | | | | | | | | | | |
| REAR-END | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| TURNING MOVEMENTS | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 0 |
| 2020 TOTAL | 0 | 2 | 1 | 3 | 0 | 3 | 0 | 2 | 1 | 2 | 1 | 3 | 0 | 0 |
| YEAR: 2019 | | | | | | | | | | | | | | |
| FIXED / OTHER OBJECT | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 2019 TOTAL | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| YEAR: 2018 | | | | | | | | | | | | | | |
| TURNING MOVEMENTS | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 2018 TOTAL | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| YEAR: 2017 | | | | | | | | | | | | | | |
| TURNING MOVEMENTS | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 2017 TOTAL | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| YEAR: 2016 | | | | | | | | | | | | | | |
| REAR-END | 0 | 2 | 0 | 2 | 0 | 5 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| 2016 TOTAL | 0 | 2 | 0 | 2 | 0 | 5 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| FINAL TOTAL | 0 | 5 | 3 | 8 | 0 | 9 | 0 | 7 | 1 | 7 | 1 | 8 | 0 | 1 |

***Disclaimers:*** *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

*A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.*

102 NEHALEM Intersectional Crashes at OR-47, Nehalem Hwy (#102) & Sunset Dr / NW Beal Rd in Washington County, OR.
January 1, 2016 through December 31, 2020

| SER# / INVEST / UNLOC? | SPE | DEL | RUG | AMC | SHJ | WOR | DATE / DAY/TIME / *LAT/LONG* | COUNTY / CITY / URBAN AREA | RD# / CMPT/MILEPNT / LRS | FC / MLG / PNT | CONN # / FIRST STREET / SECOND STREET / INTERSECTION SEQ# | RD CHAR / DIRECT / LOCTN | INT-TYP (MEDIAN) / LEGS (#LANES) | INT-REL / TRAF-CNTL | OFFRD / RNDBT / DRVWY | WTHR / SURF / LIGHT | CRASH TYP / COLL TYP / SVRTY | V# | SPCL USE / TRLR QTY / OWNER / VEH TYPE | MOVE / FROM / TO | P# | PRTC TYPE | INJ SVRTY | AGE | SEX | LICNS / RES | PED LOC | ERROR | ACTN | EVENT | CAUSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01619 | N | N | N | N | N | N | 04/10/2020 | WASHINGTON | 1 | 14 | | INTER | CROSS | N | | N | CLR | S-1STOP | 01 | NONE | 9 | STRGHT | | | | | | | | | 27,29 |
| COUNTY | | N | | | | | Fri 2P | | MN 0 | | NW SUNSET DR | N | | TRF SIGNAL | | N | DRY | REAR | | N/A | N S | | | | | | | | 000 | | 00 |
| | | | | | | | | PORTLAND UA | 88.93 | | NW NEHALEM HY | 06 | 0 | | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK | | 000 | 000 | | 00 |
| No | | | | | | | *45 32 7.21 -123* | *6 22.36* | 010200100S00 | | 1 | | | | | | | | | | | | | | | | | UNK | | | | | |
| | | | | | | | | | | | | | | | | | | | 02 | NONE | 9 | STOP | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | N/A | N S | | | | | | | | 011 | | 00 |
| | | | | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | UNK | | | | | |
| 03292 | N | N | N | N | N | N | 05/19/2016 | WASHINGTON | 1 | 14 | | INTER | CROSS | N | | N | CLD | S-1STOP | 01 | NONE | 0 | STRGHT | | | | | | | | | 07 |
| CITY | | N | | | | | Thu 6P | | MN 0 | | | E | | TRF SIGNAL | | N | DRY | REAR | | PRVTE | E W | | | | | | | | 000 | | 00 |
| | | | | | | | | PORTLAND UA | 88.93 | | | 06 | 1 | | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | INJC | 35 | F | OR-Y | | 043 | 000 | | 07 |
| No | | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | | | OR<25 | | | | | |
| | | | | | | | | | | | | | | | | | | | 02 | NONE | 0 | STOP | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | PRVTE | E W | | | | | | | | 011 | | 00 |
| | | | | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | INJC | 42 | F | OR-Y | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | OR<25 | | | | | |
| 02842 | N | N | N | N | N | N | 05/01/2016 | WASHINGTON | 1 | 14 | | INTER | CROSS | N | | N | CLR | S-1STOP | 01 | NONE | 0 | STRGHT | | | | | | | | | 29,32 |
| CITY | | N | | | | | Sun 7P | | MN 0 | | | S | | TRF SIGNAL | | N | DRY | REAR | | PRVTE | S N | | | | | | | | 000 | | 00 |
| | | | | | | | | PORTLAND UA | 88.93 | | | 06 | 1 | | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | NONE | 74 | F | OR-Y | | 026,052 | 000 | | 29,32 |
| No | | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | | | OR>25 | | | | | |
| | | | | | | | | | | | | | | | | | | | 02 | NONE | 0 | STOP | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | PRVTE | S N | | | | | | | | 011 | | 00 |
| | | | | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | INJA | 47 | M | OR-Y | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | OR>25 | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | 02 | PSNG | INJC | 43 | F | | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | | | | | | | | 03 | PSNG | INJC | 08 | F | | | 000 | 000 | | 00 |
| 01060 | N | N | N | N | N | N | 03/01/2019 | WASHINGTON | 1 | 14 | | INTER | CROSS | N | | Y | CLR | FIX OBJ | 01 | NONE | 9 | TURN-L | | | | | | | | | 052,079,010 | 08 |
| STATE | | N | | | | | Fri 4P | | MN 0 | | | W | | TRF SIGNAL | | N | DRY | FIX | | N/A | S W | | | | | | | | 000 | | 00 |
| | | | | | | | | PORTLAND UA | 88.93 | | | 05 | 1 | | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK | | 000 | 000 | | 00 |
| No | | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | | | UNK | | | | | |
| 00166 | Y | N | N | | | | 01/09/2020 | WASHINGTON | 1 | 14 | | INTER | CROSS | N | | N | RAIN | ANGL-OTH | 01 | NONE | 0 | TURN-R | | | | | | | | | 01,32 |
| CITY | | N | | | | | Thu 3P | | MN 0 | | | W | | TRF SIGNAL | | N | WET | TURN | | PRVTE | N W | | | | | | | | 000 | | 00 |
| | | | | | | | | PORTLAND UA | 88.93 | | | 06 | 1 | | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | NONE | 27 | M | OR-Y | | 047,052 | 017 | | 01,32 |
| No | | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | | | OR<25 | | | | | |
| | | | | | | | | | | | | | | | | | | | 02 | NONE | 0 | STRGHT | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | PRVTE | W E | | | | | | | | 000 | | 00 |
| | | | | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | INJC | 61 | M | OR-Y | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | OR<25 | | | | | |

102 NEHALEM Intersectional Crashes at OR-47, Nehalem Hwy (#102) & Sunset Dr / NW Beal Rd in Washington County, OR.
January 1, 2016 through December 31, 2020

| SER# / INVEST / UNLOC? | SPED | ALC | DRUG / MJ | SCHL | WORK | DATE / DAY/TIME / *LAT/LONG* | COUNTY / CITY / URBAN AREA | RD# / CMPT/MILEPNT / LRS | FC / CONN # / FIRST STREET / SECOND STREET / INTERSECTION SEQ# | RD CHAR / DIRECT / LOCTN | INT-TYP (MEDIAN) / LEGS (#LANES) | INT-REL / TRAF- / CNTL | OFFRD / RNDBT / DRVWY | WTHR / SURF / LIGHT | CRASH TYP / COLL TYP / SVRTY | V# | SPCL USE / TRLR QTY / OWNER / VEH TYPE | MOVE / FROM / TO | P# | PRTC TYPE | INJ SVRTY | AGE | SEX | LICNS RES | PED LOC | ERROR | ACTN EVENT | CAUSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07207 | N | N | N | | | 11/13/2017 | WASHINGTON | 1 14 | | INTER | CROSS | N | N | CLR | O-1 L-TURN | 01 | NONE 0 | STRGHT | | | | | | | | | | 02 |
| NONE | | | N | | | Mon 1P | | MN 0 | | CN | | TRF SIGNAL | N | DRY | TURN | | PRVTE | N S | | | | | | | | | 000 | 00 |
| | | | | | | | PORTLAND UA | 88.93 | | 01 | 1 | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | INJC | 75 | M | OR-Y | | 000 | 000 | 00 |
| No | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | OR<25 | | | | |
| | | | | | | | | | | | | | | | | 02 | NONE 0 | TURN-L | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | PRVTE | S W | | | | | | | | | 000 | 00 |
| | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 16 | F | OR-Y | | 028 | 000 | 02 |
| | | | | | | | | | | | | | | | | | | | | | | | | OR<25 | | | | |
| 06483 | N | N | N | | | 11/19/2018 | WASHINGTON | 1 14 | | INTER | CROSS | N | N | CLR | O-1 L-TURN | 01 | NONE 9 | TURN-L | | | | | | | | | | 02 |
| NONE | | | N | | | Mon 11A | | MN 0 | | CN | | TRF SIGNAL | N | DRY | TURN | | N/A | W N | | | | | | | | | 000 | 00 |
| | | | | | | | PORTLAND UA | 88.93 | | 02 | 1 | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK | | 000 | 000 | 00 |
| No | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | UNK | | | | |
| | | | | | | | | | | | | | | | | 02 | NONE 9 | STRGHT | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | N/A | E W | | | | | | | | | 000 | 00 |
| | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK | | 000 | 000 | 00 |
| | | | | | | | | | | | | | | | | | | | | | | | | UNK | | | | |
| 04451 | N | N | N | N | N | 12/03/2020 | WASHINGTON | 1 14 | | INTER | CROSS | N | N | CLR | O-1 L-TURN | 01 | NONE 0 | STRGHT | | | | | | | | | | 02 |
| COUNTY | | | N | | | Thu 8P | | MN 0 | | CN | | TRF SIGNAL | N | DRY | TURN | | PRVTE | E W | | | | | | | | | 000 | 00 |
| | | | | | | | PORTLAND UA | 88.93 | | 02 | 1 | | N | DARK | INJ | | PSNGR CAR | | 01 | DRVR | INJC | 55 | M | OR-Y | | 000 | 000 | 00 |
| No | | | | | | *45 32 7.21 -123* | *6 22.35* | 010200100S00 | | | | | | | | | | | | | | | | | OR<25 | | | | |
| | | | | | | | | | | | | | | | | 02 | NONE 0 | TURN-L | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | PRVTE | W N | | | | | | | | | 000 | 00 |
| | | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | INJC | 34 | F | OTH-Y | | 004,028 | 000 | 02 |
| | | | | | | | | | | | | | | | | | | | | | | | | OR<25 | | | | |

OREGON DEPARTMENT OF TRANSPORTATION - POLICY, DATA AND ANALYSIS DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE



Intersectional Crashes at Sunset Dr & Bonnie Ln in Forest Grove, OR.
January 1, 2016 through December 31, 2020

| COLLISION TYPE | FATAL CRASHES | NON-FATAL CRASHES | PROPERTY DAMAGE ONLY | TOTAL CRASHES | PEOPLE KILLED | PEOPLE INJURED | TRUCKS | DRY SURF | WET SURF | DAY | DARK | INTER-SECTION | INTER-SECTION RELATED | OFF-ROAD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR: 2019 | | | | | | | | | | | | | | |
| TURNING MOVEMENTS | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 2019 TOTAL | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| YEAR: 2017 | | | | | | | | | | | | | | |
| TURNING MOVEMENTS | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 2017 TOTAL | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| FINAL TOTAL | 0 | 1 | 1 | 2 | 0 | 1 | 1 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |

***Disclaimers:*** *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

*A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.*

CITY OF FOREST GROVE, WASHINGTON COUNTY

Intersectional Crashes at Sunset Dr & Bonnie Ln in Forest Grove, OR.
January 1, 2016 through December 31, 2020

| SER# / INVEST / UNLOC? | SPED | ALC | DRUG/MJ | SCHL | WORK | DATE / DAY/TIME / *LAT/LONG* | FC / DISTNC | CITY STREET / FIRST STREET / SECOND STREET / INTERSECTION SEQ # | RD CHAR / DIRECT / LOCTN | INT-TYP (MEDIAN) / LEGS / (#LANES) | INT-REL / TRAF- / CONTL | OFF-RD / RNDBT / DRVWY | WTHR / SURF / LIGHT | CRASH TYP / COLL TYP / SVRTY | V# | SPCL USE / TRLR QTY / OWNER | MOVE / FROM / TO | P# | PRTC TYPE | INJ SVRTY | AGE | SEX | LICNS RES | PED LOC | ERROR | ACTN | EVENT | CAUSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02726 | N | N | N | N | N | 05/10/2017 | 17 | BONNIE LN | INTER | 3-LEG | N | N | CLR | ANGL-OTH | 01 | NONE 0 | TURN-L | | | | | | | | | | | 02 |
| CITY | | | N | | | Wed 9A | 0 | SUNSET DR | CN | | STOP SIGN | N | DRY | TURN | | PRVTE | W N | | | | | | | | | | | 00 |
| No | *45 31 59.14* | | | | | *-123 6 27.73* | | 1 | 03 | 0 | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | INJB | 30 | F | OR-Y OR<25 | | 028 | 000 | | 02 |
| | | | | | | | | | | | | | | | 02 | NONE 0 | STRGHT | | | | | | | | | | | 00 |
| | | | | | | | | | | | | | | | | PRVTE | N S | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | TRUCK | | 01 | DRVR | NONE | 52 | M | OR-Y OR>25 | | 000 | 000 | | 00 |
| 02229 | N | N | N | N | N | 05/04/2019 | 17 | BONNIE LN | INTER | 3-LEG | N | N | CLR | ANGL-OTH | 01 | NONE 9 | TURN-L | | | | | | | | | | | 03 |
| CITY | | | N | | | Sat 7A | 0 | SUNSET DR | CN | | STOP SIGN | N | DRY | TURN | | N/A | W N | | | | | | | | | | | 00 |
| No | *45 31 59.14* | | | | | *-123 6 27.73* | | 1 | 03 | 0 | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | 02 | NONE 9 | STRGHT | | | | | | | | | | | 00 |
| | | | | | | | | | | | | | | | | N/A | N S | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |

OREGON DEPARTMENT OF TRANSPORTATION - POLICY, DATA AND ANALYSIS DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at Sunset Dr & Willamina Ave in Forest Grove, OR.
January 1, 2016 through December 31, 2020

| COLLISION TYPE | FATAL CRASHES | NON-FATAL CRASHES | PROPERTY DAMAGE ONLY | TOTAL CRASHES | PEOPLE KILLED | PEOPLE INJURED | TRUCKS | DRY SURF | WET SURF | DAY | DARK | INTER-SECTION | INTER-SECTION RELATED | OFF-ROAD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR: 2020 | | | | | | | | | | | | | | |
| ANGLE | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| TURNING MOVEMENTS | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 2020 TOTAL | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| YEAR: 2018 | | | | | | | | | | | | | | |
| TURNING MOVEMENTS | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 2018 TOTAL | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| YEAR: 2016 | | | | | | | | | | | | | | |
| ANGLE | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| TURNING MOVEMENTS | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 0 |
| 2016 TOTAL | 0 | 1 | 2 | 3 | 0 | 1 | 0 | 2 | 1 | 3 | 0 | 3 | 0 | 0 |
| FINAL TOTAL | 0 | 3 | 3 | 6 | 0 | 4 | 0 | 5 | 1 | 6 | 0 | 6 | 0 | 0 |

***Disclaimers:*** *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

*A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.*

CITY OF FOREST GROVE, WASHINGTON COUNTY

Intersectional Crashes at Sunset Dr & Willamina Ave in Forest Grove, OR.
January 1, 2016 through December 31, 2020

| SER# / INVEST / UNLOC? | SPED | ALC | DRUG/MJ | SCHL | WORK | DATE / DAY/TIME / *LAT/LONG* | FC / DISTNC | CITY STREET / FIRST STREET / SECOND STREET / INTERSECTION SEQ # | RD CHAR / DIRECT / LOCTN | INT-TYP (MEDIAN) / LEGS (#LANES) | INT-REL / TRAF- / CONTL | OFF-RD / RNDBT / DRVWY | WTHR / SURF / LIGHT | CRASH TYP / COLL TYP / SVRTY | V# | SPCL USE / TRLR QTY / OWNER | MOVE / FROM / TO | P# | PRTC TYPE | INJ SVRTY | AGE | SEX | LICNS RES | PED LOC | ERROR | ACTN | EVENT | CAUSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02234 | N | N | N | N | N | 04/05/2016 | 17 | SUNSET DR | INTER | CROSS | N | N | CLD | ANGL-OTH | 01 | NONE 0 | TURN-L | | | | | | | | | | | 03 |
| CITY | | N | | | | Tue 7A | 0 | WILLAMINA AVE | CN | | STOP SIGN | N | DRY | TURN | | PRVTE | E S | | | | | | | | | 000 | | 00 |
| No | *45 31 50.19* | | *-123 6 27.13* | | | | | 1 | 01 | 0 | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | NONE | 25 | F | OR-Y OR<25 | | 021 | 000 | | 03 |
| | | | | | | | | | | | | | | | 02 | NONE 0 | STRGHT | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | PRVTE | N S | | | | | | | | | 000 | | 00 |
| | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | INJC | 24 | M | OR-Y OR>25 | | 000 | 000 | | 00 |
| 06767 | N | N | N | N | N | 10/06/2016 | 17 | SUNSET DR | INTER | CROSS | N | N | RAIN | ANGL-OTH | 01 | NONE 9 | STRGHT | | | | | | | | | | | 03 |
| CITY | | N | | | | Thu 5P | 0 | WILLAMINA AVE | CN | | STOP SIGN | N | WET | ANGL | | N/A | N S | | | | | | | | | 000 | | 00 |
| No | *45 31 50.19* | | *-123 6 27.13* | | | | | 1 | 01 | 0 | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | 02 | NONE 9 | STRGHT | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | N/A | E W | | | | | | | | | 000 | | 00 |
| | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |
| 03536 | N | N | N | N | N | 09/29/2020 | 17 | SUNSET DR | INTER | CROSS | N | N | CLR | ANGL-OTH | 01 | NONE 0 | STRGHT | | | | | | | | | | | 27,02 |
| CITY | | N | | | | Tue 3P | 0 | WILLAMINA AVE | CN | | STOP SIGN | N | DRY | ANGL | | PRVTE | N S | | | | | | | | | 000 | | 00 |
| No | *45 31 50.19* | | *-123 6 27.13* | | | | | 1 | 01 | 0 | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | INJC | 43 | F | NONE OR<25 | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | 02 | NONE 0 | STRGHT | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | PRVTE | E W | | | | | | | | | 015 | | 00 |
| | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | INJC | 19 | F | OR-Y OR<25 | | 016,028 | 038 | | 27,02 |
| 01506 | N | N | N | N | N | 03/07/2016 | 17 | SUNSET DR | INTER | CROSS | N | N | CLR | O-1 L-TURN | 01 | NONE 9 | STRGHT | | | | | | | | | | | 03 |
| CITY | | N | | | | Mon 10A | 0 | WILLAMINA AVE | CN | | STOP SIGN | N | DRY | TURN | | N/A | E W | | | | | | | | | 000 | | 00 |
| No | *45 31 50.19* | | *-123 6 27.13* | | | | | 1 | 02 | 0 | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |
| | | | | | | | | | | | | | | | 02 | NONE 9 | TURN-L | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | N/A | W N | | | | | | | | | 000 | | 00 |
| | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |
| 03013 | N | N | N | N | N | 08/20/2020 | 17 | SUNSET DR | INTER | CROSS | N | N | CLR | BIKE | 01 | NONE 0 | TURN-L | | | | | | | | | | | 02 |
| CITY | | N | | | | Thu 9A | 0 | WILLAMINA AVE | CN | | STOP SIGN | N | DRY | TURN | | PRVTE | W N | | | | | | | | | 015 | | 00 |
| No | *45 31 50.19* | | *-123 6 27.13* | | | | | 1 | 02 | 0 | | N | DAY | INJ | | PSNGR CAR | | 01 | DRVR | NONE | 24 | M | OR-Y OR<25 | | 027 | 000 | | 02 |
| | | | | | | | | | | | | | | | | | STRGHT | 01 | BIKE | INJB | 79 | M | | 02 | 000 | 035 | | 00 |
| | | | | | | | | | | | | | | | | | E W | | | | | | | | | | | |
| 06865 | N | N | N | | | 12/13/2018 | 17 | SUNSET DR | INTER | CROSS | N | N | CLR | ANGL-OTH | 01 | NONE 9 | STRGHT | | | | | | | | | | | 02 |
| NONE | | N | | | | Thu 8A | 0 | WILLAMINA AVE | CN | | STOP SIGN | N | DRY | TURN | | N/A | N S | | | | | | | | | 000 | | 00 |
| No | *45 31 50.19* | | *-123 6 27.13* | | | | | 1 | 03 | 0 | | N | DAY | PDO | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK UNK | | 000 | 000 | | 00 |

CITY OF FOREST GROVE, WASHINGTON COUNTY

Intersectional Crashes at Sunset Dr & Willamina Ave in Forest Grove, OR.
January 1, 2016 through December 31, 2020

| SER# / INVEST / UNLOC? | SPED | ALC | DRUG/MJ | SCHL | WORK | DATE / DAY/TIME / *LAT/LONG* | FC / DISTNC | CITY STREET / FIRST STREET / SECOND STREET / INTERSECTION SEQ # | RD CHAR / DIRECT / LOCTN | INT-TYP (MEDIAN) / LEGS (#LANES) | INT-REL / TRAF- / CONTL | OFF-RD / RNDBT / DRVWY | WTHR / SURF / LIGHT | CRASH TYP / COLL TYP / SVRTY | V# | SPCL USE / TRLR QTY / OWNER | MOVE / FROM / TO | P# | PRTC TYPE | INJ SVRTY | AGE | SEX | LICNS RES | PED LOC | ERROR | ACTN | EVENT | CAUSE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | 02 | NONE 9<br>N/A | TURN-L<br>W N | | | | | | | | | 000 | | 00 |
| | | | | | | | | | | | | | | | | PSNGR CAR | | 01 | DRVR | NONE | 00 | U | UNK<br>UNK | | 000 | 000 | | 00 |

OREGON DEPARTMENT OF TRANSPORTATION - POLICY, DATA AND ANALYSIS DIVISION
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE



Intersectional Crashes at Main St & Bonnie Ln in Forest Grove, OR.
January 1, 2016 through December 31, 2020

| COLLISION TYPE | FATAL CRASHES | NON-FATAL CRASHES | PROPERTY DAMAGE ONLY | TOTAL CRASHES | PEOPLE KILLED | PEOPLE INJURED | TRUCKS | DRY SURF | WET SURF | DAY | DARK | INTER-SECTION | INTER-SECTION RELATED | OFF-ROAD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR: | | | | | | | | | | | | | | |
| TOTAL | | | | | | | | | | | | | | |
| FINAL TOTAL | | | | | | | | | | | | | | |

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**ACTION CODE TRANSLATION LIST**

| ACTION CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| 000 | NONE | NO ACTION OR NON-WARRANTED |
| 001 | SKIDDED | SKIDDED |
| 002 | ON/OFF V | GETTING ON OR OFF STOPPED OR PARKED VEHICLE |
| 003 | LOAD OVR | OVERHANGING LOAD STRUCK ANOTHER VEHICLE, ETC. |
| 006 | SLOW DN | SLOWED DOWN |
| 007 | AVOIDING | AVOIDING MANEUVER |
| 008 | PAR PARK | PARALLEL PARKING |
| 009 | ANG PARK | ANGLE PARKING |
| 010 | INTERFERE | PASSENGER INTERFERING WITH DRIVER |
| 011 | STOPPED | STOPPED IN TRAFFIC NOT WAITING TO MAKE A LEFT TURN |
| 012 | STP/L TRN | STOPPED BECAUSE OF LEFT TURN SIGNAL OR WAITING, ETC. |
| 013 | STP TURN | STOPPED WHILE EXECUTING A TURN |
| 014 | EMR V PKD | EMERGENCY VEHICLE LEGALLY PARKED IN THE ROADWAY |
| 015 | GO A/STOP | PROCEED AFTER STOPPING FOR A STOP SIGN/FLASHING RED. |
| 016 | TRN A/RED | TURNED ON RED AFTER STOPPING |
| 017 | LOSTCTRL | LOST CONTROL OF VEHICLE |
| 018 | EXIT DWY | ENTERING STREET OR HIGHWAY FROM ALLEY OR DRIVEWAY |
| 019 | ENTR DWY | ENTERING ALLEY OR DRIVEWAY FROM STREET OR HIGHWAY |
| 020 | STR ENTR | BEFORE ENTERING ROADWAY, STRUCK PEDESTRIAN, ETC. ON SIDEWALK OR SHOULDER |
| 021 | NO DRVR | CAR RAN AWAY - NO DRIVER |
| 022 | PREV COL | STRUCK, OR WAS STRUCK BY, VEHICLE OR PEDESTRIAN IN PRIOR COLLISION BEFORE ACC. STABILIZED |
| 023 | STALLED | VEHICLE STALLED OR DISABLED |
| 024 | DRVR DEAD | DEAD BY UNASSOCIATED CAUSE |
| 025 | FATIGUE | FATIGUED, SLEEPY, ASLEEP |
| 026 | SUN | DRIVER BLINDED BY SUN |
| 027 | HDLGHTS | DRIVER BLINDED BY HEADLIGHTS |
| 028 | ILLNESS | PHYSICALLY ILL |
| 029 | THRU MED | VEHICLE CROSSED, PLUNGED OVER, OR THROUGH MEDIAN BARRIER |
| 030 | PURSUIT | PURSUING OR ATTEMPTING TO STOP A VEHICLE |
| 031 | PASSING | PASSING SITUATION |
| 032 | PRKOFFRD | VEHICLE PARKED BEYOND CURB OR SHOULDER |
| 033 | CROS MED | VEHICLE CROSSED EARTH OR GRASS MEDIAN |
| 034 | X N/SGNL | CROSSING AT INTERSECTION - NO TRAFFIC SIGNAL PRESENT |
| 035 | X W/ SGNL | CROSSING AT INTERSECTION - TRAFFIC SIGNAL PRESENT |
| 036 | DIAGONAL | CROSSING AT INTERSECTION - DIAGONALLY |
| 037 | BTWN INT | CROSSING BETWEEN INTERSECTIONS |
| 038 | DISTRACT | DRIVER'S ATTENTION DISTRACTED |
| 039 | W/TRAF-S | WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC |
| 040 | A/TRAF-S | WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC |
| 041 | W/TRAF-P | WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC |
| 042 | A/TRAF-P | WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC |
| 043 | PLAYINRD | PLAYING IN STREET OR ROAD |
| 044 | PUSH MV | PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER |
| 045 | WORK ON | WORKING IN ROADWAY OR ALONG SHOULDER |
| 046 | W/ TRAFIC | NON-MOTORIST WALKING, RUNNING, RIDING, ETC. WITH TRAFFIC |
| 047 | A/ TRAFIC | NON-MOTORIST WALKING, RUNNING, RIDING, ETC. FACING TRAFFIC |
| 050 | LAY ON RD | STANDING OR LYING IN ROADWAY |
| 051 | ENT OFFRD | ENTERING / STARTING IN TRAFFIC LANE FROM OFF ROAD |
| 052 | MERGING | MERGING |

**ACTION CODE TRANSLATION LIST**

| ACTION CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| 055 | SPRAY | BLINDED BY WATER SPRAY |
| 088 | OTHER | OTHER ACTION |
| 099 | UNK | UNKNOWN ACTION |

## CAUSE CODE TRANSLATION LIST

| CAUSE CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| 00 | NO CODE | NO CAUSE ASSOCIATED AT THIS LEVEL |
| 01 | TOO-FAST | TOO FAST FOR CONDITIONS (NOT EXCEED POSTED SPEED |
| 02 | NO-YIELD | DID NOT YIELD RIGHT-OF-WAY |
| 03 | PAS-STOP | PASSED STOP SIGN OR RED FLASHER |
| 04 | DIS SIG | DISREGARDED TRAFFIC SIGNAL |
| 05 | LEFT-CTR | DROVE LEFT OF CENTER ON TWO-WAY ROAD; STRADDLING |
| 06 | IMP-OVER | IMPROPER OVERTAKING |
| 07 | TOO-CLOS | FOLLOWED TOO CLOSELY |
| 08 | IMP-TURN | MADE IMPROPER TURN |
| 09 | DRINKING | ALCOHOL OR DRUG INVOLVED |
| 10 | OTHR-IMP | OTHER IMPROPER DRIVING |
| 11 | MECH-DEF | MECHANICAL DEFECT |
| 12 | OTHER | OTHER (NOT IMPROPER DRIVING) |
| 13 | IMP LN C | IMPROPER CHANGE OF TRAFFIC LANES |
| 14 | DIS TCD | DISREGARDED OTHER TRAFFIC CONTROL DEVICE |
| 15 | WRNG WAY | WRONG WAY ON ONE-WAY ROAD; WRONG SIDE DIVIDED RO |
| 16 | FATIGUE | DRIVER DROWSY/FATIGUED/SLEEPY |
| 17 | ILLNESS | PHYSICAL ILLNESS |
| 18 | IN RDWY | NON-MOTORIST ILLEGALLY IN ROADWAY |
| 19 | NT VISBL | NON-MOTORIST NOT VISIBLE; NON-REFLECTIVE CLOTHIN |
| 20 | IMP PKNG | VEHICLE IMPROPERLY PARKED |
| 21 | DEF STER | DEFECTIVE STEERING MECHANISM |
| 22 | DEF BRKE | INADEQUATE OR NO BRAKES |
| 24 | LOADSHFT | VEHICLE LOST LOAD OR LOAD SHIFTED |
| 25 | TIREFAIL | TIRE FAILURE |
| 26 | PHANTOM | PHANTOM / NON-CONTACT VEHICLE |
| 27 | INATTENT | INATTENTION |
| 28 | NM INATT | NON-MOTORIST INATTENTION |
| 29 | F AVOID | FAILED TO AVOID VEHICLE AHEAD |
| 30 | SPEED | DRIVING IN EXCESS OF POSTED SPEED |
| 31 | RACING | SPEED RACING (PER PAR) |
| 32 | CARELESS | CARELESS DRIVING (PER PAR) |
| 33 | RECKLESS | RECKLESS DRIVING (PER PAR) |
| 34 | AGGRESV | AGGRESSIVE DRIVING (PER PAR) |
| 35 | RD RAGE | ROAD RAGE (PER PAR) |
| 40 | VIEW OBS | VIEW OBSCURED |
| 50 | USED MDN | IMPROPER USE OF MEDIAN OR SHOULDER |
| 51 | FAIL LN | FAILED TO MAINTAIN LANE |
| 52 | OFF RD | RAN OFF ROAD |

## COLLISION TYPE CODE TRANSLATION LIST

| COLL CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| & | OTH | MISCELLANEOUS |
| - | BACK | BACKING |
| 0 | PED | PEDESTRIAN |
| 1 | ANGL | ANGLE |
| 2 | HEAD | HEAD-ON |
| 3 | REAR | REAR-END |
| 4 | SS-M | SIDESWIPE - MEETING |
| 5 | SS-O | SIDESWIPE - OVERTAKING |
| 6 | TURN | TURNING MOVEMENT |
| 7 | PARK | PARKING MANEUVER |
| 8 | NCOL | NON-COLLISION |
| 9 | FIX | FIXED OBJECT OR OTHER OBJECT |

## CRASH TYPE CODE TRANSLATION LIST

| CRASH TYPE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| & | OVERTURN | OVERTURNED |
| 0 | NON-COLL | OTHER NON-COLLISION |
| 1 | OTH RDWY | MOTOR VEHICLE ON OTHER ROADWAY |
| 2 | PRKD MV | PARKED MOTOR VEHICLE |
| 3 | PED | PEDESTRIAN |
| 4 | TRAIN | RAILWAY TRAIN |
| 6 | BIKE | PEDALCYCLIST |
| 7 | ANIMAL | ANIMAL |
| 8 | FIX OBJ | FIXED OBJECT |
| 9 | OTH OBJ | OTHER OBJECT |
| A | ANGL-STP | ENTERING AT ANGLE - ONE VEHICLE STOPPED |
| B | ANGL-OTH | ENTERING AT ANGLE - ALL OTHERS |
| C | S-STRGHT | FROM SAME DIRECTION - BOTH GOING STRAIGHT |
| D | S-1TURN | FROM SAME DIRECTION - ONE TURN, ONE STRAIGHT |
| E | S-1STOP | FROM SAME DIRECTION - ONE STOPPED |
| F | S-OTHER | FROM SAME DIRECTION-ALL OTHERS, INCLUDING PARKING |
| G | O-STRGHT | FROM OPPOSITE DIRECTION - BOTH GOING STRAIGHT |
| H | O-1 L-TURN | FROM OPPOSITE DIRECTION-ONE LEFT TURN,ONE STRAIGHT |
| I | O-1STOP | FROM OPPOSITE DIRECTION - ONE STOPPED |
| J | O-OTHER | FROM OPPOSITE DIRECTION-ALL OTHERS INCL. PARKING |

## DRIVER LICENSE CODE TRANSLATION LIST

| LIC CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | NONE | NOT LICENSED (HAD NEVER BEEN LICENSED) |
| 1 | OR-Y | VALID OREGON LICENSE |
| 2 | OTH-Y | VALID LICENSE, OTHER STATE OR COUNTRY |
| 3 | SUSP | SUSPENDED/REVOKED |
| 4 | EXP | EXPIRED |
| 8 | N-VAL | OTHER NON-VALID LICENSE |
| 9 | UNK | UNKNOWN IF DRIVER WAS LICENSED AT TIME OF CRASH |

## DRIVER RESIDENCE CODE TRANSLATION LIST

| RES CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 1 | OR<25 | OREGON RESIDENT WITHIN 25 MILE OF HOME |
| 2 | OR>25 | OREGON RESIDENT 25 OR MORE MILES FROM HOME |
| 3 | OR-? | OREGON RESIDENT - UNKNOWN DISTANCE FROM HOME |
| 4 | N-RES | NON-RESIDENT |
| 9 | UNK | UNKNOWN IF OREGON RESIDENT |

## ERROR CODE TRANSLATION LIST

| ERROR CODE | SHORT DESCRIPTION | FULL DESCRIPTION |
|---|---|---|
| 000 | NONE | NO ERROR |
| 001 | WIDE TRN | WIDE TURN |
| 002 | CUT CORN | CUT CORNER ON TURN |
| 003 | FAIL TRN | FAILED TO OBEY MANDATORY TRAFFIC TURN SIGNAL, SIGN OR LANE MARKINGS |
| 004 | L IN TRF | LEFT TURN IN FRONT OF ONCOMING TRAFFIC |
| 005 | L PROHIB | LEFT TURN WHERE PROHIBITED |
| 006 | FRM WRNG | TURNED FROM WRONG LANE |
| 007 | TO WRONG | TURNED INTO WRONG LANE |
| 008 | ILLEG U | U-TURNED ILLEGALLY |
| 009 | IMP STOP | IMPROPERLY STOPPED IN TRAFFIC LANE |
| 010 | IMP SIG | IMPROPER SIGNAL OR FAILURE TO SIGNAL |
| 011 | IMP BACK | BACKING IMPROPERLY (NOT PARKING) |
| 012 | IMP PARK | IMPROPERLY PARKED |
| 013 | UNPARK | IMPROPER START LEAVING PARKED POSITION |
| 014 | IMP STRT | IMPROPER START FROM STOPPED POSITION |
| 015 | IMP LGHT | IMPROPER OR NO LIGHTS (VEHICLE IN TRAFFIC) |
| 016 | INATTENT | INATTENTION (FAILURE TO DIM LIGHTS PRIOR TO 4/1/97) |
| 017 | UNSF VEH | DRIVING UNSAFE VEHICLE (NO OTHER ERROR APPARENT) |
| 018 | OTH PARK | ENTERING/EXITING PARKED POSITION W/ INSUFFICIENT CLEARANCE; OTHER IMPROPER PARKING MANEUVER |
| 019 | DIS DRIV | DISREGARDED OTHER DRIVER'S SIGNAL |
| 020 | DIS SGNL | DISREGARDED TRAFFIC SIGNAL |
| 021 | RAN STOP | DISREGARDED STOP SIGN OR FLASHING RED |
| 022 | DIS SIGN | DISREGARDED WARNING SIGN, FLARES OR FLASHING AMBER |
| 023 | DIS OFCR | DISREGARDED POLICE OFFICER OR FLAGMAN |
| 024 | DIS EMER | DISREGARDED SIREN OR WARNING OF EMERGENCY VEHICLE |
| 025 | DIS RR | DISREGARDED RR SIGNAL, RR SIGN, OR RR FLAGMAN |
| 026 | REAR-END | FAILED TO AVOID STOPPED OR PARKED VEHICLE AHEAD OTHER THAN SCHOOL BUS |
| 027 | BIKE ROW | DID NOT HAVE RIGHT-OF-WAY OVER PEDALCYCLIST |
| 028 | NO ROW | DID NOT HAVE RIGHT-OF-WAY |
| 029 | PED ROW | FAILED TO YIELD RIGHT-OF-WAY TO PEDESTRIAN |
| 030 | PAS CURV | PASSING ON A CURVE |
| 031 | PAS WRNG | PASSING ON THE WRONG SIDE |
| 032 | PAS TANG | PASSING ON STRAIGHT ROAD UNDER UNSAFE CONDITIONS |
| 033 | PAS X-WK | PASSED VEHICLE STOPPED AT CROSSWALK FOR PEDESTRIAN |
| 034 | PAS INTR | PASSING AT INTERSECTION |
| 035 | PAS HILL | PASSING ON CREST OF HILL |
| 036 | N/PAS ZN | PASSING IN "NO PASSING" ZONE |
| 037 | PAS TRAF | PASSING IN FRONT OF ONCOMING TRAFFIC |
| 038 | CUT-IN | CUTTING IN (TWO LANES - TWO WAY ONLY) |
| 039 | WRNGSIDE | DRIVING ON WRONG SIDE OF THE ROAD (2-WAY UNDIVIDED ROADWAYS) |

**ERROR CODE TRANSLATION LIST**

| ERROR CODE | SHORT DESCRIPTION | FULL DESCRIPTION |
|---|---|---|
| 040 | THRU MED | DRIVING THROUGH SAFETY ZONE OR OVER ISLAND |
| 041 | F/ST BUS | FAILED TO STOP FOR SCHOOL BUS |
| 042 | F/SLO MV | FAILED TO DECREASE SPEED FOR SLOWER MOVING VEHICLE |
| 043 | TOO CLOSE | FOLLOWING TOO CLOSELY (MUST BE ON OFFICER'S REPORT) |
| 044 | STRDL LN | STRADDLING OR DRIVING ON WRONG LANES |
| 045 | IMP CHG | IMPROPER CHANGE OF TRAFFIC LANES |
| 046 | WRNG WAY | WRONG WAY ON ONE-WAY ROADWAY; WRONG SIDE DIVIDED ROAD |
| 047 | BASCRULE | DRIVING TOO FAST FOR CONDITIONS (NOT EXCEEDING POSTED SPEED) |
| 048 | OPN DOOR | OPENED DOOR INTO ADJACENT TRAFFIC LANE |
| 049 | IMPEDING | IMPEDING TRAFFIC |
| 050 | SPEED | DRIVING IN EXCESS OF POSTED SPEED |
| 051 | RECKLESS | RECKLESS DRIVING (PER PAR) |
| 052 | CARELESS | CARELESS DRIVING (PER PAR) |
| 053 | RACING | SPEED RACING (PER PAR) |
| 054 | X N/SGNL | CROSSING AT INTERSECTION, NO TRAFFIC SIGNAL PRESENT |
| 055 | X W/SGNL | CROSSING AT INTERSECTION, TRAFFIC SIGNAL PRESENT |
| 056 | DIAGONAL | CROSSING AT INTERSECTION - DIAGONALLY |
| 057 | BTWN INT | CROSSING BETWEEN INTERSECTIONS |
| 059 | W/TRAF-S | WALKING, RUNNING, RIDING, ETC., ON SHOULDER WITH TRAFFIC |
| 060 | A/TRAF-S | WALKING, RUNNING, RIDING, ETC., ON SHOULDER FACING TRAFFIC |
| 061 | W/TRAF-P | WALKING, RUNNING, RIDING, ETC., ON PAVEMENT WITH TRAFFIC |
| 062 | A/TRAF-P | WALKING, RUNNING, RIDING, ETC., ON PAVEMENT FACING TRAFFIC |
| 063 | PLAYINRD | PLAYING IN STREET OR ROAD |
| 064 | PUSH MV | PUSHING OR WORKING ON VEHICLE IN ROAD OR ON SHOULDER |
| 065 | WORK IN RD | WORKING IN ROADWAY OR ALONG SHOULDER |
| 070 | LAY ON RD | STANDING OR LYING IN ROADWAY |
| 071 | NM IMP USE | IMPROPER USE OF TRAFFIC LANE BY NON-MOTORIST |
| 073 | ELUDING | ELUDING / ATTEMPT TO ELUDE |
| 079 | F NEG CURV | FAILED TO NEGOTIATE A CURVE |
| 080 | FAIL LN | FAILED TO MAINTAIN LANE |
| 081 | OFF RD | RAN OFF ROAD |
| 082 | NO CLEAR | DRIVER MISJUDGED CLEARANCE |
| 083 | OVRSTEER | OVER-CORRECTING |
| 084 | NOT USED | CODE NOT IN USE |
| 085 | OVRLOAD | OVERLOADING OR IMPROPER LOADING OF VEHICLE WITH CARGO OR PASSENGERS |
| 097 | UNA DIS TC | UNABLE TO DETERMINE WHICH DRIVER DISREGARDED TRAFFIC CONTROL DEVICE |

**EVENT CODE TRANSLATION LIST**

| EVENT CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| 001 | FEL/JUMP | OCCUPANT FELL, JUMPED OR WAS EJECTED FROM MOVING VEHICLE |
| 002 | INTERFER | PASSENGER INTERFERED WITH DRIVER |
| 003 | BUG INTF | ANIMAL OR INSECT IN VEHICLE INTERFERED WITH DRIVER |
| 004 | INDRCT PED | PEDESTRIAN INDIRECTLY INVOLVED (NOT STRUCK) |
| 005 | SUB-PED | "SUB-PED": PEDESTRIAN INJURED SUBSEQUENT TO COLLISION, ETC. |
| 006 | INDRCT BIK | PEDALCYCLIST INDIRECTLY INVOLVED (NOT STRUCK) |
| 007 | HITCHIKR | HITCHHIKER (SOLICITING A RIDE) |
| 008 | PSNGR TOW | PASSENGER OR NON-MOTORIST BEING TOWED OR PUSHED ON CONVEYANCE |
| 009 | ON/OFF V | GETTING ON/OFF STOPPED/PARKED VEHICLE (OCCUPANTS ONLY; MUST HAVE PHYSICAL CONTACT W/ VEHIC |
| 010 | SUB OTRN | OVERTURNED AFTER FIRST HARMFUL EVENT |
| 011 | MV PUSHD | VEHICLE BEING PUSHED |
| 012 | MV TOWED | VEHICLE TOWED OR HAD BEEN TOWING ANOTHER VEHICLE |
| 013 | FORCED | VEHICLE FORCED BY IMPACT INTO ANOTHER VEHICLE, PEDALCYCLIST OR PEDESTRIAN |
| 014 | SET MOTN | VEHICLE SET IN MOTION BY NON-DRIVER (CHILD RELEASED BRAKES, ETC.) |
| 015 | RR ROW | AT OR ON RAILROAD RIGHT-OF-WAY (NOT LIGHT RAIL) |
| 016 | LT RL ROW | AT OR ON LIGHT-RAIL RIGHT-OF-WAY |
| 017 | RR HIT V | TRAIN STRUCK VEHICLE |
| 018 | V HIT RR | VEHICLE STRUCK TRAIN |
| 019 | HIT RR CAR | VEHICLE STRUCK RAILROAD CAR ON ROADWAY |
| 020 | JACKNIFE | JACKKNIFE; TRAILER OR TOWED VEHICLE STRUCK TOWING VEHICLE |
| 021 | TRL OTRN | TRAILER OR TOWED VEHICLE OVERTURNED |
| 022 | CN BROKE | TRAILER CONNECTION BROKE |
| 023 | DETACH TRL | DETACHED TRAILING OBJECT STRUCK OTHER VEHICLE, NON-MOTORIST, OR OBJECT |
| 024 | V DOOR OPN | VEHICLE DOOR OPENED INTO ADJACENT TRAFFIC LANE |
| 025 | WHEELOFF | WHEEL CAME OFF |
| 026 | HOOD UP | HOOD FLEW UP |
| 028 | LOAD SHIFT | LOST LOAD, LOAD MOVED OR SHIFTED |
| 029 | TIREFAIL | TIRE FAILURE |
| 030 | PET | PET: CAT, DOG AND SIMILAR |
| 031 | LVSTOCK | STOCK: COW, CALF, BULL, STEER, SHEEP, ETC. |
| 032 | HORSE | HORSE, MULE, OR DONKEY |
| 033 | HRSE&RID | HORSE AND RIDER |
| 034 | GAME | WILD ANIMAL, GAME (INCLUDES BIRDS; NOT DEER OR ELK) |
| 035 | DEER ELK | DEER OR ELK, WAPITI |
| 036 | ANML VEH | ANIMAL-DRAWN VEHICLE |
| 037 | CULVERT | CULVERT, OPEN LOW OR HIGH MANHOLE |
| 038 | ATENUATN | IMPACT ATTENUATOR |
| 039 | PK METER | PARKING METER |
| 040 | CURB | CURB  (ALSO NARROW SIDEWALKS ON BRIDGES) |
| 041 | JIGGLE | JIGGLE BAR OR TRAFFIC SNAKE FOR CHANNELIZATION |
| 042 | GDRL END | LEADING EDGE OF GUARDRAIL |
| 043 | GARDRAIL | GUARD RAIL (NOT METAL MEDIAN BARRIER) |
| 044 | BARRIER | MEDIAN BARRIER (RAISED OR METAL) |
| 045 | WALL | RETAINING WALL OR TUNNEL WALL |
| 046 | BR RAIL | BRIDGE RAILING OR PARAPET (ON BRIDGE OR APPROACH) |
| 047 | BR ABUTMNT | BRIDGE ABUTMENT (INCLUDED "APPROACH END" THRU 2013) |
| 048 | BR COLMN | BRIDGE PILLAR OR COLUMN |
| 049 | BR GIRDR | BRIDGE GIRDER (HORIZONTAL BRIDGE STRUCTURE OVERHEAD) |
| 050 | ISLAND | TRAFFIC RAISED ISLAND |
| 051 | GORE | GORE |
| 052 | POLE UNK | POLE - TYPE UNKNOWN |
| 053 | POLE UTL | POLE - POWER OR TELEPHONE |
| 054 | ST LIGHT | POLE - STREET LIGHT ONLY |
| 055 | TRF SGNL | POLE - TRAFFIC SIGNAL AND PED SIGNAL ONLY |
| 056 | SGN BRDG | POLE - SIGN BRIDGE |
| 057 | STOPSIGN | STOP OR YIELD SIGN |

**EVENT CODE TRANSLATION LIST**

| EVENT CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| 058 | OTH SIGN | OTHER SIGN, INCLUDING STREET SIGNS |
| 059 | HYDRANT | HYDRANT |
| 060 | MARKER | DELINEATOR OR MARKER (REFLECTOR POSTS) |
| 061 | MAILBOX | MAILBOX |
| 062 | TREE | TREE, STUMP OR SHRUBS |
| 063 | VEG OHED | TREE BRANCH OR OTHER VEGETATION OVERHEAD, ETC. |
| 064 | WIRE/CBL | WIRE OR CABLE ACROSS OR OVER THE ROAD |
| 065 | TEMP SGN | TEMPORARY SIGN OR BARRICADE IN ROAD, ETC. |
| 066 | PERM SGN | PERMANENT SIGN OR BARRICADE IN/OFF ROAD |
| 067 | SLIDE | SLIDES, FALLEN OR FALLING ROCKS |
| 068 | FRGN OBJ | FOREIGN OBSTRUCTION/DEBRIS IN ROAD (NOT GRAVEL) |
| 069 | EQP WORK | EQUIPMENT WORKING IN/OFF ROAD |
| 070 | OTH EQP | OTHER EQUIPMENT IN OR OFF ROAD (INCLUDES PARKED TRAILER, BOAT) |
| 071 | MAIN EQP | WRECKER, STREET SWEEPER, SNOW PLOW OR SANDING EQUIPMENT |
| 072 | OTHER WALL | ROCK, BRICK OR OTHER SOLID WALL |
| 073 | IRRGL PVMT | OTHER BUMP (NOT SPEED BUMP), POTHOLE OR PAVEMENT IRREGULARITY (PER PAR) |
| 074 | OVERHD OBJ | OTHER OVERHEAD OBJECT (HIGHWAY SIGN, SIGNAL HEAD, ETC.); NOT BRIDGE |
| 075 | CAVE IN | BRIDGE OR ROAD CAVE IN |
| 076 | HI WATER | HIGH WATER |
| 077 | SNO BANK | SNOW BANK |
| 078 | LO-HI EDGE | LOW OR HIGH SHOULDER AT PAVEMENT EDGE |
| 079 | DITCH | CUT SLOPE OR DITCH EMBANKMENT |
| 080 | OBJ FRM MV | STRUCK BY ROCK OR OTHER OBJECT SET IN MOTION BY OTHER VEHICLE (INCL. LOST LOADS) |
| 081 | FLY-OBJ | STRUCK BY ROCK OR OTHER MOVING OR FLYING OBJECT (NOT SET IN MOTION BY VEHICLE) |
| 082 | VEH HID | VEHICLE OBSCURED VIEW |
| 083 | VEG HID | VEGETATION OBSCURED VIEW |
| 084 | BLDG HID | VIEW OBSCURED BY FENCE, SIGN, PHONE BOOTH, ETC. |
| 085 | WIND GUST | WIND GUST |
| 086 | IMMERSED | VEHICLE IMMERSED IN BODY OF WATER |
| 087 | FIRE/EXP | FIRE OR EXPLOSION |
| 088 | FENC/BLD | FENCE OR BUILDING, ETC. |
| 089 | OTHR CRASH | CRASH RELATED TO ANOTHER SEPARATE CRASH |
| 090 | TO 1 SIDE | TWO-WAY TRAFFIC ON DIVIDED ROADWAY ALL ROUTED TO ONE SIDE |
| 091 | BUILDING | BUILDING OR OTHER STRUCTURE |
| 092 | PHANTOM | OTHER (PHANTOM) NON-CONTACT VEHICLE |
| 093 | CELL PHONE | CELL PHONE (ON PAR OR DRIVER IN USE) |
| 094 | VIOL GDL | TEENAGE DRIVER IN VIOLATION OF GRADUATED LICENSE PGM |
| 095 | GUY WIRE | GUY WIRE |
| 096 | BERM | BERM (EARTHEN OR GRAVEL MOUND) |
| 097 | GRAVEL | GRAVEL IN ROADWAY |
| 098 | ABR EDGE | ABRUPT EDGE |
| 099 | CELL WTNSD | CELL PHONE USE WITNESSED BY OTHER PARTICIPANT |
| 100 | UNK FIXD | FIXED OBJECT, UNKNOWN TYPE. |
| 101 | OTHER OBJ | NON-FIXED OBJECT, OTHER OR UNKNOWN TYPE |
| 102 | TEXTING | TEXTING |
| 103 | WZ WORKER | WORK ZONE WORKER |
| 104 | ON VEHICLE | PASSENGER RIDING ON VEHICLE EXTERIOR |
| 105 | PEDAL PSGR | PASSENGER RIDING ON PEDALCYCLE |
| 106 | MAN WHLCHR | PEDESTRIAN IN NON-MOTORIZED WHEELCHAIR |
| 107 | MTR WHLCHR | PEDESTRIAN IN MOTORIZED WHEELCHAIR |
| 108 | OFFICER | LAW ENFORCEMENT / POLICE OFFICER |
| 109 | SUB-BIKE | "SUB-BIKE": PEDALCYCLIST INJURED SUBSEQUENT TO COLLISION, ETC. |
| 110 | N-MTR | NON-MOTORIST STRUCK VEHICLE |
| 111 | S CAR VS V | STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM) STRUCK VEHICLE |
| 112 | V VS S CAR | VEHICLE STRUCK STREET CAR/TROLLEY (ON RAILS OR OVERHEAD WIRE SYSTEM) |
| 113 | S CAR ROW | AT OR ON STREET CAR OR TROLLEY RIGHT-OF-WAY |

**EVENT CODE TRANSLATION LIST**

| EVENT CODE | SHORT DESCRIPTION | LONG DESCRIPTION |
|---|---|---|
| 114 | RR EQUIP | VEHICLE STRUCK RAILROAD EQUIPMENT (NOT TRAIN) ON TRACKS |
| 115 | DSTRCT GPS | DISTRACTED BY NAVIGATION SYSTEM OR GPS DEVICE |
| 116 | DSTRCT OTH | DISTRACTED BY OTHER ELECTRONIC DEVICE |
| 117 | RR GATE | RAIL CROSSING DROP-ARM GATE |
| 118 | EXPNSN JNT | EXPANSION JOINT |
| 119 | JERSEY BAR | JERSEY BARRIER |
| 120 | WIRE BAR | WIRE OR CABLE MEDIAN BARRIER |
| 121 | FENCE | FENCE |
| 123 | OBJ IN VEH | LOOSE OBJECT IN VEHICLE STRUCK OCCUPANT |
| 124 | SLIPPERY | SLIDING OR SWERVING DUE TO WET, ICY, SLIPPERY OR LOOSE SURFACE (NOT GRAVEL) |
| 125 | SHLDR | SHOULDER GAVE WAY |
| 126 | BOULDER | ROCK(S), BOULDER (NOT GRAVEL; NOT ROCK SLIDE) |
| 127 | LAND SLIDE | ROCK SLIDE OR LAND SLIDE |
| 128 | CURVE INV | CURVE PRESENT AT CRASH LOCATION |
| 129 | HILL INV | VERTICAL GRADE / HILL PRESENT AT CRASH LOCATION |
| 130 | CURVE HID | VIEW OBSCURED BY CURVE |
| 131 | HILL HID | VIEW OBSCURED BY VERTICAL GRADE / HILL |
| 132 | WINDOW HID | VIEW OBSCURED BY VEHICLE WINDOW CONDITIONS |
| 133 | SPRAY HID | VIEW OBSCURED BY WATER SPRAY |
| 134 | TORRENTIAL | TORRENTIAL RAIN (EXCEPTIONALLY HEAVY RAIN) |
| 135 | RAIL OCC | INJURED OCCUPANT OF RAILWAY TRAIN, LIGHT RAIL, STREET CAR OR CABLE CAR |

**FUNCTIONAL CLASSIFICATION TRANSLATION LIST**

| FUNC CLASS | DESCRIPTION |
|---|---|
| 01 | RURAL PRINCIPAL ARTERIAL - INTERSTATE |
| 02 | RURAL PRINCIPAL ARTERIAL - OTHER |
| 06 | RURAL MINOR ARTERIAL |
| 07 | RURAL MAJOR COLLECTOR |
| 08 | RURAL MINOR COLLECTOR |
| 09 | RURAL LOCAL |
| 11 | URBAN PRINCIPAL ARTERIAL - INTERSTATE |
| 12 | URBAN PRINCIPAL ARTERIAL - OTHER FREEWAYS AND EXP |
| 14 | URBAN PRINCIPAL ARTERIAL - OTHER |
| 16 | URBAN MINOR ARTERIAL |
| 17 | URBAN MAJOR COLLECTOR |
| 18 | URBAN MINOR COLLECTOR |
| 19 | URBAN LOCAL |
| 78 | UNKNOWN RURAL SYSTEM |
| 79 | UNKNOWN RURAL NON-SYSTEM |
| 98 | UNKNOWN URBAN SYSTEM |
| 99 | UNKNOWN URBAN NON-SYSTEM |

**HIGHWAY COMPONENT TRANSLATION LIST**

| CODE | DESCRIPTION |
|---|---|
| 0 | MAINLINE STATE HIGHWAY |
| 1 | COUPLET |
| 3 | FRONTAGE ROAD |
| 6 | CONNECTION |
| 8 | HIGHWAY - OTHER |

**INJURY SEVERITY CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 1 | KILL | FATAL INJURY (K) |
| 2 | INJA | SUSPECTED SERIOUS INJURY (A) |
| 3 | INJB | SUSPECTED MINOR INJURY (B) |
| 4 | INJC | POSSIBLE INJURY (C) |
| 5 | PRI | DIED PRIOR TO CRASH |
| 7 | NO<5 | NO INJURY - 0 TO 4 YEARS OF AGE |
| 9 | NONE | NO APPARENT INJURY (O) |

**LIGHT CONDITION CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | UNK | UNKNOWN |
| 1 | DAY | DAYLIGHT |
| 2 | DLIT | DARKNESS - WITH STREET LIGHTS |
| 3 | DARK | DARKNESS - NO STREET LIGHTS |
| 4 | DAWN | DAWN (TWILIGHT) |
| 5 | DUSK | DUSK (TWILIGHT) |

**MEDIAN TYPE CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | NONE | NO MEDIAN |
| 1 | RSDMD | SOLID MEDIAN BARRIER |
| 2 | DIVMD | EARTH, GRASS OR PAVED MEDIAN |

**MILEAGE TYPE CODE TRANSLATION LIST**

| CODE | LONG DESCRIPTION |
|---|---|
| 0 | REGULAR MILEAGE |
| T | TEMPORARY |
| Y | SPUR |
| Z | OVERLAPPING |

**MOVEMENT TYPE CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | UNK | UNKNOWN |
| 1 | STRGHT | STRAIGHT AHEAD |
| 2 | TURN-R | TURNING RIGHT |
| 3 | TURN-L | TURNING LEFT |
| 4 | U-TURN | MAKING A U-TURN |
| 5 | BACK | BACKING |
| 6 | STOP | STOPPED IN TRAFFIC |
| 7 | PRKD-P | PARKED - PROPERLY |
| 8 | PRKD-I | PARKED - IMPROPERLY |
| 9 | PARKNG | PARKING MANEUVER |

**NON-MOTORIST LOCATION CODE TRANSLATION LIST**

| CODE | LONG DESCRIPTION |
|---|---|
| 00 | AT INTERSECTION - NOT IN ROADWAY |
| 01 | AT INTERSECTION - INSIDE CROSSWALK |
| 02 | AT INTERSECTION - IN ROADWAY, OUTSIDE CROSSWALK |
| 03 | AT INTERSECTION - IN ROADWAY, XWALK AVAIL UNKNWN |
| 04 | NOT AT INTERSECTION - IN ROADWAY |
| 05 | NOT AT INTERSECTION - ON SHOULDER |
| 06 | NOT AT INTERSECTION - ON MEDIAN |
| 07 | NOT AT INTERSECTION - WITHIN TRAFFIC RIGHT-OF-WAY |
| 08 | NOT AT INTERSECTION - IN BIKE PATH OR PARKING LANE |
| 09 | NOT-AT INTERSECTION - ON SIDEWALK |
| 10 | OUTSIDE TRAFFICWAY BOUNDARIES |
| 13 | AT INTERSECTION - IN BIKE LANE |
| 14 | NOT AT INTERSECTION - IN BIKE LANE |
| 15 | NOT AT INTERSECTION - INSIDE MID-BLOCK CROSSWALK |
| 16 | NOT AT INTERSECTION - IN PARKING LANE |
| 18 | OTHER, NOT IN ROADWAY |
| 99 | UNKNOWN LOCATION |

**ROAD CHARACTER CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | UNK | UNKNOWN |
| 1 | INTER | INTERSECTION |
| 2 | ALLEY | DRIVEWAY OR ALLEY |
| 3 | STRGHT | STRAIGHT ROADWAY |
| 4 | TRANS | TRANSITION |
| 5 | CURVE | CURVE (HORIZONTAL CURVE) |
| 6 | OPENAC | OPEN ACCESS OR TURNOUT |
| 7 | GRADE | GRADE (VERTICAL CURVE) |
| 8 | BRIDGE | BRIDGE STRUCTURE |
| 9 | TUNNEL | TUNNEL |

**PARTICIPANT TYPE CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | OCC | UNKNOWN OCCUPANT TYPE |
| 1 | DRVR | DRIVER |
| 2 | PSNG | PASSENGER |
| 3 | PED | PEDESTRIAN |
| 4 | CONV | PEDESTRIAN USING A PEDESTRIAN CONVEYA |
| 5 | PTOW | PEDESTRIAN TOWING OR TRAILERING AN OB |
| 6 | BIKE | PEDALCYCLIST |
| 7 | BTOW | PEDALCYCLIST TOWING OR TRAILERING AN |
| 8 | PRKD | OCCUPANT OF A PARKED MOTOR VEHICLE |
| 9 | OTHR | OTHER TYPE OF NON-MOTORIST |

**TRAFFIC CONTROL DEVICE CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 000 | NONE | NO CONTROL |
| 001 | TRF SIGNAL | TRAFFIC SIGNALS |
| 002 | FLASHBCN-R | FLASHING BEACON - RED (STOP) |
| 003 | FLASHBCN-A | FLASHING BEACON - AMBER (SLOW) |
| 004 | STOP SIGN | STOP SIGN |
| 005 | SLOW SIGN | SLOW SIGN |
| 006 | REG-SIGN | REGULATORY SIGN |
| 007 | YIELD | YIELD SIGN |
| 008 | WARNING | WARNING SIGN |
| 009 | CURVE | CURVE SIGN |
| 010 | SCHL X-ING | SCHOOL CROSSING SIGN OR SPECIAL SIGNAL |
| 011 | OFCR/FLAG | POLICE OFFICER, FLAGMAN - SCHOOL PATROL |
| 012 | BRDG-GATE | BRIDGE GATE - BARRIER |
| 013 | TEMP-BARR | TEMPORARY BARRIER |
| 014 | NO-PASS-ZN | NO PASSING ZONE |
| 015 | ONE-WAY | ONE-WAY STREET |
| 016 | CHANNEL | CHANNELIZATION |
| 017 | MEDIAN BAR | MEDIAN BARRIER |
| 018 | PILOT CAR | PILOT CAR |
| 019 | SP PED SIG | SPECIAL PEDESTRIAN SIGNAL |
| 020 | X-BUCK | CROSSBUCK |
| 021 | THR-GN-SIG | THROUGH GREEN ARROW OR SIGNAL |
| 022 | L-GRN-SIG | LEFT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL |
| 023 | R-GRN-SIG | RIGHT TURN GREEN ARROW, LANE MARKINGS, OR SIGNAL |
| 024 | WIGWAG | WIGWAG OR FLASHING LIGHTS W/O DROP-ARM GATE |
| 025 | X-BUCK WRN | CROSSBUCK AND ADVANCE WARNING |
| 026 | WW W/ GATE | FLASHING LIGHTS WITH DROP-ARM GATES |
| 027 | OVRHD SGNL | SUPPLEMENTAL OVERHEAD SIGNAL (RR XING ONLY) |
| 028 | SP RR STOP | SPECIAL RR STOP SIGN |
| 029 | ILUM GRD X | ILLUMINATED GRADE CROSSING |
| 037 | RAMP METER | METERED RAMPS |
| 038 | RUMBLE STR | RUMBLE STRIP |
| 040 | AUTO. FLAG | AUTOMATED FLAGGER ASSISTANCE DEVICE |
| 090 | L-TURN REF | LEFT TURN REFUGE (WHEN REFUGE IS INVOLVED) |
| 091 | R-TURN ALL | RIGHT TURN AT ALL TIMES SIGN, ETC. |
| 092 | EMR SGN/FL | EMERGENCY SIGNS OR FLARES |
| 093 | ACCEL LANE | ACCELERATION OR DECELERATION LANES |
| 094 | R-TURN PRO | RIGHT TURN PROHIBITED ON RED AFTER STOPPING |
| 095 | BUS STPSGN | BUS STOP SIGN AND RED LIGHTS |

099 UNKNOWN UNKNOWN OR NOT DEFINITE

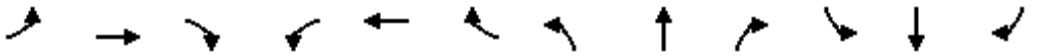
**VEHICLE TYPE CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 00 | PDO | NOT COLLECTED FOR PDO CRASHES |
| 01 | PSNGR CAR | PASSENGER CAR, PICKUP, LIGHT DELIVERY, ETC. |
| 02 | BOBTAIL | TRUCK TRACTOR WITH NO TRAILERS (BOBTAIL) |
| 03 | FARM TRCTR | FARM TRACTOR OR SELF-PROPELLED FARM EQUIPMENT |
| 04 | SEMI TOW | TRUCK TRACTOR WITH TRAILER/MOBILE HOME IN TOW |
| 05 | TRUCK | TRUCK WITH NON-DETACHABLE BED, PANEL, ETC. |
| 06 | MOPED | MOPED, MINIBIKE, SEATED MOTOR SCOOTER, MOTOR BIKE |
| 07 | SCHL BUS | SCHOOL BUS (INCLUDES VAN) |
| 08 | OTH BUS | OTHER BUS |
| 09 | MTRCYCLE | MOTORCYCLE, DIRT BIKE |
| 10 | OTHER | OTHER: FORKLIFT, BACKHOE, ETC. |
| 11 | MOTRHOME | MOTORHOME |
| 12 | TROLLEY | MOTORIZED STREET CAR/TROLLEY (NO RAILS/WIRES) |
| 13 | ATV | ATV |
| 14 | MTRSCTR | MOTORIZED SCOOTER (STANDING) |
| 15 | SNOWMOBILE | SNOWMOBILE |
| 99 | UNKNOWN | UNKNOWN VEHICLE TYPE |

**WEATHER CONDITION CODE TRANSLATION LIST**

| CODE | SHORT DESC | LONG DESCRIPTION |
|---|---|---|
| 0 | UNK | UNKNOWN |
| 1 | CLR | CLEAR |
| 2 | CLD | CLOUDY |
| 3 | RAIN | RAIN |
| 4 | SLT | SLEET |
| 5 | FOG | FOG |
| 6 | SNOW | SNOW |
| 7 | DUST | DUST |
| 8 | SMOK | SMOKE |
| 9 | ASH | ASH |

# Appendix D: Year 2024 Background Traffic Conditions Analysis Worksheets



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 308 | 180 | 198 | 215 | 1 | 159 | 0 | 219 | 1 | 0 | 0 |
| Future Volume (veh/h) | 0 | 308 | 180 | 198 | 215 | 1 | 159 | 0 | 219 | 1 | 0 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1796 | 1811 | 1826 | 1781 | 1900 | 1826 | 1900 | 1870 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 371 | 48 | 239 | 259 | 1 | 192 | 0 | 18 | 1 | 0 | 0 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 0 | 7 | 6 | 5 | 8 | 0 | 5 | 0 | 2 | 0 | 0 | 0 |
| Cap, veh/h | 4 | 600 | 513 | 310 | 1075 | 4 | 392 | 0 | 282 | 385 | 332 | 0 |
| Arrive On Green | 0.00 | 0.33 | 0.33 | 0.18 | 0.61 | 0.61 | 0.17 | 0.00 | 0.17 | 0.17 | 0.00 | 0.00 |
| Sat Flow, veh/h | 1810 | 1796 | 1535 | 1739 | 1773 | 7 | 1384 | 0 | 1610 | 1417 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 371 | 48 | 239 | 0 | 260 | 192 | 0 | 18 | 1 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1796 | 1535 | 1739 | 0 | 1780 | 1384 | 0 | 1610 | 1417 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 8.3 | 1.0 | 6.3 | 0.0 | 3.2 | 6.4 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 8.3 | 1.0 | 6.3 | 0.0 | 3.2 | 6.4 | 0.0 | 0.4 | 0.5 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 600 | 513 | 310 | 0 | 1079 | 392 | 0 | 282 | 385 | 332 | 0 |
| V/C Ratio(X) | 0.00 | 0.62 | 0.09 | 0.77 | 0.00 | 0.24 | 0.49 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 566 | 2248 | 1921 | 1269 | 0 | 2228 | 872 | 0 | 840 | 580 | 594 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 13.4 | 11.0 | 18.8 | 0.0 | 4.4 | 18.9 | 0.0 | 16.5 | 16.7 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.2 | 0.2 | 4.1 | 0.0 | 0.1 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 5.7 | 0.6 | 4.2 | 0.0 | 0.9 | 3.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 15.6 | 11.1 | 22.8 | 0.0 | 4.5 | 19.9 | 0.0 | 16.6 | 16.7 | 0.0 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | A | A |
| Approach Vol, veh/h | | 419 | | | 499 | | | 210 | | | 1 | |
| Approach Delay, s/veh | | 15.1 | | | 13.3 | | | 19.6 | | | 16.7 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 13.0 | 22.0 | | 12.9 | 0.0 | 35.1 | | 12.9 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 8.3 | 10.3 | | 2.5 | 0.0 | 5.2 | | 8.4 | | | | |
| Green Ext Time (p_c), s | 0.6 | 5.7 | | 0.0 | 0.0 | 1.4 | | 0.5 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | 15.1 | |
| HCM 6th LOS | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.1 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 161 | 52 | 64 | 217 | 200 | 177 |
| Future Vol, veh/h | 161 | 52 | 64 | 217 | 200 | 177 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 3 | 6 | 6 | 4 | 6 | 6 |
| Mvmt Flow | 209 | 68 | 83 | 282 | 260 | 230 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 823 | 375 | 490 | 0 | - | 0 |
| Stage 1 | 375 | - | - | - | - | - |
| Stage 2 | 448 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.26 | 4.16 | - | - | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.354 | 2.254 | - | - | - |
| Pot Cap-1 Maneuver | 342 | 663 | 1053 | - | - | - |
| Stage 1 | 693 | - | - | - | - | - |
| Stage 2 | 642 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 315 | 663 | 1053 | - | - | - |
| Mov Cap-2 Maneuver | 436 | - | - | - | - | - |
| Stage 1 | 638 | - | - | - | - | - |
| Stage 2 | 642 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 22.5 | 2 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1053 | - | 476 | - | - |
| HCM Lane V/C Ratio | 0.079 | - | 0.581 | - | - |
| HCM Control Delay (s) | 8.7 | - | 22.5 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.3 | - | 3.6 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 66 | 5 | 31 | 12 | 8 | 34 | 38 | 182 | 3 | 8 | 202 | 43 |
| Future Vol, veh/h | 66 | 5 | 31 | 12 | 8 | 34 | 38 | 182 | 3 | 8 | 202 | 43 |
| Conflicting Peds, #/hr | 2 | 0 | 1 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 0 | 6 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| Heavy Vehicles, % | 0 | 0 | 7 | 8 | 0 | 3 | 3 | 7 | 33 | 12 | 5 | 5 |
| Mvmt Flow | 87 | 7 | 41 | 16 | 11 | 45 | 50 | 239 | 4 | 11 | 266 | 57 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 694 | 667 | 302 | 684 | 693 | 244 | 329 | 0 | 0 | 244 | 0 | 0 |
| Stage 1 | 323 | 323 | - | 342 | 342 | - | - | - | - | - | - | - |
| Stage 2 | 371 | 344 | - | 342 | 351 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.27 | 7.18 | 6.5 | 6.23 | 4.13 | - | - | 4.22 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.363 | 3.572 | 4 | 3.327 | 2.227 | - | - | 2.308 | - | - |
| Pot Cap-1 Maneuver | 360 | 382 | 726 | 355 | 369 | 792 | 1225 | - | - | 1266 | - | - |
| Stage 1 | 693 | 654 | - | 661 | 642 | - | - | - | - | - | - | - |
| Stage 2 | 653 | 640 | - | 661 | 636 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 318 | 361 | 721 | 318 | 348 | 790 | 1218 | - | - | 1265 | - | - |
| Mov Cap-2 Maneuver | 422 | 448 | - | 415 | 430 | - | - | - | - | - | - | - |
| Stage 1 | 660 | 644 | - | 633 | 615 | - | - | - | - | - | - | - |
| Stage 2 | 580 | 613 | - | 611 | 626 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 15.3 | 11.9 | 1.4 | 0.2 |
| HCM LOS | C | B | | |

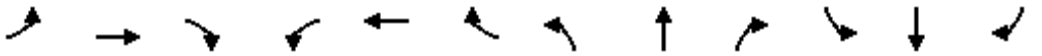
| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1218 | - | - | 484 | 596 | 1265 | - | - |
| HCM Lane V/C Ratio | 0.041 | - | - | 0.277 | 0.119 | 0.008 | - | - |
| HCM Control Delay (s) | 8.1 | - | - | 15.3 | 11.9 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.1 | 0.4 | 0 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 11.6 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 4 | 182 | 26 | 5 | 227 | 8 | 17 | 64 | 10 | 14 | 37 | 10 |
| Future Vol, veh/h | 4 | 182 | 26 | 5 | 227 | 8 | 17 | 64 | 10 | 14 | 37 | 10 |
| Peak Hour Factor | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| Heavy Vehicles, % | 25 | 5 | 12 | 0 | 7 | 0 | 6 | 8 | 10 | 0 | 8 | 10 |
| Mvmt Flow | 5 | 249 | 36 | 7 | 311 | 11 | 23 | 88 | 14 | 19 | 51 | 14 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 12.3 | 11.9 | 10.2 | 9.6 |
| HCM LOS | B | B | B | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 19% | 2% | 2% | 23% |
| Vol Thru, % | 70% | 86% | 95% | 61% |
| Vol Right, % | 11% | 12% | 3% | 16% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 91 | 212 | 240 | 61 |
| LT Vol | 17 | 4 | 5 | 14 |
| Through Vol | 64 | 182 | 227 | 37 |
| RT Vol | 10 | 26 | 8 | 10 |
| Lane Flow Rate | 125 | 290 | 329 | 84 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.198 | 0.43 | 0.451 | 0.132 |
| Departure Headway (Hd) | 5.715 | 5.329 | 4.934 | 5.677 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 627 | 680 | 733 | 631 |
| Service Time | 3.753 | 3.339 | 2.943 | 3.717 |
| HCM Lane V/C Ratio | 0.199 | 0.426 | 0.449 | 0.133 |
| HCM Control Delay | 10.2 | 12.3 | 11.9 | 9.6 |
| HCM Lane LOS | B | B | B | A |
| HCM 95th-tile Q | 0.7 | 2.2 | 2.4 | 0.5 |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 298 | 269 | 202 | 332 | 2 | 193 | 1 | 141 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 298 | 269 | 202 | 332 | 2 | 193 | 1 | 141 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 331 | 79 | 224 | 369 | 2 | 214 | 1 | 26 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 4 | 582 | 499 | 296 | 1051 | 6 | 428 | 12 | 303 | 310 | 369 | 0 |
| Arrive On Green | 0.00 | 0.32 | 0.32 | 0.17 | 0.58 | 0.58 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1814 | 10 | 1421 | 60 | 1559 | 857 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 331 | 79 | 224 | 0 | 371 | 214 | 0 | 27 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1619 | 857 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 7.0 | 1.7 | 5.6 | 0.0 | 5.0 | 6.6 | 0.0 | 0.6 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 7.0 | 1.7 | 5.6 | 0.0 | 5.0 | 6.8 | 0.0 | 0.6 | 0.7 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.96 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 582 | 499 | 296 | 0 | 1057 | 428 | 0 | 315 | 310 | 369 | 0 |
| V/C Ratio(X) | 0.00 | 0.57 | 0.16 | 0.76 | 0.00 | 0.35 | 0.50 | 0.00 | 0.09 | 0.01 | 0.02 | 0.00 |
| Avail Cap(c_a), veh/h | 585 | 2381 | 2044 | 1344 | 0 | 2360 | 918 | 0 | 873 | 421 | 615 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 13.2 | 11.4 | 18.4 | 0.0 | 5.2 | 17.8 | 0.0 | 15.3 | 15.6 | 15.1 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 1.9 | 0.3 | 4.0 | 0.0 | 0.2 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 4.8 | 1.0 | 3.8 | 0.0 | 1.5 | 3.5 | 0.0 | 0.4 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 15.1 | 11.7 | 22.4 | 0.0 | 5.4 | 18.7 | 0.0 | 15.4 | 15.6 | 15.1 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | B | A |
| Approach Vol, veh/h | | 410 | | | 595 | | | 241 | | | 8 | |
| Approach Delay, s/veh | | 14.4 | | | 11.8 | | | 18.4 | | | 15.2 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 12.2 | 20.7 | | 13.5 | 0.0 | 32.9 | | 13.5 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 7.6 | 9.0 | | 2.7 | 0.0 | 7.0 | | 8.8 | | | | |
| Green Ext Time (p_c), s | 0.6 | 5.3 | | 0.0 | 0.0 | 2.1 | | 0.6 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | 13.9 | |
| HCM 6th LOS | | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.1 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 84 | 56 | 50 | 251 | 366 | 110 |
| Future Vol, veh/h | 84 | 56 | 50 | 251 | 366 | 110 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 0 | 0 | 1 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 4 | 4 | 0 | 0 | 1 | 3 |
| Mvmt Flow | 99 | 66 | 59 | 295 | 431 | 129 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 910 | 497 | 561 | 0 | - | 0 |
| Stage 1 | 497 | - | - | - | - | - |
| Stage 2 | 413 | - | - | - | - | - |
| Critical Hdwy | 6.44 | 6.24 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.44 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.44 | - | - | - | - | - |
| Follow-up Hdwy | 3.536 | 3.336 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 302 | 569 | 1020 | - | - | - |
| Stage 1 | 607 | - | - | - | - | - |
| Stage 2 | 664 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 284 | 568 | 1019 | - | - | - |
| Mov Cap-2 Maneuver | 408 | - | - | - | - | - |
| Stage 1 | 571 | - | - | - | - | - |
| Stage 2 | 663 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 17.1 | 1.5 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1019 | - | 460 | - | - |
| HCM Lane V/C Ratio | 0.058 | - | 0.358 | - | - |
| HCM Control Delay (s) | 8.7 | - | 17.1 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 1.6 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 67 | 8 | 33 | 6 | 3 | 8 | 37 | 226 | 9 | 33 | 279 | 110 |
| Future Vol, veh/h | 67 | 8 | 33 | 6 | 3 | 8 | 37 | 226 | 9 | 33 | 279 | 110 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 6 | 17 | 0 | 0 | 6 | 0 | 11 | 0 | 2 | 1 |
| Mvmt Flow | 79 | 9 | 39 | 7 | 4 | 9 | 44 | 266 | 11 | 39 | 328 | 129 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 842 | 841 | 399 | 856 | 900 | 272 | 462 | 0 | 0 | 277 | 0 | 0 |
| Stage 1 | 476 | 476 | - | 360 | 360 | - | - | - | - | - | - | - |
| Stage 2 | 366 | 365 | - | 496 | 540 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.26 | 7.27 | 6.5 | 6.2 | 4.16 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.354 | 3.653 | 4 | 3.3 | 2.254 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 286 | 303 | 642 | 262 | 280 | 772 | 1078 | - | - | 1298 | - | - |
| Stage 1 | 574 | 560 | - | 628 | 630 | - | - | - | - | - | - | - |
| Stage 2 | 657 | 627 | - | 529 | 524 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 264 | 281 | 638 | 228 | 259 | 772 | 1073 | - | - | 1298 | - | - |
| Mov Cap-2 Maneuver | 378 | 380 | - | 327 | 353 | - | - | - | - | - | - | - |
| Stage 1 | 548 | 540 | - | 602 | 604 | - | - | - | - | - | - | - |
| Stage 2 | 619 | 601 | - | 473 | 506 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 16.8 | 13.2 | 1.2 | 0.6 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1073 | - | - | 432 | 457 | 1298 | - | - |
| HCM Lane V/C Ratio | 0.041 | - | - | 0.294 | 0.044 | 0.03 | - | - |
| HCM Control Delay (s) | 8.5 | - | - | 16.8 | 13.2 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.2 | 0.1 | 0.1 | - | - |

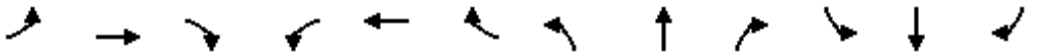
| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.8 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 118 | 9 | 12 | 114 | 23 | 14 | 59 | 9 | 11 | 63 | 4 |
| Future Vol, veh/h | 3 | 118 | 9 | 12 | 114 | 23 | 14 | 59 | 9 | 11 | 63 | 4 |
| Peak Hour Factor | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Heavy Vehicles, % | 0 | 4 | 11 | 0 | 3 | 0 | 8 | 7 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 4 | 148 | 11 | 15 | 143 | 29 | 18 | 74 | 11 | 14 | 79 | 5 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.8 | 8.9 | 8.8 | 8.6 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 17% | 2% | 8% | 14% |
| Vol Thru, % | 72% | 91% | 77% | 81% |
| Vol Right, % | 11% | 7% | 15% | 5% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 82 | 130 | 149 | 78 |
| LT Vol | 14 | 3 | 12 | 11 |
| Through Vol | 59 | 118 | 114 | 63 |
| RT Vol | 9 | 9 | 23 | 4 |
| Lane Flow Rate | 102 | 162 | 186 | 98 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.14 | 0.206 | 0.233 | 0.131 |
| Departure Headway (Hd) | 4.927 | 4.568 | 4.505 | 4.829 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 726 | 783 | 795 | 740 |
| Service Time | 2.973 | 2.607 | 2.541 | 2.875 |
| HCM Lane V/C Ratio | 0.14 | 0.207 | 0.234 | 0.132 |
| HCM Control Delay | 8.8 | 8.8 | 8.9 | 8.6 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.5 | 0.8 | 0.9 | 0.4 |

# Appendix E: Year 2024 Total Traffic Conditions Analysis Worksheets



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 308 | 181 | 199 | 215 | 1 | 160 | 0 | 221 | 1 | 0 | 0 |
| Future Volume (veh/h) | 0 | 308 | 181 | 199 | 215 | 1 | 160 | 0 | 221 | 1 | 0 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1796 | 1811 | 1826 | 1781 | 1900 | 1826 | 1900 | 1870 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 371 | 41 | 240 | 259 | 1 | 193 | 0 | 12 | 1 | 0 | 0 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 0 | 7 | 6 | 5 | 8 | 0 | 5 | 0 | 2 | 0 | 0 | 0 |
| Cap, veh/h | 4 | 598 | 511 | 311 | 1075 | 4 | 392 | 0 | 281 | 390 | 331 | 0 |
| Arrive On Green | 0.00 | 0.33 | 0.33 | 0.18 | 0.61 | 0.61 | 0.17 | 0.00 | 0.17 | 0.17 | 0.00 | 0.00 |
| Sat Flow, veh/h | 1810 | 1796 | 1535 | 1739 | 1773 | 7 | 1384 | 0 | 1610 | 1424 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 371 | 41 | 240 | 0 | 260 | 193 | 0 | 12 | 1 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1796 | 1535 | 1739 | 0 | 1780 | 1384 | 0 | 1610 | 1424 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 8.3 | 0.9 | 6.3 | 0.0 | 3.2 | 6.4 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 8.3 | 0.9 | 6.3 | 0.0 | 3.2 | 6.4 | 0.0 | 0.3 | 0.3 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 598 | 511 | 311 | 0 | 1079 | 392 | 0 | 281 | 390 | 331 | 0 |
| V/C Ratio(X) | 0.00 | 0.62 | 0.08 | 0.77 | 0.00 | 0.24 | 0.49 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 567 | 2252 | 1924 | 1272 | 0 | 2232 | 873 | 0 | 841 | 588 | 596 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 13.4 | 10.9 | 18.7 | 0.0 | 4.3 | 18.9 | 0.0 | 16.4 | 16.6 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.2 | 0.1 | 4.0 | 0.0 | 0.1 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 5.7 | 0.5 | 4.2 | 0.0 | 0.9 | 3.4 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 15.7 | 11.1 | 22.8 | 0.0 | 4.5 | 19.9 | 0.0 | 16.5 | 16.6 | 0.0 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | A | A |
| Approach Vol, veh/h | | 412 | | | 500 | | | 205 | | | 1 | |
| Approach Delay, s/veh | | 15.2 | | | 13.2 | | | 19.7 | | | 16.6 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 13.1 | 21.9 | | 12.8 | 0.0 | 35.0 | | 12.8 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 8.3 | 10.3 | | 2.3 | 0.0 | 5.2 | | 8.4 | | | | |
| Green Ext Time (p_c), s | 0.6 | 5.6 | | 0.0 | 0.0 | 1.4 | | 0.5 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | 15.2 | |
| HCM 6th LOS | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.2 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 161 | 52 | 64 | 217 | 201 | 178 |
| Future Vol, veh/h | 161 | 52 | 64 | 217 | 201 | 178 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 3 | 6 | 6 | 4 | 6 | 6 |
| Mvmt Flow | 209 | 68 | 83 | 282 | 261 | 231 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 825 | 377 | 492 | 0 | - | 0 |
| Stage 1 | 377 | - | - | - | - | - |
| Stage 2 | 448 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.26 | 4.16 | - | - | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.354 | 2.254 | - | - | - |
| Pot Cap-1 Maneuver | 341 | 661 | 1051 | - | - | - |
| Stage 1 | 691 | - | - | - | - | - |
| Stage 2 | 642 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 314 | 661 | 1051 | - | - | - |
| Mov Cap-2 Maneuver | 435 | - | - | - | - | - |
| Stage 1 | 636 | - | - | - | - | - |
| Stage 2 | 642 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 22.6 | 2 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1051 | - | 475 | - | - |
| HCM Lane V/C Ratio | 0.079 | - | 0.582 | - | - |
| HCM Control Delay (s) | 8.7 | - | 22.6 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.3 | - | 3.6 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 66 | 5 | 31 | 12 | 8 | 34 | 38 | 182 | 3 | 8 | 203 | 43 |
| Future Vol, veh/h | 66 | 5 | 31 | 12 | 8 | 34 | 38 | 182 | 3 | 8 | 203 | 43 |
| Conflicting Peds, #/hr | 2 | 0 | 1 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 0 | 6 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| Heavy Vehicles, % | 0 | 0 | 7 | 8 | 0 | 3 | 3 | 7 | 33 | 12 | 5 | 5 |
| Mvmt Flow | 87 | 7 | 41 | 16 | 11 | 45 | 50 | 239 | 4 | 11 | 267 | 57 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 695 | 668 | 303 | 685 | 694 | 244 | 330 | 0 | 0 | 244 | 0 | 0 |
| Stage 1 | 324 | 324 | - | 342 | 342 | - | - | - | - | - | - | - |
| Stage 2 | 371 | 344 | - | 343 | 352 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.27 | 7.18 | 6.5 | 6.23 | 4.13 | - | - | 4.22 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.363 | 3.572 | 4 | 3.327 | 2.227 | - | - | 2.308 | - | - |
| Pot Cap-1 Maneuver | 359 | 382 | 725 | 354 | 369 | 792 | 1224 | - | - | 1266 | - | - |
| Stage 1 | 692 | 653 | - | 661 | 642 | - | - | - | - | - | - | - |
| Stage 2 | 653 | 640 | - | 660 | 635 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 317 | 361 | 720 | 317 | 348 | 790 | 1217 | - | - | 1265 | - | - |
| Mov Cap-2 Maneuver | 421 | 448 | - | 415 | 430 | - | - | - | - | - | - | - |
| Stage 1 | 659 | 643 | - | 633 | 615 | - | - | - | - | - | - | - |
| Stage 2 | 579 | 613 | - | 610 | 625 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 15.3 | 11.9 | 1.4 | 0.2 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1217 | - | - | 483 | 596 | 1265 | - | - |
| HCM Lane V/C Ratio | 0.041 | - | - | 0.278 | 0.119 | 0.008 | - | - |
| HCM Control Delay (s) | 8.1 | - | - | 15.3 | 11.9 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.1 | 0.4 | 0 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 11.6 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 4 | 182 | 26 | 5 | 228 | 8 | 17 | 64 | 10 | 14 | 37 | 10 |
| Future Vol, veh/h | 4 | 182 | 26 | 5 | 228 | 8 | 17 | 64 | 10 | 14 | 37 | 10 |
| Peak Hour Factor | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| Heavy Vehicles, % | 25 | 5 | 12 | 0 | 7 | 0 | 6 | 8 | 10 | 0 | 8 | 10 |
| Mvmt Flow | 5 | 249 | 36 | 7 | 312 | 11 | 23 | 88 | 14 | 19 | 51 | 14 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 12.3 | 12 | 10.2 | 9.6 |
| HCM LOS | B | B | B | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 19% | 2% | 2% | 23% |
| Vol Thru, % | 70% | 86% | 95% | 61% |
| Vol Right, % | 11% | 12% | 3% | 16% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 91 | 212 | 241 | 61 |
| LT Vol | 17 | 4 | 5 | 14 |
| Through Vol | 64 | 182 | 228 | 37 |
| RT Vol | 10 | 26 | 8 | 10 |
| Lane Flow Rate | 125 | 290 | 330 | 84 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.198 | 0.43 | 0.453 | 0.132 |
| Departure Headway (Hd) | 5.718 | 5.331 | 4.935 | 5.681 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 627 | 680 | 733 | 631 |
| Service Time | 3.756 | 3.341 | 2.944 | 3.721 |
| HCM Lane V/C Ratio | 0.199 | 0.426 | 0.45 | 0.133 |
| HCM Control Delay | 10.2 | 12.3 | 12 | 9.6 |
| HCM Lane LOS | B | B | B | A |
| HCM 95th-tile Q | 0.7 | 2.2 | 2.4 | 0.5 |

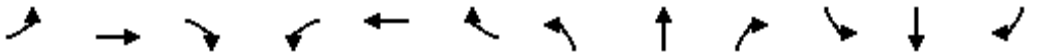
| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 378 | 0 | 0 | 377 | 2 |
| Future Vol, veh/h | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 378 | 0 | 0 | 377 | 2 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | Stop | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | 0 | 75 | - | - | - | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 0 |
| Mvmt Flow | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 491 | 0 | 0 | 490 | 3 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 983 | 983 | 492 | - | - | 491 | 493 | 0 | 0 | - | - | 0 |
| Stage 1 | 492 | 492 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 491 | 491 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | - | - | 6.2 | 4.1 | - | - | - | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | - | - | 3.3 | 2.2 | - | - | - | - | - |
| Pot Cap-1 Maneuver | 230 | 251 | 581 | 0 | 0 | 582 | 1081 | - | - | 0 | - | - |
| Stage 1 | 562 | 551 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Stage 2 | 563 | 552 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 230 | 251 | 581 | - | - | 582 | 1081 | - | - | - | - | - |
| Mov Cap-2 Maneuver | 362 | 366 | - | - | - | - | - | - | - | - | - | - |
| Stage 1 | 562 | 551 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 563 | 552 | - | - | - | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 13.6 | 0 | 0 | 0 |
| HCM LOS | B | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBT | SBR |
|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1081 | - | - | 426 | - | - | - |
| HCM Lane V/C Ratio | - | - | - | 0.015 | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 13.6 | 0 | - | - |
| HCM Lane LOS | A | - | - | B | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - | - | - |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 298 | 271 | 204 | 332 | 2 | 194 | 1 | 142 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 298 | 271 | 204 | 332 | 2 | 194 | 1 | 142 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 331 | 72 | 227 | 369 | 2 | 216 | 1 | 21 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 4 | 579 | 497 | 299 | 1051 | 6 | 428 | 14 | 302 | 313 | 370 | 0 |
| Arrive On Green | 0.00 | 0.31 | 0.31 | 0.17 | 0.58 | 0.58 | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1814 | 10 | 1421 | 74 | 1548 | 861 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 331 | 72 | 227 | 0 | 371 | 216 | 0 | 22 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1621 | 861 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 7.0 | 1.5 | 5.7 | 0.0 | 5.0 | 6.7 | 0.0 | 0.5 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 7.0 | 1.5 | 5.7 | 0.0 | 5.0 | 6.9 | 0.0 | 0.5 | 0.6 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.95 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 579 | 497 | 299 | 0 | 1057 | 428 | 0 | 316 | 313 | 370 | 0 |
| V/C Ratio(X) | 0.00 | 0.57 | 0.14 | 0.76 | 0.00 | 0.35 | 0.50 | 0.00 | 0.07 | 0.01 | 0.02 | 0.00 |
| Avail Cap(c_a), veh/h | 584 | 2374 | 2038 | 1340 | 0 | 2353 | 915 | 0 | 871 | 423 | 613 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 13.3 | 11.4 | 18.5 | 0.0 | 5.2 | 17.9 | 0.0 | 15.3 | 15.5 | 15.1 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 1.9 | 0.3 | 3.9 | 0.0 | 0.2 | 0.9 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 4.9 | 0.9 | 3.8 | 0.0 | 1.5 | 3.6 | 0.0 | 0.3 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 15.2 | 11.7 | 22.4 | 0.0 | 5.4 | 18.8 | 0.0 | 15.4 | 15.5 | 15.1 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | B | A |
| Approach Vol, veh/h | | 403 | | | 598 | | | 238 | | | 8 | |
| Approach Delay, s/veh | | 14.6 | | | 11.8 | | | 18.5 | | | 15.2 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 12.3 | 20.6 | | 13.6 | 0.0 | 32.9 | | 13.6 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 7.7 | 9.0 | | 2.6 | 0.0 | 7.0 | | 8.9 | | | | |
| Green Ext Time (p_c), s | 0.6 | 5.2 | | 0.0 | 0.0 | 2.1 | | 0.6 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | 14.0 | |
| HCM 6th LOS | | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.1 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 85 | 56 | 50 | 252 | 367 | 111 |
| Future Vol, veh/h | 85 | 56 | 50 | 252 | 367 | 111 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 0 | 0 | 1 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 4 | 4 | 0 | 0 | 1 | 3 |
| Mvmt Flow | 100 | 66 | 59 | 296 | 432 | 131 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 913 | 499 | 564 | 0 | - | 0 |
| Stage 1 | 499 | - | - | - | - | - |
| Stage 2 | 414 | - | - | - | - | - |
| Critical Hdwy | 6.44 | 6.24 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.44 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.44 | - | - | - | - | - |
| Follow-up Hdwy | 3.536 | 3.336 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 301 | 568 | 1018 | - | - | - |
| Stage 1 | 606 | - | - | - | - | - |
| Stage 2 | 663 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 283 | 567 | 1017 | - | - | - |
| Mov Cap-2 Maneuver | 407 | - | - | - | - | - |
| Stage 1 | 570 | - | - | - | - | - |
| Stage 2 | 662 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 17.3 | 1.4 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1017 | - | 458 | - | - |
| HCM Lane V/C Ratio | 0.058 | - | 0.362 | - | - |
| HCM Control Delay (s) | 8.8 | - | 17.3 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 1.6 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 67 | 8 | 33 | 6 | 3 | 8 | 37 | 227 | 9 | 33 | 280 | 110 |
| Future Vol, veh/h | 67 | 8 | 33 | 6 | 3 | 8 | 37 | 227 | 9 | 33 | 280 | 110 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 6 | 17 | 0 | 0 | 6 | 0 | 11 | 0 | 2 | 1 |
| Mvmt Flow | 79 | 9 | 39 | 7 | 4 | 9 | 44 | 267 | 11 | 39 | 329 | 129 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 844 | 843 | 400 | 858 | 902 | 273 | 463 | 0 | 0 | 278 | 0 | 0 |
| Stage 1 | 477 | 477 | - | 361 | 361 | - | - | - | - | - | - | - |
| Stage 2 | 367 | 366 | - | 497 | 541 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.26 | 7.27 | 6.5 | 6.2 | 4.16 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.354 | 3.653 | 4 | 3.3 | 2.254 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 285 | 303 | 641 | 261 | 280 | 771 | 1078 | - | - | 1296 | - | - |
| Stage 1 | 573 | 559 | - | 628 | 629 | - | - | - | - | - | - | - |
| Stage 2 | 657 | 626 | - | 528 | 524 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 263 | 281 | 637 | 227 | 259 | 771 | 1073 | - | - | 1296 | - | - |
| Mov Cap-2 Maneuver | 377 | 379 | - | 327 | 353 | - | - | - | - | - | - | - |
| Stage 1 | 547 | 539 | - | 602 | 603 | - | - | - | - | - | - | - |
| Stage 2 | 619 | 600 | - | 472 | 506 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 16.8 | 13.2 | 1.2 | 0.6 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1073 | - | - | 431 | 457 | 1296 | - | - |
| HCM Lane V/C Ratio | 0.041 | - | - | 0.295 | 0.044 | 0.03 | - | - |
| HCM Control Delay (s) | 8.5 | - | - | 16.8 | 13.2 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.2 | 0.1 | 0.1 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.8 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 119 | 9 | 12 | 115 | 23 | 14 | 59 | 9 | 11 | 63 | 4 |
| Future Vol, veh/h | 3 | 119 | 9 | 12 | 115 | 23 | 14 | 59 | 9 | 11 | 63 | 4 |
| Peak Hour Factor | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Heavy Vehicles, % | 0 | 4 | 11 | 0 | 3 | 0 | 8 | 7 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 4 | 149 | 11 | 15 | 144 | 29 | 18 | 74 | 11 | 14 | 79 | 5 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.8 | 8.9 | 8.8 | 8.6 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 17% | 2% | 8% | 14% |
| Vol Thru, % | 72% | 91% | 77% | 81% |
| Vol Right, % | 11% | 7% | 15% | 5% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 82 | 131 | 150 | 78 |
| LT Vol | 14 | 3 | 12 | 11 |
| Through Vol | 59 | 119 | 115 | 63 |
| RT Vol | 9 | 9 | 23 | 4 |
| Lane Flow Rate | 102 | 164 | 188 | 98 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.14 | 0.208 | 0.235 | 0.131 |
| Departure Headway (Hd) | 4.933 | 4.571 | 4.506 | 4.835 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 725 | 783 | 795 | 739 |
| Service Time | 2.98 | 2.609 | 2.543 | 2.882 |
| HCM Lane V/C Ratio | 0.141 | 0.209 | 0.236 | 0.133 |
| HCM Control Delay | 8.8 | 8.8 | 8.9 | 8.6 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.5 | 0.8 | 0.9 | 0.4 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 336 | 0 | 0 | 476 | 4 |
| Future Vol, veh/h | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 336 | 0 | 0 | 476 | 4 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | Stop | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | 0 | 75 | - | - | - | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 |
| Mvmt Flow | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 395 | 0 | 0 | 560 | 5 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 962 | 962 | 563 | - | - | 395 | 565 | 0 | 0 | - | - | 0 |
| Stage 1 | 563 | 563 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 399 | 399 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | - | - | 6.2 | 4.1 | - | - | - | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | - | - | 3.3 | 2.2 | - | - | - | - | - |
| Pot Cap-1 Maneuver | 237 | 258 | 530 | 0 | 0 | 659 | 1017 | - | - | 0 | - | - |
| Stage 1 | 514 | 512 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Stage 2 | 631 | 606 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 237 | 257 | 530 | - | - | 659 | 1017 | - | - | - | - | - |
| Mov Cap-2 Maneuver | 364 | 369 | - | - | - | - | - | - | - | - | - | - |
| Stage 1 | 513 | 512 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 630 | 605 | - | - | - | - | - | - | - | - | - | - |

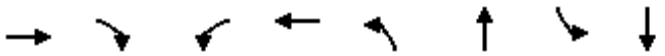
| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 13.4 | 0 | 0.1 | 0 |
| HCM LOS | B | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBT | SBR |
|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1017 | - | - | 432 | - | - | - |
| HCM Lane V/C Ratio | 0.002 | - | - | 0.011 | - | - | - |
| HCM Control Delay (s) | 8.5 | - | - | 13.4 | 0 | - | - |
| HCM Lane LOS | A | - | - | B | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - | - | - |

# Appendix F: Queuing Analysis Worksheets

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 316 | 201 | 229 | 236 | 182 | 254 | 1 |
| v/c Ratio | 0.56 | 0.32 | 0.60 | 0.22 | 0.58 | 0.29 | 0.01 |
| Control Delay | 25.7 | 5.0 | 34.4 | 7.1 | 34.9 | 0.8 | 26.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 25.7 | 5.0 | 34.4 | 7.1 | 34.9 | 0.8 | 26.0 |
| Queue Length 50th (ft) | 108 | 0 | 88 | 39 | 69 | 0 | 0 |
| Queue Length 95th (ft) | 214 | 35 | 184 | 81 | 153 | 0 | 4 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 |
| Base Capacity (vph) | 1495 | 1315 | 904 | 1686 | 514 | 1005 | 315 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.21 | 0.15 | 0.25 | 0.14 | 0.35 | 0.25 | 0.00 |

Intersection Summary

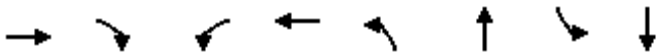


| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 292 | 283 | 216 | 312 | 199 | 152 | 2 | 6 |
| v/c Ratio | 0.52 | 0.42 | 0.57 | 0.29 | 0.58 | 0.30 | 0.01 | 0.01 |
| Control Delay | 24.6 | 5.0 | 32.8 | 7.9 | 32.5 | 6.7 | 23.5 | 23.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 24.6 | 5.0 | 32.8 | 7.9 | 32.5 | 6.7 | 23.5 | 23.4 |
| Queue Length 50th (ft) | 97 | 0 | 79 | 54 | 72 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 211 | 54 | 184 | 121 | 171 | 46 | 6 | 12 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 1574 | 1370 | 960 | 1757 | 549 | 706 | 320 | 736 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.19 | 0.21 | 0.23 | 0.18 | 0.36 | 0.22 | 0.01 | 0.01 |

Intersection Summary

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 371 | 217 | 239 | 260 | 192 | 264 | 1 |
| v/c Ratio | 0.60 | 0.32 | 0.63 | 0.23 | 0.62 | 0.32 | 0.01 |
| Control Delay | 27.0 | 4.6 | 38.7 | 7.1 | 40.3 | 1.0 | 30.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 27.0 | 4.6 | 38.7 | 7.1 | 40.3 | 1.0 | 30.0 |
| Queue Length 50th (ft) | 144 | 0 | 104 | 47 | 83 | 0 | 0 |
| Queue Length 95th (ft) | 262 | 35 | 208 | 88 | 180 | 0 | 4 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 |
| Base Capacity (vph) | 1386 | 1237 | 816 | 1620 | 464 | 941 | 259 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.27 | 0.18 | 0.29 | 0.16 | 0.41 | 0.28 | 0.00 |

Intersection Summary

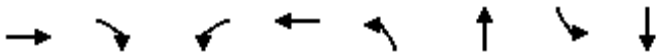


| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 331 | 299 | 224 | 371 | 214 | 158 | 2 | 6 |
| v/c Ratio | 0.55 | 0.42 | 0.60 | 0.34 | 0.61 | 0.31 | 0.01 | 0.01 |
| Control Delay | 25.5 | 4.7 | 36.7 | 8.5 | 36.4 | 7.1 | 26.5 | 26.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 25.5 | 4.7 | 36.7 | 8.5 | 36.4 | 7.1 | 26.5 | 26.2 |
| Queue Length 50th (ft) | 121 | 0 | 92 | 75 | 86 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 245 | 53 | 205 | 143 | 203 | 50 | 7 | 13 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 1482 | 1310 | 876 | 1704 | 501 | 661 | 280 | 672 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.22 | 0.23 | 0.26 | 0.22 | 0.43 | 0.24 | 0.01 | 0.01 |

Intersection Summary

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 371 | 218 | 240 | 260 | 193 | 266 | 1 |
| v/c Ratio | 0.60 | 0.32 | 0.63 | 0.23 | 0.62 | 0.32 | 0.01 |
| Control Delay | 27.1 | 4.6 | 38.8 | 7.1 | 40.4 | 1.0 | 30.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 27.1 | 4.6 | 38.8 | 7.1 | 40.4 | 1.0 | 30.0 |
| Queue Length 50th (ft) | 144 | 0 | 105 | 48 | 84 | 0 | 0 |
| Queue Length 95th (ft) | 262 | 35 | 208 | 87 | 182 | 0 | 4 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 |
| Base Capacity (vph) | 1384 | 1235 | 814 | 1619 | 463 | 941 | 255 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.27 | 0.18 | 0.29 | 0.16 | 0.42 | 0.28 | 0.00 |

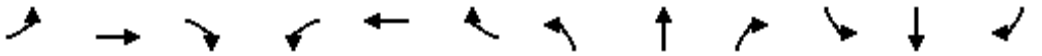
Intersection Summary



| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 331 | 301 | 227 | 371 | 216 | 159 | 2 | 6 |
| v/c Ratio | 0.55 | 0.42 | 0.61 | 0.34 | 0.62 | 0.31 | 0.01 | 0.01 |
| Control Delay | 25.8 | 4.7 | 36.9 | 8.5 | 36.6 | 7.1 | 27.0 | 26.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 25.8 | 4.7 | 36.9 | 8.5 | 36.6 | 7.1 | 27.0 | 26.4 |
| Queue Length 50th (ft) | 123 | 0 | 95 | 76 | 87 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 247 | 54 | 208 | 143 | 207 | 50 | 7 | 14 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 1474 | 1305 | 870 | 1701 | 498 | 659 | 277 | 667 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.22 | 0.23 | 0.26 | 0.22 | 0.43 | 0.24 | 0.01 | 0.01 |

Intersection Summary

# Appendix G: Year 2026 Background Traffic Conditions Analysis Worksheets



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 319 | 187 | 206 | 222 | 1 | 166 | 0 | 230 | 1 | 0 | 0 |
| Future Volume (veh/h) | 0 | 319 | 187 | 206 | 222 | 1 | 166 | 0 | 230 | 1 | 0 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1796 | 1811 | 1826 | 1781 | 1900 | 1826 | 1900 | 1870 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 384 | 43 | 248 | 267 | 1 | 200 | 0 | 13 | 1 | 0 | 0 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 0 | 7 | 6 | 5 | 8 | 0 | 5 | 0 | 2 | 0 | 0 | 0 |
| Cap, veh/h | 4 | 606 | 518 | 318 | 1083 | 4 | 393 | 0 | 289 | 390 | 341 | 0 |
| Arrive On Green | 0.00 | 0.34 | 0.34 | 0.18 | 0.61 | 0.61 | 0.18 | 0.00 | 0.18 | 0.18 | 0.00 | 0.00 |
| Sat Flow, veh/h | 1810 | 1796 | 1535 | 1739 | 1774 | 7 | 1384 | 0 | 1610 | 1423 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 384 | 43 | 248 | 0 | 268 | 200 | 0 | 13 | 1 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1796 | 1535 | 1739 | 0 | 1780 | 1384 | 0 | 1610 | 1423 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 9.0 | 1.0 | 6.8 | 0.0 | 3.5 | 6.9 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 9.0 | 1.0 | 6.8 | 0.0 | 3.5 | 6.9 | 0.0 | 0.3 | 0.4 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 606 | 518 | 318 | 0 | 1087 | 393 | 0 | 289 | 390 | 341 | 0 |
| V/C Ratio(X) | 0.00 | 0.63 | 0.08 | 0.78 | 0.00 | 0.25 | 0.51 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 542 | 2153 | 1840 | 1216 | 0 | 2134 | 835 | 0 | 804 | 561 | 569 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 14.0 | 11.3 | 19.5 | 0.0 | 4.5 | 19.7 | 0.0 | 17.0 | 17.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.3 | 0.1 | 4.1 | 0.0 | 0.1 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 6.3 | 0.5 | 4.6 | 0.0 | 1.0 | 3.7 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 16.3 | 11.4 | 23.6 | 0.0 | 4.6 | 20.7 | 0.0 | 17.0 | 17.1 | 0.0 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | C | A | B | B | A | A |
| Approach Vol, veh/h | | 427 | | | 516 | | | 213 | | | 1 | |
| Approach Delay, s/veh | | 15.8 | | | 13.7 | | | 20.5 | | | 17.1 | |
| Approach LOS | | B | | | B | | | C | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 13.7 | 22.9 | | 13.5 | 0.0 | 36.6 | | 13.5 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 8.8 | 11.0 | | 2.4 | 0.0 | 5.5 | | 8.9 | | | | |
| Green Ext Time (p_c), s | 0.7 | 5.9 | | 0.0 | 0.0 | 1.5 | | 0.5 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 15.7 |
| HCM 6th LOS | | B |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.7 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 167 | 54 | 67 | 226 | 209 | 185 |
| Future Vol, veh/h | 167 | 54 | 67 | 226 | 209 | 185 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 3 | 6 | 6 | 4 | 6 | 6 |
| Mvmt Flow | 217 | 70 | 87 | 294 | 271 | 240 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 859 | 391 | 511 | 0 | - | 0 |
| Stage 1 | 391 | - | - | - | - | - |
| Stage 2 | 468 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.26 | 4.16 | - | - | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.354 | 2.254 | - | - | - |
| Pot Cap-1 Maneuver | 326 | 649 | 1034 | - | - | - |
| Stage 1 | 681 | - | - | - | - | - |
| Stage 2 | 628 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 299 | 649 | 1034 | - | - | - |
| Mov Cap-2 Maneuver | 422 | - | - | - | - | - |
| Stage 1 | 624 | - | - | - | - | - |
| Stage 2 | 628 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 24.8 | 2 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1034 | - | 461 | - | - |
| HCM Lane V/C Ratio | 0.084 | - | 0.623 | - | - |
| HCM Control Delay (s) | 8.8 | - | 24.8 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.3 | - | 4.2 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 68 | 5 | 32 | 13 | 9 | 36 | 40 | 189 | 3 | 9 | 210 | 44 |
| Future Vol, veh/h | 68 | 5 | 32 | 13 | 9 | 36 | 40 | 189 | 3 | 9 | 210 | 44 |
| Conflicting Peds, #/hr | 2 | 0 | 1 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 0 | 6 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| Heavy Vehicles, % | 0 | 0 | 7 | 8 | 0 | 3 | 3 | 7 | 33 | 12 | 5 | 5 |
| Mvmt Flow | 89 | 7 | 42 | 17 | 12 | 47 | 53 | 249 | 4 | 12 | 276 | 58 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 724 | 695 | 312 | 713 | 722 | 254 | 340 | 0 | 0 | 254 | 0 | 0 |
| Stage 1 | 335 | 335 | - | 358 | 358 | - | - | - | - | - | - | - |
| Stage 2 | 389 | 360 | - | 355 | 364 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.27 | 7.18 | 6.5 | 6.23 | 4.13 | - | - | 4.22 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.363 | 3.572 | 4 | 3.327 | 2.227 | - | - | 2.308 | - | - |
| Pot Cap-1 Maneuver | 344 | 368 | 717 | 339 | 355 | 782 | 1214 | - | - | 1255 | - | - |
| Stage 1 | 683 | 646 | - | 648 | 631 | - | - | - | - | - | - | - |
| Stage 2 | 639 | 630 | - | 650 | 627 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 301 | 346 | 712 | 302 | 334 | 780 | 1207 | - | - | 1254 | - | - |
| Mov Cap-2 Maneuver | 407 | 437 | - | 402 | 418 | - | - | - | - | - | - | - |
| Stage 1 | 650 | 636 | - | 619 | 603 | - | - | - | - | - | - | - |
| Stage 2 | 561 | 602 | - | 599 | 617 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 15.8 | 12.1 | 1.4 | 0.3 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1207 | - | - | 470 | 580 | 1254 | - | - |
| HCM Lane V/C Ratio | 0.044 | - | - | 0.294 | 0.132 | 0.009 | - | - |
| HCM Control Delay (s) | 8.1 | - | - | 15.8 | 12.1 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.2 | 0.5 | 0 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 11.9 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 4 | 189 | 27 | 5 | 236 | 9 | 17 | 66 | 11 | 14 | 38 | 11 |
| Future Vol, veh/h | 4 | 189 | 27 | 5 | 236 | 9 | 17 | 66 | 11 | 14 | 38 | 11 |
| Peak Hour Factor | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| Heavy Vehicles, % | 25 | 5 | 12 | 0 | 7 | 0 | 6 | 8 | 10 | 0 | 8 | 10 |
| Mvmt Flow | 5 | 259 | 37 | 7 | 323 | 12 | 23 | 90 | 15 | 19 | 52 | 15 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 12.7 | 12.4 | 10.3 | 9.7 |
| HCM LOS | B | B | B | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 18% | 2% | 2% | 22% |
| Vol Thru, % | 70% | 86% | 94% | 60% |
| Vol Right, % | 12% | 12% | 4% | 17% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 94 | 220 | 250 | 63 |
| LT Vol | 17 | 4 | 5 | 14 |
| Through Vol | 66 | 189 | 236 | 38 |
| RT Vol | 11 | 27 | 9 | 11 |
| Lane Flow Rate | 129 | 301 | 342 | 86 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.207 | 0.449 | 0.475 | 0.138 |
| Departure Headway (Hd) | 5.79 | 5.366 | 4.992 | 5.755 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 619 | 672 | 726 | 622 |
| Service Time | 3.832 | 3.395 | 2.992 | 3.801 |
| HCM Lane V/C Ratio | 0.208 | 0.448 | 0.471 | 0.138 |
| HCM Control Delay | 10.3 | 12.7 | 12.4 | 9.7 |
| HCM Lane LOS | B | B | B | A |
| HCM 95th-tile Q | 0.8 | 2.3 | 2.6 | 0.5 |

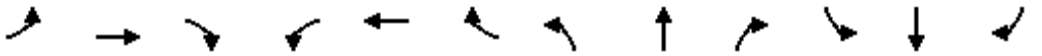
| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 393 | 0 | 0 | 392 | 2 |
| Future Vol, veh/h | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 393 | 0 | 0 | 392 | 2 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | Stop | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | 0 | 75 | - | - | - | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 0 |
| Mvmt Flow | 4 | 0 | 3 | 0 | 0 | 0 | 0 | 510 | 0 | 0 | 509 | 3 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1021 | 1021 | 511 | - | - | 510 | 512 | 0 | 0 | - | - | 0 |
| Stage 1 | 511 | 511 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 510 | 510 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | - | - | 6.2 | 4.1 | - | - | - | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | - | - | 3.3 | 2.2 | - | - | - | - | - |
| Pot Cap-1 Maneuver | 217 | 238 | 567 | 0 | 0 | 567 | 1064 | - | - | 0 | - | - |
| Stage 1 | 549 | 540 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Stage 2 | 550 | 541 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 217 | 238 | 567 | - | - | 567 | 1064 | - | - | - | - | - |
| Mov Cap-2 Maneuver | 350 | 355 | - | - | - | - | - | - | - | - | - | - |
| Stage 1 | 549 | 540 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 550 | 541 | - | - | - | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 13.9 | 0 | 0 | 0 |
| HCM LOS | B | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBT | SBR |
|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1064 | - | - | 413 | - | - | - |
| HCM Lane V/C Ratio | - | - | - | 0.016 | - | - | - |
| HCM Control Delay (s) | 0 | - | - | 13.9 | 0 | - | - |
| HCM Lane LOS | A | - | - | B | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - | - | - |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 308 | 281 | 212 | 343 | 2 | 201 | 1 | 148 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 308 | 281 | 212 | 343 | 2 | 201 | 1 | 148 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 342 | 75 | 236 | 381 | 2 | 223 | 1 | 23 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 4 | 585 | 502 | 308 | 1059 | 6 | 429 | 13 | 310 | 310 | 379 | 0 |
| Arrive On Green | 0.00 | 0.32 | 0.32 | 0.17 | 0.58 | 0.58 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1815 | 10 | 1421 | 68 | 1553 | 860 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 342 | 75 | 236 | 0 | 383 | 223 | 0 | 24 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1620 | 860 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 7.5 | 1.6 | 6.1 | 0.0 | 5.4 | 7.2 | 0.0 | 0.6 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 7.5 | 1.6 | 6.1 | 0.0 | 5.4 | 7.4 | 0.0 | 0.6 | 0.7 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.96 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 4 | 585 | 502 | 308 | 0 | 1065 | 429 | 0 | 324 | 310 | 379 | 0 |
| V/C Ratio(X) | 0.00 | 0.58 | 0.15 | 0.77 | 0.00 | 0.36 | 0.52 | 0.00 | 0.07 | 0.01 | 0.02 | 0.00 |
| Avail Cap(c_a), veh/h | 560 | 2280 | 1957 | 1287 | 0 | 2259 | 878 | 0 | 836 | 404 | 588 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 13.8 | 11.8 | 19.1 | 0.0 | 5.3 | 18.5 | 0.0 | 15.7 | 16.0 | 15.6 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.0 | 0.3 | 4.0 | 0.0 | 0.2 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 5.3 | 1.0 | 4.2 | 0.0 | 1.7 | 3.9 | 0.0 | 0.4 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 15.8 | 12.1 | 23.1 | 0.0 | 5.5 | 19.5 | 0.0 | 15.8 | 16.0 | 15.6 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | B | A | B | B | B | A |
| Approach Vol, veh/h | | 417 | | | 619 | | | 247 | | | 8 | |
| Approach Delay, s/veh | | 15.2 | | | 12.2 | | | 19.1 | | | 15.7 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 12.9 | 21.4 | | 14.2 | 0.0 | 34.3 | | 14.2 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 8.1 | 9.5 | | 2.7 | 0.0 | 7.4 | | 9.4 | | | | |
| Green Ext Time (p_c), s | 0.6 | 5.4 | | 0.0 | 0.0 | 2.2 | | 0.6 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | 14.5 | |
| HCM 6th LOS | | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.2 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 88 | 58 | 52 | 262 | 381 | 115 |
| Future Vol, veh/h | 88 | 58 | 52 | 262 | 381 | 115 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 0 | 0 | 1 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 4 | 4 | 0 | 0 | 1 | 3 |
| Mvmt Flow | 104 | 68 | 61 | 308 | 448 | 135 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 947 | 517 | 584 | 0 | - | 0 |
| Stage 1 | 517 | - | - | - | - | - |
| Stage 2 | 430 | - | - | - | - | - |
| Critical Hdwy | 6.44 | 6.24 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.44 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.44 | - | - | - | - | - |
| Follow-up Hdwy | 3.536 | 3.336 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 287 | 554 | 1001 | - | - | - |
| Stage 1 | 594 | - | - | - | - | - |
| Stage 2 | 652 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 269 | 553 | 1000 | - | - | - |
| Mov Cap-2 Maneuver | 395 | - | - | - | - | - |
| Stage 1 | 557 | - | - | - | - | - |
| Stage 2 | 651 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 18 | 1.5 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1000 | - | 446 | - | - |
| HCM Lane V/C Ratio | 0.061 | - | 0.385 | - | - |
| HCM Control Delay (s) | 8.8 | - | 18 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 1.8 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 69 | 9 | 35 | 6 | 3 | 9 | 39 | 236 | 10 | 35 | 290 | 114 |
| Future Vol, veh/h | 69 | 9 | 35 | 6 | 3 | 9 | 39 | 236 | 10 | 35 | 290 | 114 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 6 | 17 | 0 | 0 | 6 | 0 | 11 | 0 | 2 | 1 |
| Mvmt Flow | 81 | 11 | 41 | 7 | 4 | 11 | 46 | 278 | 12 | 41 | 341 | 134 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 879 | 877 | 414 | 893 | 938 | 284 | 480 | 0 | 0 | 290 | 0 | 0 |
| Stage 1 | 495 | 495 | - | 376 | 376 | - | - | - | - | - | - | - |
| Stage 2 | 384 | 382 | - | 517 | 562 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.26 | 7.27 | 6.5 | 6.2 | 4.16 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.354 | 3.653 | 4 | 3.3 | 2.254 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 270 | 289 | 630 | 247 | 266 | 760 | 1062 | - | - | 1283 | - | - |
| Stage 1 | 560 | 549 | - | 616 | 620 | - | - | - | - | - | - | - |
| Stage 2 | 643 | 616 | - | 515 | 513 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 248 | 266 | 626 | 213 | 245 | 760 | 1057 | - | - | 1283 | - | - |
| Mov Cap-2 Maneuver | 363 | 367 | - | 312 | 341 | - | - | - | - | - | - | - |
| Stage 1 | 533 | 529 | - | 589 | 593 | - | - | - | - | - | - | - |
| Stage 2 | 603 | 589 | - | 456 | 494 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 17.6 | 13.4 | 1.2 | 0.6 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1057 | - | - | 418 | 451 | 1283 | - | - |
| HCM Lane V/C Ratio | 0.043 | - | - | 0.318 | 0.047 | 0.032 | - | - |
| HCM Control Delay (s) | 8.6 | - | - | 17.6 | 13.4 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.3 | 0.1 | 0.1 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.9 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 123 | 10 | 13 | 120 | 24 | 14 | 60 | 10 | 12 | 65 | 4 |
| Future Vol, veh/h | 3 | 123 | 10 | 13 | 120 | 24 | 14 | 60 | 10 | 12 | 65 | 4 |
| Peak Hour Factor | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Heavy Vehicles, % | 0 | 4 | 11 | 0 | 3 | 0 | 8 | 7 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 4 | 154 | 13 | 16 | 150 | 30 | 18 | 75 | 13 | 15 | 81 | 5 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 8.9 | 9.1 | 8.9 | 8.7 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 17% | 2% | 8% | 15% |
| Vol Thru, % | 71% | 90% | 76% | 80% |
| Vol Right, % | 12% | 7% | 15% | 5% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 84 | 136 | 157 | 81 |
| LT Vol | 14 | 3 | 13 | 12 |
| Through Vol | 60 | 123 | 120 | 65 |
| RT Vol | 10 | 10 | 24 | 4 |
| Lane Flow Rate | 105 | 170 | 196 | 101 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.145 | 0.217 | 0.247 | 0.137 |
| Departure Headway (Hd) | 4.971 | 4.598 | 4.535 | 4.88 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 718 | 779 | 789 | 732 |
| Service Time | 3.02 | 2.64 | 2.575 | 2.93 |
| HCM Lane V/C Ratio | 0.146 | 0.218 | 0.248 | 0.138 |
| HCM Control Delay | 8.9 | 8.9 | 9.1 | 8.7 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.5 | 0.8 | 1 | 0.5 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

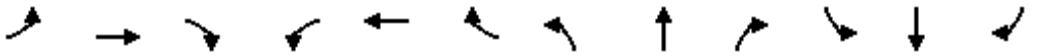
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 348 | 0 | 0 | 494 | 4 |
| Future Vol, veh/h | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 348 | 0 | 0 | 494 | 4 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | Stop | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | 0 | 75 | - | - | - | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| Mvmt Flow | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 409 | 0 | 0 | 581 | 5 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 997 | 997 | 584 | - | - | 409 | 586 | 0 | 0 | - | - | 0 |
| Stage 1 | 584 | 584 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 413 | 413 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | - | - | 6.2 | 4.1 | - | - | - | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | - | - | 3.3 | 2.2 | - | - | - | - | - |
| Pot Cap-1 Maneuver | 225 | 246 | 515 | 0 | 0 | 647 | 999 | - | - | 0 | - | - |
| Stage 1 | 501 | 501 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Stage 2 | 620 | 597 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 225 | 246 | 515 | - | - | 647 | 999 | - | - | - | - | - |
| Mov Cap-2 Maneuver | 353 | 359 | - | - | - | - | - | - | - | - | - | - |
| Stage 1 | 500 | 501 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 619 | 596 | - | - | - | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 13.7 | 0 | 0 | 0 |
| HCM LOS | B | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBT | SBR |
|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 999 | - | - | 419 | - | - | - |
| HCM Lane V/C Ratio | 0.002 | - | - | 0.011 | - | - | - |
| HCM Control Delay (s) | 8.6 | - | - | 13.7 | 0 | - | - |
| HCM Lane LOS | A | - | - | B | A | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - | - | - |

# Appendix H: Year 2026 Total Traffic Conditions Analysis Worksheets



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 319 | 205 | 226 | 222 | 1 | 196 | 0 | 263 | 1 | 0 | 0 |
| Future Volume (veh/h) | 0 | 319 | 205 | 226 | 222 | 1 | 196 | 0 | 263 | 1 | 0 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1796 | 1811 | 1826 | 1781 | 1900 | 1826 | 1900 | 1870 | 1900 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 384 | 43 | 272 | 267 | 1 | 236 | 0 | 150 | 1 | 0 | 0 |
| Peak Hour Factor | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| Percent Heavy Veh, % | 0 | 7 | 6 | 5 | 8 | 0 | 5 | 0 | 2 | 0 | 0 | 0 |
| Cap, veh/h | 3 | 579 | 495 | 339 | 1058 | 4 | 430 | 0 | 352 | 301 | 416 | 0 |
| Arrive On Green | 0.00 | 0.32 | 0.32 | 0.19 | 0.60 | 0.60 | 0.22 | 0.00 | 0.22 | 0.22 | 0.00 | 0.00 |
| Sat Flow, veh/h | 1810 | 1796 | 1535 | 1739 | 1774 | 7 | 1384 | 0 | 1610 | 1257 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 384 | 43 | 272 | 0 | 268 | 236 | 0 | 150 | 1 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1796 | 1535 | 1739 | 0 | 1780 | 1384 | 0 | 1610 | 1257 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 10.5 | 1.1 | 8.5 | 0.0 | 4.1 | 9.1 | 0.0 | 4.6 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 10.5 | 1.1 | 8.5 | 0.0 | 4.1 | 9.1 | 0.0 | 4.6 | 4.6 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 3 | 579 | 495 | 339 | 0 | 1062 | 430 | 0 | 352 | 301 | 416 | 0 |
| V/C Ratio(X) | 0.00 | 0.66 | 0.09 | 0.80 | 0.00 | 0.25 | 0.55 | 0.00 | 0.43 | 0.00 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 478 | 1897 | 1621 | 1071 | 0 | 1880 | 736 | 0 | 708 | 358 | 502 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 16.6 | 13.4 | 21.8 | 0.0 | 5.5 | 20.9 | 0.0 | 19.1 | 21.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.8 | 0.2 | 4.5 | 0.0 | 0.1 | 1.1 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 7.7 | 0.7 | 5.9 | 0.0 | 1.5 | 5.0 | 0.0 | 2.9 | 0.0 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 19.4 | 13.6 | 26.3 | 0.0 | 5.6 | 22.0 | 0.0 | 19.9 | 21.1 | 0.0 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | C | A | B | C | A | A |
| Approach Vol, veh/h | | 427 | | | 540 | | | 386 | | | 1 | |
| Approach Delay, s/veh | | 18.8 | | | 16.0 | | | 21.2 | | | 21.1 | |
| Approach LOS | | B | | | B | | | C | | | C | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 15.6 | 24.3 | | 16.9 | 0.0 | 39.9 | | 16.9 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 10.5 | 12.5 | | 6.6 | 0.0 | 6.1 | | 11.1 | | | | |
| Green Ext Time (p_c), s | 0.7 | 5.9 | | 0.0 | 0.0 | 1.5 | | 1.3 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 18.4 |
| HCM 6th LOS | | B |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 9.3 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 175 | 61 | 90 | 290 | 229 | 189 |
| Future Vol, veh/h | 175 | 61 | 90 | 290 | 229 | 189 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 3 | 6 | 6 | 4 | 6 | 6 |
| Mvmt Flow | 227 | 79 | 117 | 377 | 297 | 245 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1031 | 420 | 542 | 0 | - | 0 |
| Stage 1 | 420 | - | - | - | - | - |
| Stage 2 | 611 | - | - | - | - | - |
| Critical Hdwy | 6.43 | 6.26 | 4.16 | - | - | - |
| Critical Hdwy Stg 1 | 5.43 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.43 | - | - | - | - | - |
| Follow-up Hdwy | 3.527 | 3.354 | 2.254 | - | - | - |
| Pot Cap-1 Maneuver | 257 | 625 | 1007 | - | - | - |
| Stage 1 | 661 | - | - | - | - | - |
| Stage 2 | 540 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 227 | 625 | 1007 | - | - | - |
| Mov Cap-2 Maneuver | 359 | - | - | - | - | - |
| Stage 1 | 584 | - | - | - | - | - |
| Stage 2 | 540 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 37.3 | 2.1 | 0 |
| HCM LOS | E | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1007 | - | 403 | - | - |
| HCM Lane V/C Ratio | 0.116 | - | 0.761 | - | - |
| HCM Control Delay (s) | 9 | - | 37.3 | - | - |
| HCM Lane LOS | A | - | E | - | - |
| HCM 95th %tile Q(veh) | 0.4 | - | 6.3 | - | - |

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

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 73 | 5 | 32 | 13 | 9 | 38 | 40 | 200 | 3 | 11 | 227 | 51 |
| Future Vol, veh/h | 73 | 5 | 32 | 13 | 9 | 38 | 40 | 200 | 3 | 11 | 227 | 51 |
| Conflicting Peds, #/hr | 2 | 0 | 1 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 0 | 6 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 | 76 |
| Heavy Vehicles, % | 0 | 0 | 7 | 8 | 0 | 3 | 3 | 7 | 33 | 12 | 5 | 5 |
| Mvmt Flow | 96 | 7 | 42 | 17 | 12 | 50 | 53 | 263 | 4 | 14 | 299 | 67 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 771 | 741 | 340 | 758 | 772 | 268 | 372 | 0 | 0 | 268 | 0 | 0 |
| Stage 1 | 367 | 367 | - | 372 | 372 | - | - | - | - | - | - | - |
| Stage 2 | 404 | 374 | - | 386 | 400 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.27 | 7.18 | 6.5 | 6.23 | 4.13 | - | - | 4.22 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.18 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.363 | 3.572 | 4 | 3.327 | 2.227 | - | - | 2.308 | - | - |
| Pot Cap-1 Maneuver | 320 | 347 | 691 | 316 | 333 | 768 | 1181 | - | - | 1240 | - | - |
| Stage 1 | 657 | 626 | - | 636 | 622 | - | - | - | - | - | - | - |
| Stage 2 | 627 | 621 | - | 625 | 605 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 278 | 325 | 686 | 280 | 312 | 766 | 1174 | - | - | 1239 | - | - |
| Mov Cap-2 Maneuver | 388 | 420 | - | 382 | 400 | - | - | - | - | - | - | - |
| Stage 1 | 623 | 615 | - | 607 | 593 | - | - | - | - | - | - | - |
| Stage 2 | 547 | 592 | - | 573 | 595 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 16.9 | 12.4 | 1.4 | 0.3 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1174 | - | - | 446 | 565 | 1239 | - | - |
| HCM Lane V/C Ratio | 0.045 | - | - | 0.325 | 0.14 | 0.012 | - | - |
| HCM Control Delay (s) | 8.2 | - | - | 16.9 | 12.4 | 7.9 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.4 | 0.5 | 0 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 12.8 |
| Intersection LOS | B |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 4 | 200 | 27 | 10 | 253 | 14 | 17 | 66 | 13 | 16 | 38 | 11 |
| Future Vol, veh/h | 4 | 200 | 27 | 10 | 253 | 14 | 17 | 66 | 13 | 16 | 38 | 11 |
| Peak Hour Factor | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| Heavy Vehicles, % | 25 | 5 | 12 | 0 | 7 | 0 | 6 | 8 | 10 | 0 | 8 | 10 |
| Mvmt Flow | 5 | 274 | 37 | 14 | 347 | 19 | 23 | 90 | 18 | 22 | 52 | 15 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 13.5 | 13.6 | 10.6 | 10 |
| HCM LOS | B | B | B | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 18% | 2% | 4% | 25% |
| Vol Thru, % | 69% | 87% | 91% | 58% |
| Vol Right, % | 14% | 12% | 5% | 17% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 96 | 231 | 277 | 65 |
| LT Vol | 17 | 4 | 10 | 16 |
| Through Vol | 66 | 200 | 253 | 38 |
| RT Vol | 13 | 27 | 14 | 11 |
| Lane Flow Rate | 132 | 316 | 379 | 89 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.217 | 0.48 | 0.53 | 0.147 |
| Departure Headway (Hd) | 5.937 | 5.46 | 5.024 | 5.929 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 604 | 658 | 717 | 604 |
| Service Time | 3.984 | 3.496 | 3.059 | 3.98 |
| HCM Lane V/C Ratio | 0.219 | 0.48 | 0.529 | 0.147 |
| HCM Control Delay | 10.6 | 13.5 | 13.6 | 10 |
| HCM Lane LOS | B | B | B | A |
| HCM 95th-tile Q | 0.8 | 2.6 | 3.1 | 0.5 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 0 | 2 | 0 | 0 | 4 | 0 | 452 | 7 | 0 | 430 | 2 |
| Future Vol, veh/h | 3 | 0 | 2 | 0 | 0 | 4 | 0 | 452 | 7 | 0 | 430 | 2 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | Stop | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | 0 | 75 | - | - | - | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 5 | 0 |
| Mvmt Flow | 4 | 0 | 3 | 0 | 0 | 5 | 0 | 587 | 9 | 0 | 558 | 3 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1152 | 1156 | 560 | - | - | 592 | 561 | 0 | 0 | - | - | 0 |
| Stage 1 | 560 | 560 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 592 | 596 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | - | - | 6.2 | 4.1 | - | - | - | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | - | - | 3.3 | 2.2 | - | - | - | - | - |
| Pot Cap-1 Maneuver | 176 | 198 | 532 | 0 | 0 | 510 | 1020 | - | - | 0 | - | - |
| Stage 1 | 516 | 514 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Stage 2 | 496 | 495 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 174 | 198 | 532 | - | - | 510 | 1020 | - | - | - | - | - |
| Mov Cap-2 Maneuver | 309 | 320 | - | - | - | - | - | - | - | - | - | - |
| Stage 1 | 516 | 514 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 491 | 495 | - | - | - | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 14.9 | 12.1 | 0 | 0 |
| HCM LOS | B | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBT | SBR |
|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1020 | - | - | 371 | 510 | - | - |
| HCM Lane V/C Ratio | - | - | - | 0.018 | 0.01 | - | - |
| HCM Control Delay (s) | 0 | - | - | 14.9 | 12.1 | - | - |
| HCM Lane LOS | A | - | - | B | B | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0.1 | 0 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.8 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 18 | 12 | 446 | 19 | 32 | 400 |
| Future Vol, veh/h | 18 | 12 | 446 | 19 | 32 | 400 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | 0 | - | - | 75 | - |
| Veh in Median Storage, # | 1 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 77 | 77 | 77 | 77 | 77 | 77 |
| Heavy Vehicles, % | 0 | 0 | 4 | 0 | 0 | 6 |
| Mvmt Flow | 23 | 16 | 579 | 25 | 42 | 519 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1195 | 592 | 0 | 0 | 604 | 0 |
| Stage 1 | 592 | - | - | - | - | - |
| Stage 2 | 603 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 208 | 510 | - | - | 984 | - |
| Stage 1 | 557 | - | - | - | - | - |
| Stage 2 | 550 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 199 | 510 | - | - | 984 | - |
| Mov Cap-2 Maneuver | 338 | - | - | - | - | - |
| Stage 1 | 557 | - | - | - | - | - |
| Stage 2 | 526 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 14.8 | 0 | 0.7 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 338 | 510 | 984 | - |
| HCM Lane V/C Ratio | - | - | 0.069 | 0.031 | 0.042 | - |
| HCM Control Delay (s) | - | - | 16.4 | 12.3 | 8.8 | - |
| HCM Lane LOS | - | - | C | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 0.2 | 0.1 | 0.1 | - |

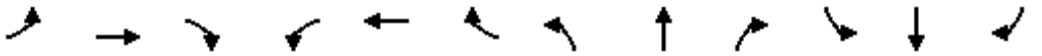
| Intersection | |
|---|---|
| Int Delay, s/veh | 2.1 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 23 | 77 | 303 | 8 | 24 | 266 |
| Future Vol, veh/h | 23 | 77 | 303 | 8 | 24 | 266 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | 100 | - |
| Veh in Median Storage, # | 1 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 76 | 76 | 76 | 76 | 76 | 76 |
| Heavy Vehicles, % | 0 | 0 | 4 | 0 | 0 | 6 |
| Mvmt Flow | 30 | 101 | 399 | 11 | 32 | 350 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 819 | 405 | 0 | 0 | 410 | 0 |
| Stage 1 | 405 | - | - | - | - | - |
| Stage 2 | 414 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 348 | 650 | - | - | 1160 | - |
| Stage 1 | 678 | - | - | - | - | - |
| Stage 2 | 671 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 338 | 650 | - | - | 1160 | - |
| Mov Cap-2 Maneuver | 458 | - | - | - | - | - |
| Stage 1 | 678 | - | - | - | - | - |
| Stage 2 | 652 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 12.8 | 0 | 0.7 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 593 | 1160 | - |
| HCM Lane V/C Ratio | - | - | 0.222 | 0.027 | - |
| HCM Control Delay (s) | - | - | 12.8 | 8.2 | - |
| HCM Lane LOS | - | - | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 0.8 | 0.1 | - |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 308 | 324 | 251 | 343 | 2 | 236 | 1 | 179 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 308 | 324 | 251 | 343 | 2 | 236 | 1 | 179 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 342 | 81 | 279 | 381 | 2 | 262 | 1 | 36 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 3 | 558 | 479 | 350 | 1056 | 6 | 450 | 10 | 356 | 308 | 430 | 0 |
| Arrive On Green | 0.00 | 0.30 | 0.30 | 0.20 | 0.58 | 0.58 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1815 | 10 | 1421 | 44 | 1573 | 850 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 342 | 81 | 279 | 0 | 383 | 262 | 0 | 37 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1617 | 850 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 8.7 | 2.1 | 8.2 | 0.0 | 6.1 | 9.6 | 0.0 | 1.0 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 8.7 | 2.1 | 8.2 | 0.0 | 6.1 | 9.7 | 0.0 | 1.0 | 1.1 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.97 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 3 | 558 | 479 | 350 | 0 | 1062 | 450 | 0 | 366 | 308 | 430 | 0 |
| V/C Ratio(X) | 0.00 | 0.61 | 0.17 | 0.80 | 0.00 | 0.36 | 0.58 | 0.00 | 0.10 | 0.01 | 0.01 | 0.00 |
| Avail Cap(c_a), veh/h | 495 | 2016 | 1730 | 1138 | 0 | 1998 | 776 | 0 | 738 | 349 | 520 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 16.3 | 14.0 | 21.0 | 0.0 | 6.1 | 20.2 | 0.0 | 16.8 | 17.2 | 16.4 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.3 | 0.4 | 4.2 | 0.0 | 0.2 | 1.2 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 6.5 | 1.3 | 5.8 | 0.0 | 2.3 | 5.3 | 0.0 | 0.6 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 18.7 | 14.4 | 25.1 | 0.0 | 6.3 | 21.4 | 0.0 | 16.9 | 17.2 | 16.5 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | C | A | B | B | B | A |
| Approach Vol, veh/h | | 423 | | | 662 | | | 299 | | | 8 | |
| Approach Delay, s/veh | | 17.8 | | | 14.2 | | | 20.9 | | | 16.7 | |
| Approach LOS | | B | | | B | | | C | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 15.3 | 22.6 | | 16.9 | 0.0 | 37.9 | | 16.9 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 10.2 | 10.7 | | 3.1 | 0.0 | 8.1 | | 11.7 | | | | |
| Green Ext Time (p_c), s | 0.8 | 5.5 | | 0.0 | 0.0 | 2.2 | | 0.8 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | 16.8 | |
| HCM 6th LOS | | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

| Intersection | |
|---|---|
| Int Delay, s/veh | 4 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 99 | 71 | 60 | 306 | 444 | 127 |
| Future Vol, veh/h | 99 | 71 | 60 | 306 | 444 | 127 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 0 | 0 | 1 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | 100 | - | - | - |
| Veh in Median Storage, # | 1 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 4 | 4 | 0 | 0 | 1 | 3 |
| Mvmt Flow | 116 | 84 | 71 | 360 | 522 | 149 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1100 | 598 | 672 | 0 | - | 0 |
| Stage 1 | 598 | - | - | - | - | - |
| Stage 2 | 502 | - | - | - | - | - |
| Critical Hdwy | 6.44 | 6.24 | 4.1 | - | - | - |
| Critical Hdwy Stg 1 | 5.44 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.44 | - | - | - | - | - |
| Follow-up Hdwy | 3.536 | 3.336 | 2.2 | - | - | - |
| Pot Cap-1 Maneuver | 233 | 499 | 928 | - | - | - |
| Stage 1 | 545 | - | - | - | - | - |
| Stage 2 | 604 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 215 | 499 | 927 | - | - | - |
| Mov Cap-2 Maneuver | 347 | - | - | - | - | - |
| Stage 1 | 502 | - | - | - | - | - |
| Stage 2 | 603 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 22.8 | 1.5 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 927 | - | 398 | - | - |
| HCM Lane V/C Ratio | 0.076 | - | 0.503 | - | - |
| HCM Control Delay (s) | 9.2 | - | 22.8 | - | - |
| HCM Lane LOS | A | - | C | - | - |
| HCM 95th %tile Q(veh) | 0.2 | - | 2.7 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.6 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 80 | 9 | 35 | 6 | 3 | 12 | 39 | 261 | 10 | 37 | 310 | 123 |
| Future Vol, veh/h | 80 | 9 | 35 | 6 | 3 | 12 | 39 | 261 | 10 | 37 | 310 | 123 |
| Conflicting Peds, #/hr | 0 | 0 | 1 | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | 100 | - | - | 100 | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 6 | 17 | 0 | 0 | 6 | 0 | 11 | 0 | 2 | 1 |
| Mvmt Flow | 94 | 11 | 41 | 7 | 4 | 14 | 46 | 307 | 12 | 44 | 365 | 145 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 945 | 942 | 444 | 958 | 1008 | 313 | 515 | 0 | 0 | 319 | 0 | 0 |
| Stage 1 | 531 | 531 | - | 405 | 405 | - | - | - | - | - | - | - |
| Stage 2 | 414 | 411 | - | 553 | 603 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.26 | 7.27 | 6.5 | 6.2 | 4.16 | - | - | 4.1 | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | 6.27 | 5.5 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.354 | 3.653 | 4 | 3.3 | 2.254 | - | - | 2.2 | - | - |
| Pot Cap-1 Maneuver | 244 | 265 | 606 | 223 | 242 | 732 | 1030 | - | - | 1252 | - | - |
| Stage 1 | 536 | 529 | - | 594 | 602 | - | - | - | - | - | - | - |
| Stage 2 | 620 | 598 | - | 492 | 492 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 222 | 243 | 603 | 191 | 222 | 732 | 1025 | - | - | 1252 | - | - |
| Mov Cap-2 Maneuver | 339 | 347 | - | 292 | 321 | - | - | - | - | - | - | - |
| Stage 1 | 510 | 508 | - | 567 | 575 | - | - | - | - | - | - | - |
| Stage 2 | 577 | 571 | - | 433 | 472 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 19.8 | 13.4 | 1.1 | 0.6 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1025 | - | - | 388 | 454 | 1252 | - | - |
| HCM Lane V/C Ratio | 0.045 | - | - | 0.376 | 0.054 | 0.035 | - | - |
| HCM Control Delay (s) | 8.7 | - | - | 19.8 | 13.4 | 8 | - | - |
| HCM Lane LOS | A | - | - | C | B | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 1.7 | 0.2 | 0.1 | - | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 9.3 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 3 | 134 | 10 | 18 | 130 | 29 | 14 | 60 | 17 | 18 | 65 | 4 |
| Future Vol, veh/h | 3 | 134 | 10 | 18 | 130 | 29 | 14 | 60 | 17 | 18 | 65 | 4 |
| Peak Hour Factor | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Heavy Vehicles, % | 0 | 4 | 11 | 0 | 3 | 0 | 8 | 7 | 0 | 0 | 0 | 0 |
| Mvmt Flow | 4 | 168 | 13 | 23 | 163 | 36 | 18 | 75 | 21 | 23 | 81 | 5 |
| Number of Lanes | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 1 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 1 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 1 |
| HCM Control Delay | 9.2 | 9.5 | 9.1 | 9 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|---|---|---|---|---|
| Vol Left, % | 15% | 2% | 10% | 21% |
| Vol Thru, % | 66% | 91% | 73% | 75% |
| Vol Right, % | 19% | 7% | 16% | 5% |
| Sign Control | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 91 | 147 | 177 | 87 |
| LT Vol | 14 | 3 | 18 | 18 |
| Through Vol | 60 | 134 | 130 | 65 |
| RT Vol | 17 | 10 | 29 | 4 |
| Lane Flow Rate | 114 | 184 | 221 | 109 |
| Geometry Grp | 1 | 1 | 1 | 1 |
| Degree of Util (X) | 0.159 | 0.239 | 0.283 | 0.151 |
| Departure Headway (Hd) | 5.039 | 4.683 | 4.601 | 5.006 |
| Convergence, Y/N | Yes | Yes | Yes | Yes |
| Cap | 708 | 763 | 777 | 712 |
| Service Time | 3.102 | 2.734 | 2.649 | 3.069 |
| HCM Lane V/C Ratio | 0.161 | 0.241 | 0.284 | 0.153 |
| HCM Control Delay | 9.1 | 9.2 | 9.5 | 9 |
| HCM Lane LOS | A | A | A | A |
| HCM 95th-tile Q | 0.6 | 0.9 | 1.2 | 0.5 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 2 | 0 | 2 | 0 | 0 | 14 | 2 | 400 | 11 | 0 | 576 | 4 |
| Future Vol, veh/h | 2 | 0 | 2 | 0 | 0 | 14 | 2 | 400 | 11 | 0 | 576 | 4 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | Stop | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | 0 | 75 | - | - | - | - | - |
| Veh in Median Storage, # | - | 1 | - | - | 1 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 |
| Mvmt Flow | 2 | 0 | 2 | 0 | 0 | 16 | 2 | 471 | 13 | 0 | 678 | 5 |

| Major/Minor | Minor2 | | | Minor1 | | | Major1 | | | Major2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1163 | 1169 | 681 | - | - | 478 | 683 | 0 | 0 | - | - | 0 |
| Stage 1 | 681 | 681 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 482 | 488 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy | 7.1 | 6.5 | 6.2 | - | - | 6.2 | 4.1 | - | - | - | - | - |
| Critical Hdwy Stg 1 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.1 | 5.5 | - | - | - | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 4 | 3.3 | - | - | 3.3 | 2.2 | - | - | - | - | - |
| Pot Cap-1 Maneuver | 173 | 195 | 454 | 0 | 0 | 591 | 919 | - | - | 0 | - | - |
| Stage 1 | 444 | 453 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Stage 2 | 569 | 553 | - | 0 | 0 | - | - | - | - | 0 | - | - |
| Platoon blocked, % | | | | | | | | - | - | | - | - |
| Mov Cap-1 Maneuver | 168 | 195 | 454 | - | - | 591 | 919 | - | - | - | - | - |
| Mov Cap-2 Maneuver | 300 | 315 | - | - | - | - | - | - | - | - | - | - |
| Stage 1 | 443 | 453 | - | - | - | - | - | - | - | - | - | - |
| Stage 2 | 552 | 552 | - | - | - | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 15.1 | 11.3 | 0 | 0 |
| HCM LOS | C | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBT | SBR |
|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 919 | - | - | 361 | 591 | - | - |
| HCM Lane V/C Ratio | 0.003 | - | - | 0.013 | 0.028 | - | - |
| HCM Control Delay (s) | 8.9 | - | - | 15.1 | 11.3 | - | - |
| HCM Lane LOS | A | - | - | C | B | - | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | 0.1 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 58 | 44 | 370 | 36 | 65 | 513 |
| Future Vol, veh/h | 58 | 44 | 370 | 36 | 65 | 513 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | 0 | - | - | 75 | - |
| Veh in Median Storage, # | 1 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 1 | 0 | 0 | 1 |
| Mvmt Flow | 68 | 52 | 435 | 42 | 76 | 604 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1212 | 456 | 0 | 0 | 477 | 0 |
| Stage 1 | 456 | - | - | - | - | - |
| Stage 2 | 756 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 203 | 609 | - | - | 1096 | - |
| Stage 1 | 643 | - | - | - | - | - |
| Stage 2 | 467 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 189 | 609 | - | - | 1096 | - |
| Mov Cap-2 Maneuver | 318 | - | - | - | - | - |
| Stage 1 | 643 | - | - | - | - | - |
| Stage 2 | 435 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 16 | 0 | 1 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 318 | 609 | 1096 | - |
| HCM Lane V/C Ratio | - | - | 0.215 | 0.085 | 0.07 | - |
| HCM Control Delay (s) | - | - | 19.4 | 11.5 | 8.5 | - |
| HCM Lane LOS | - | - | C | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 0.8 | 0.3 | 0.2 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.1 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 12 | 34 | 332 | 21 | 57 | 458 |
| Future Vol, veh/h | 12 | 34 | 332 | 21 | 57 | 458 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | 100 | - |
| Veh in Median Storage, # | 1 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 85 | 85 | 85 | 85 | 85 | 85 |
| Heavy Vehicles, % | 0 | 0 | 0 | 0 | 0 | 1 |
| Mvmt Flow | 14 | 40 | 391 | 25 | 67 | 539 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1077 | 404 | 0 | 0 | 416 | 0 |
| Stage 1 | 404 | - | - | - | - | - |
| Stage 2 | 673 | - | - | - | - | - |
| Critical Hdwy | 6.4 | 6.2 | - | - | 4.1 | - |
| Critical Hdwy Stg 1 | 5.4 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.4 | - | - | - | - | - |
| Follow-up Hdwy | 3.5 | 3.3 | - | - | 2.2 | - |
| Pot Cap-1 Maneuver | 245 | 651 | - | - | 1154 | - |
| Stage 1 | 679 | - | - | - | - | - |
| Stage 2 | 511 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 231 | 651 | - | - | 1154 | - |
| Mov Cap-2 Maneuver | 357 | - | - | - | - | - |
| Stage 1 | 679 | - | - | - | - | - |
| Stage 2 | 481 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 12.5 | 0 | 0.9 |
| HCM LOS | B | | |

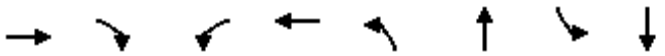
| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 536 | 1154 | - |
| HCM Lane V/C Ratio | - | - | 0.101 | 0.058 | - |
| HCM Control Delay (s) | - | - | 12.5 | 8.3 | - |
| HCM Lane LOS | - | - | B | A | - |
| HCM 95th %tile Q(veh) | - | - | 0.3 | 0.2 | - |

# Appendix I: Queuing Analysis Worksheets

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 384 | 247 | 272 | 268 | 236 | 317 | 1 |
| v/c Ratio | 0.64 | 0.36 | 0.70 | 0.25 | 0.66 | 0.37 | 0.01 |
| Control Delay | 31.0 | 4.6 | 44.2 | 8.0 | 43.5 | 1.2 | 33.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 31.0 | 4.6 | 44.2 | 8.0 | 43.5 | 1.2 | 33.0 |
| Queue Length 50th (ft) | 182 | 0 | 141 | 65 | 114 | 0 | 0 |
| Queue Length 95th (ft) | 285 | 37 | 245 | 89 | #258 | 0 | 5 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 |
| Base Capacity (vph) | 1264 | 1155 | 713 | 1549 | 406 | 894 | 189 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.30 | 0.21 | 0.38 | 0.17 | 0.58 | 0.35 | 0.01 |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



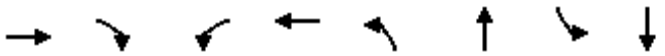
| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 342 | 360 | 279 | 383 | 262 | 200 | 2 | 6 |
| v/c Ratio | 0.59 | 0.49 | 0.72 | 0.36 | 0.64 | 0.33 | 0.01 | 0.01 |
| Control Delay | 30.2 | 5.0 | 44.1 | 9.8 | 39.9 | 6.8 | 30.5 | 30.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 30.2 | 5.0 | 44.1 | 9.8 | 39.9 | 6.8 | 30.5 | 30.0 |
| Queue Length 50th (ft) | 155 | 0 | 140 | 100 | 122 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 274 | 59 | 268 | 146 | #322 | 60 | 8 | 15 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 1283 | 1192 | 725 | 1621 | 414 | 604 | 204 | 555 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.27 | 0.30 | 0.38 | 0.24 | 0.63 | 0.33 | 0.01 | 0.01 |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 384 | 225 | 248 | 268 | 200 | 277 | 1 |
| v/c Ratio | 0.62 | 0.33 | 0.65 | 0.24 | 0.64 | 0.33 | 0.01 |
| Control Delay | 28.0 | 4.5 | 40.3 | 7.2 | 42.0 | 1.1 | 31.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 28.0 | 4.5 | 40.3 | 7.2 | 42.0 | 1.1 | 31.0 |
| Queue Length 50th (ft) | 156 | 0 | 113 | 51 | 90 | 0 | 0 |
| Queue Length 95th (ft) | 276 | 35 | 221 | 89 | 196 | 0 | 5 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 |
| Base Capacity (vph) | 1349 | 1211 | 788 | 1598 | 448 | 924 | 233 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.28 | 0.19 | 0.31 | 0.17 | 0.45 | 0.30 | 0.00 |

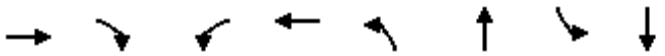
Intersection Summary



| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 342 | 312 | 236 | 383 | 223 | 165 | 2 | 6 |
| v/c Ratio | 0.56 | 0.43 | 0.63 | 0.35 | 0.63 | 0.32 | 0.01 | 0.01 |
| Control Delay | 26.5 | 4.7 | 38.7 | 8.7 | 38.0 | 7.1 | 28.0 | 27.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.5 | 4.7 | 38.7 | 8.7 | 38.0 | 7.1 | 28.0 | 27.4 |
| Queue Length 50th (ft) | 134 | 0 | 105 | 84 | 95 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 259 | 55 | 221 | 147 | 222 | 53 | 7 | 14 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 1425 | 1273 | 833 | 1681 | 477 | 642 | 258 | 639 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.24 | 0.25 | 0.28 | 0.23 | 0.47 | 0.26 | 0.01 | 0.01 |

Intersection Summary

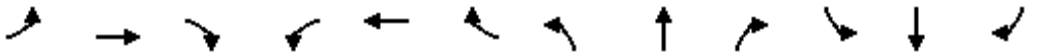
# Appendix J: Example Intersection Operations Analysis and Queuing Worksheets



| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 342 | 360 | 279 | 383 | 262 | 200 | 2 | 6 |
| v/c Ratio | 0.59 | 0.49 | 0.76 | 0.36 | 0.71 | 0.36 | 0.01 | 0.01 |
| Control Delay | 26.4 | 5.0 | 46.7 | 10.1 | 35.9 | 5.5 | 20.5 | 20.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 26.4 | 5.0 | 46.7 | 10.1 | 35.9 | 5.5 | 20.5 | 20.4 |
| Queue Length 50th (ft) | 123 | 0 | 117 | 78 | 105 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 243 | 58 | #317 | 179 | 200 | 46 | 6 | 11 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 798 | 878 | 367 | 1116 | 609 | 794 | 305 | 816 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.43 | 0.41 | 0.76 | 0.34 | 0.43 | 0.25 | 0.01 | 0.01 |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



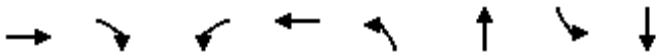
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 308 | 324 | 251 | 343 | 2 | 236 | 1 | 179 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 308 | 324 | 251 | 343 | 2 | 236 | 1 | 179 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 342 | 81 | 279 | 381 | 2 | 262 | 1 | 36 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 3 | 536 | 460 | 341 | 1032 | 5 | 461 | 10 | 361 | 318 | 436 | 0 |
| Arrive On Green | 0.00 | 0.29 | 0.29 | 0.19 | 0.57 | 0.57 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1815 | 10 | 1421 | 44 | 1573 | 850 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 342 | 81 | 279 | 0 | 383 | 262 | 0 | 37 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1617 | 850 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 8.4 | 2.0 | 7.8 | 0.0 | 6.0 | 9.1 | 0.0 | 0.9 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 8.4 | 2.0 | 7.8 | 0.0 | 6.0 | 9.2 | 0.0 | 0.9 | 1.0 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.97 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 3 | 536 | 460 | 341 | 0 | 1038 | 461 | 0 | 371 | 318 | 436 | 0 |
| V/C Ratio(X) | 0.00 | 0.64 | 0.18 | 0.82 | 0.00 | 0.37 | 0.57 | 0.00 | 0.10 | 0.01 | 0.01 | 0.00 |
| Avail Cap(c_a), veh/h | 191 | 1078 | 925 | 496 | 0 | 1383 | 953 | 0 | 931 | 612 | 1094 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 16.1 | 13.8 | 20.2 | 0.0 | 6.1 | 19.1 | 0.0 | 15.8 | 16.2 | 15.5 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.7 | 0.4 | 6.9 | 0.0 | 0.2 | 1.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 6.3 | 1.2 | 5.9 | 0.0 | 2.3 | 4.9 | 0.0 | 0.6 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 18.8 | 14.2 | 27.1 | 0.0 | 6.3 | 20.2 | 0.0 | 15.9 | 16.2 | 15.5 | 0.0 |
| LnGrp LOS | A | B | B | C | A | A | C | A | B | B | B | A |
| Approach Vol, veh/h | | 423 | | | 662 | | | 299 | | | 8 | |
| Approach Delay, s/veh | | 17.9 | | | 15.1 | | | 19.7 | | | 15.7 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 14.5 | 21.2 | | 16.5 | 0.0 | 35.6 | | 16.5 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 14.5 | 30.5 | | 30.0 | 5.5 | 39.5 | | 30.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 9.8 | 10.4 | | 3.0 | 0.0 | 8.0 | | 11.2 | | | | |
| Green Ext Time (p_c), s | 0.3 | 4.3 | | 0.0 | 0.0 | 2.1 | | 0.9 | | | | |

| Intersection Summary | | |
|---|---|---|
| HCM 6th Ctrl Delay | | 16.9 |
| HCM 6th LOS | | B |

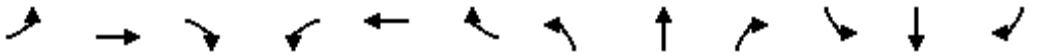
**Notes**

User approved pedestrian interval to be less than phase max green.



| Lane Group | EBT | EBR | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 342 | 360 | 279 | 383 | 262 | 200 | 2 | 6 |
| v/c Ratio | 0.58 | 0.48 | 0.51 | 0.39 | 0.58 | 0.31 | 0.01 | 0.01 |
| Control Delay | 25.7 | 4.6 | 12.0 | 11.3 | 30.1 | 5.4 | 22.5 | 22.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 25.7 | 4.6 | 12.0 | 11.3 | 30.1 | 5.4 | 22.5 | 22.0 |
| Queue Length 50th (ft) | 133 | 0 | 63 | 98 | 100 | 0 | 1 | 2 |
| Queue Length 95th (ft) | 222 | 53 | 103 | 152 | 222 | 50 | 6 | 12 |
| Internal Link Dist (ft) | 432 | | | 1535 | | 227 | | 117 |
| Turn Bay Length (ft) | | | 475 | | 100 | | 75 | |
| Base Capacity (vph) | 1460 | 1307 | 894 | 1756 | 472 | 660 | 245 | 632 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.23 | 0.28 | 0.31 | 0.22 | 0.56 | 0.30 | 0.01 | 0.01 |

Intersection Summary



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 0 | 308 | 324 | 251 | 343 | 2 | 236 | 1 | 179 | 2 | 5 | 0 |
| Future Volume (veh/h) | 0 | 308 | 324 | 251 | 343 | 2 | 236 | 1 | 179 | 2 | 5 | 0 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1900 | 1841 | 1870 | 1870 | 1826 | 1900 | 1885 | 1900 | 1870 | 1159 | 1900 | 1900 |
| Adj Flow Rate, veh/h | 0 | 342 | 81 | 279 | 381 | 2 | 262 | 1 | 36 | 2 | 6 | 0 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 0 | 4 | 2 | 2 | 5 | 0 | 1 | 0 | 2 | 50 | 0 | 0 |
| Cap, veh/h | 473 | 584 | 502 | 562 | 1007 | 5 | 471 | 10 | 363 | 328 | 438 | 0 |
| Arrive On Green | 0.00 | 0.32 | 0.32 | 0.15 | 0.55 | 0.55 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.00 |
| Sat Flow, veh/h | 1810 | 1841 | 1580 | 1781 | 1815 | 10 | 1421 | 44 | 1573 | 850 | 1900 | 0 |
| Grp Volume(v), veh/h | 0 | 342 | 81 | 279 | 0 | 383 | 262 | 0 | 37 | 2 | 6 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1810 | 1841 | 1580 | 1781 | 0 | 1824 | 1421 | 0 | 1617 | 850 | 1900 | 0 |
| Q Serve(g_s), s | 0.0 | 7.6 | 1.8 | 4.5 | 0.0 | 5.8 | 8.5 | 0.0 | 0.9 | 0.1 | 0.1 | 0.0 |
| Cycle Q Clear(g_c), s | 0.0 | 7.6 | 1.8 | 4.5 | 0.0 | 5.8 | 8.7 | 0.0 | 0.9 | 1.0 | 0.1 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 1.00 | | 0.97 | 1.00 | | 0.00 |
| Lane Grp Cap(c), veh/h | 473 | 584 | 502 | 562 | 0 | 1012 | 471 | 0 | 373 | 328 | 438 | 0 |
| V/C Ratio(X) | 0.00 | 0.59 | 0.16 | 0.50 | 0.00 | 0.38 | 0.56 | 0.00 | 0.10 | 0.01 | 0.01 | 0.00 |
| Avail Cap(c_a), veh/h | 1025 | 2259 | 1939 | 1578 | 0 | 2238 | 870 | 0 | 827 | 393 | 583 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 0.0 | 14.0 | 12.0 | 8.5 | 0.0 | 6.1 | 17.9 | 0.0 | 14.8 | 15.2 | 14.5 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 2.0 | 0.3 | 0.7 | 0.0 | 0.2 | 1.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(95%),veh/ln | 0.0 | 5.4 | 1.1 | 1.9 | 0.0 | 2.1 | 4.5 | 0.0 | 0.5 | 0.0 | 0.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 0.0 | 16.0 | 12.3 | 9.2 | 0.0 | 6.4 | 18.9 | 0.0 | 14.9 | 15.2 | 14.5 | 0.0 |
| LnGrp LOS | A | B | B | A | A | A | B | A | B | B | B | A |
| Approach Vol, veh/h | | 423 | | | 662 | | | 299 | | | 8 | |
| Approach Delay, s/veh | | 15.3 | | | 7.5 | | | 18.4 | | | 14.7 | |
| Approach LOS | | B | | | A | | | B | | | B | |

| Timer - Assigned Phs | 1 | 2 | | 4 | 5 | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | 11.6 | 21.5 | | 15.8 | 0.0 | 33.1 | | 15.8 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.0 | | 4.5 | 4.5 | 6.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 35.0 | 60.0 | | 15.0 | 15.0 | 60.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 6.5 | 9.6 | | 3.0 | 0.0 | 7.8 | | 10.7 | | | | |
| Green Ext Time (p_c), s | 0.8 | 5.5 | | 0.0 | 0.0 | 2.2 | | 0.8 | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| HCM 6th Ctrl Delay | | 12.3 | |
| HCM 6th LOS | | B | |

**Notes**

User approved pedestrian interval to be less than phase max green.

3J CONSULTING

CIVIL ENGINEERING | WATER RESOURCES | COMMUNITY PLANNING

# PRELIMINARY STORMWATER REPORT

## Brown's Farm Mixed Use Development
## Forest Grove, Oregon

October 19, 2023

Prepared For:

JTSC, LLC

5285 Meadows Road, Suite 171
Lake Oswego, OR 97035

Prepared By:

3J Consulting, Inc.
9600 SW Nimbus Avenue, Suite 100
Beaverton, Oregon 97008
Project No: 22807
PJP

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# DESIGNER'S CERTIFICATION & STATEMENT

I hereby certify that this Preliminary Stormwater Management Report for the Brown's Farm Mixed Used Development has been prepared by me or under my supervision and meets minimum standards of the City of Forest Grove, Clean Water Services, and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

# EXECUTIVE SUMMARY

The Brown's Farm Mixed Use Development is proposed on tax lots 1N331BA 00100 & 00600 near the intersection of Sunset Drive and Highway 47, Forest Grove, Oregon. This project is within the jurisdictions of City of Forest Grove and Clean Water Services (CWS). Stormwater management will adhere to CWS' *Design & Construction Standards for Sanitary Sewer & Surface Water Management* (2019).

The development will occur on lots spanning a cumulative area of 24.91 acres. However, for the purposes of this report, the area of analysis (termed "project site") is 18.78 acres. This primarily excludes the wetlands along the southern edge of the project area that will remain untouched with sufficient buffer. The proposed improvements include a commercial and two residential developments. Runoff from the project site will eventually discharge into Council Creek.

Given the substantial amount of impervious area that will be modified or created, stormwater management approaches must be implemented, which will be addressed in the following ways:

- Water Quality Treatment
  - Runoff from post-developed basin areas will be treated using ADS BayFilter structures.
- Water Quantity Management
  - A Downstream Analysis was performed and indicated that no downstream deficiencies exist. Considering the regulatory floodway in Council Creek near the project site, it is proposed that the floors of all onsite detention facilities exceed 167 ft to mitigate backwater impacts.
  - Three (3) underground detention facilities, consisting of ADS StormTech Chambers, will manage flows in conjunction with flow control manholes to mitigate post-developed peak flows to predeveloped levels to address hydromodification.

A Conveyance Analysis will be provided in the final Stormwater Report demonstrating sufficient flow capacity in the proposed private storm drain systems.

An Operations & Maintenance Plan will be provided in the final Stormwater Report.

Please refer to this project's Construction Plans for locations and construction details of all stormwater facilities.

The purpose of this report is to accomplish the following.

- Describe pre- and post-developed site and drainage characteristics.
- Outline relevant hydrologic and hydraulic results.
- Describe the design and analysis of proposed stormwater management facilities.
- Demonstrate compliance with City of Forest Grove and Clean Water Services pertaining to stormwater management.

# PROJECT DESCRIPTION

The Brown's Farm Mixed Use Development is proposed on tax lots 1N331BA 00100 & 00600 near the intersection of Sunset Drive and Highway 47, Forest Grove, Oregon. This project is within the jurisdictions of City of Forest Grove and Clean Water Services (CWS).

The lots that the project will be developed on have a cumulative area of 24.91 ac. However, the area of analysis (project site) for this report is 18.78 acres, which primarily excludes wetlands to remain along the southern edge of the project. Proposed improvements include a commercial and two residential developments. Due to the amount of impervious area modified/created, stormwater management approaches are required and proposed. Runoff from the project site eventually discharges to Council Creek.

The design and analysis of required stormwater management approaches will be per City of Forest Grove standards; for stormwater management, the City has adopted CWS' *Design & Construction Standards for Sanitary Sewer & Surface Water Management* (2019).

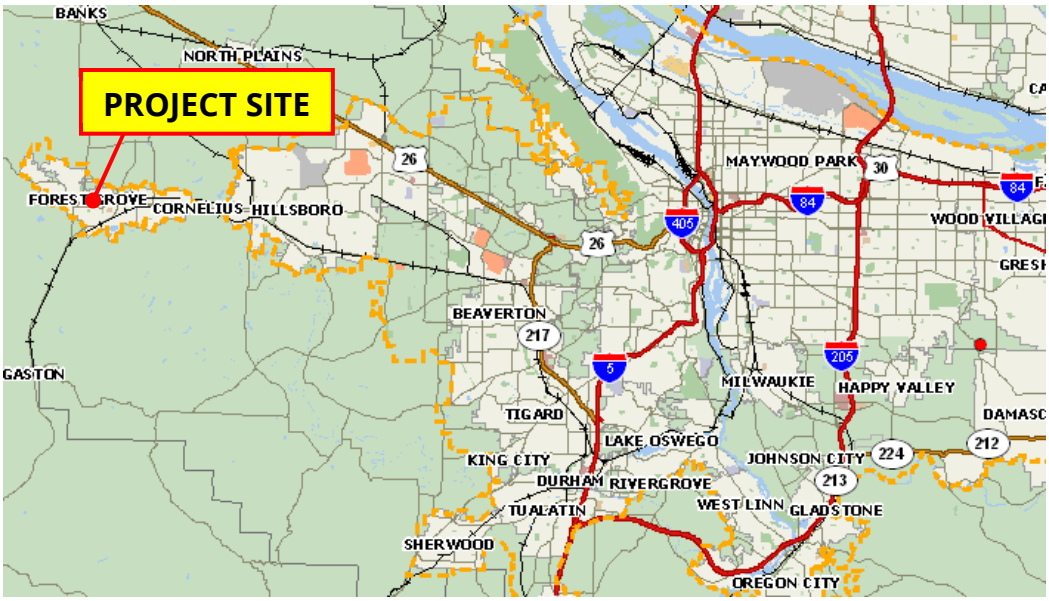



**Figure 1 – Vicinity Map**

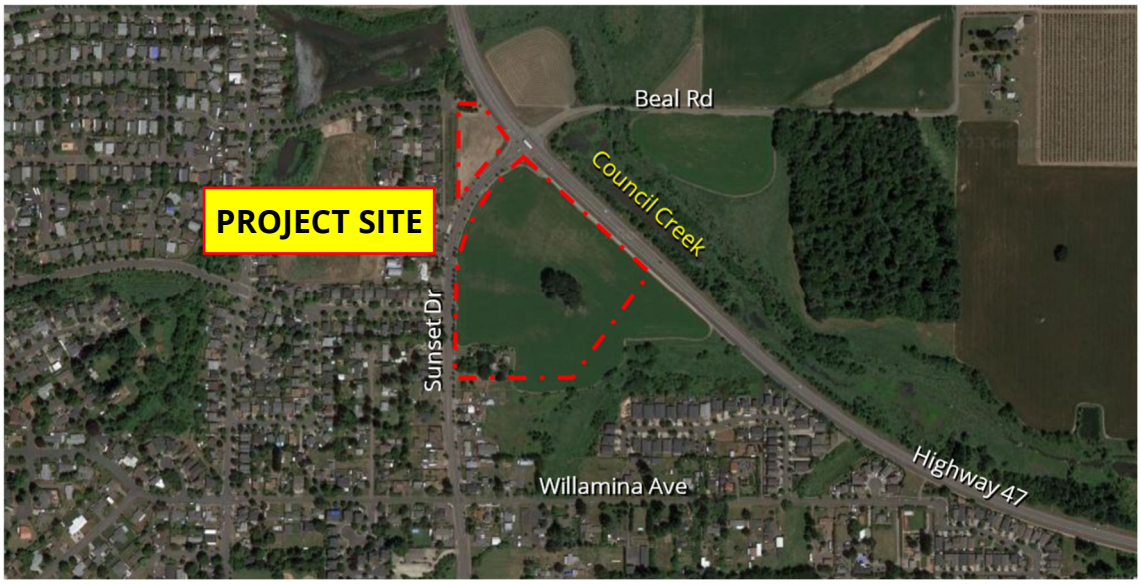



**Figure 2 – Site Location**

# EXISTING CONDITIONS

Please refer to "Exhibits" in the Technical Appendix for support documentation of this section.

## Site & Drainage

In existing conditions, the project site is undeveloped except for the residence at 3081 Sunset Drive, which will be completely demolished. A tributary to Council Creek is directly south of the project site.

The project proposes three (3) discharge locations; therefore, the site is divided into three (3) basins, denoted as Basins 1 through 3, for stormwater design and analysis. All basins discharge directly to Council Creek or into the aforementioned tributary near its confluence with the creek.

Flood Map

The site is located within Zone X (no screen) per FEMA FIRM 41067C0311E, which corresponds to an area of minimal flood hazard.

Soil & Infiltration

USDA Web Soil Survey indicates that the project site is underlain primarily by Woodburn silt loam with a portion of Amity silt loam roughly coinciding with the Council Creek tributary along the southern edge of the property. Woodburn and Amity silt loam are categorized as hydrologic soil group C and C/D, respectively. For simplicity, the site will be assumed to be completely underlain with C soils.

A Geotechnical Engineering Report prepared by GeoEngineers in November 2022 included infiltration testing at two onsite locations (also see "Geotech Report" in the Technical Appendix). A test location closer to the intersection of Sunset Drive and Highway 47 yielded an infiltration rate of 2.1 in/hr. Reduced testing frequency and duration (three, one hour-long measurements) will be reflected in a higher applied safety factor. For preliminary sizing, infiltration will not be factored into detention sizing.

## Basin Areas

Table 1 shows the existing impervious (all modified) and pervious areas for each basin.

| Basin | Impervious Area | | Pervious Area | | Total Area | |
|---|---|---|---|---|---|---|
| | sf | ac | sf | ac | sf | ac |
| 1 | 7,971 | 0.18 | 573,495 | 13.17 | 581,466 | 13.35 |
| 2 | 0 | 0.00 | 170,878 | 3.92 | 170,878 | 3.92 |
| 3 | 0 | 0.00 | 65,906 | 1.51 | 65,906 | 1.51 |
| Total | 7,971 | 0.18 | 810,279 | 18.60 | 818,250 | 18.78 |

**Table 1 – Existing Basin Areas**

# POST-DEVELOPED CONDITIONS

Please refer to "Exhibits" in the Technical Appendix for support documentation of this section.

## Site & Drainage

This project proposes a commercial and two residential developments. Separate storm drain systems are proposed to capture and convey runoff from post-developed areas to stormwater management facilities prior to discharging to Council Creek. A 22,384-sf undeveloped, wooded area within the residential development will remain in place. The site plan for the commercial development is unknown; therefore, it is assumed that both basins have an impervious fraction of 85%.

## Basin Areas

Table 2 shows the post-developed impervious and pervious areas for each basin.

| Basin | Impervious Area | | Pervious Area | | Subtotal Area | |
|---|---|---|---|---|---|---|
| | sf | ac | sf | ac | sf | ac |
| 1 | 404,844 | 9.29 | 154,238[(1)] | 4.05 | 581,466 | 13.35 |
| 2 | 145,247 | 3.33 | 25,631 | 0.59 | 170,878 | 3.92 |
| 3 | 45,466 | 1.04 | 20,440 | 0.47 | 65,906 | 1.51 |
| Total | 595,557 | 13.67 | 222,693 | 5.11 | 818,250 | 18.78 |

**Table 2 – Post-Developed Basin Areas**

[(1)]Includes 22,384 sf of undeveloped (woods-grass combination) area.

When comparing Tables 1 & 2, the project proposes 587,586 sf of new impervious area.

# HYDROLOGIC ANALYSIS

Please refer to "H&H Modeling – Onsite Analysis" in the Technical Appendix for support documentation of this section.

## Design Guidelines

The site is located within the jurisdictions of the City of Forest Grove and Clean Water Services (CWS). The guidelines used for stormwater design and analysis of this project reflect CWS' *Design & Construction Standards* (2019).

## Methodology

Hydrograph Method

Naturally occurring rainstorms dissipate over long periods of time. An effective way of estimating storm rainfall is by using the hydrograph method. In accordance with CWS standards, the Santa Barbara Urban Hydrograph (SBUH) method was used to develop runoff rates. The computer software XPStorm was used to perform SBUH calculations to compare predeveloped and post-developed runoff responses.

Design Storms

The Type 1A rainfall distribution (24-hr duration) was used in conjunction with the SBUH. Table 3 shows total precipitation depths referenced from the CWS standards, which were used as multipliers for the Type 1A distribution to develop the rainfall distribution for each recurrence interval.

| Recurrence Interval (yr) | Precipitation Depth (in) |
|---|---|
| 2 | 2.50 |
| 5 | 3.10 |
| 10 | 3.45 |
| 25 | 3.90[(1)] |
| 100 | 4.50[(1)] |

**Table 3 – Precipitation Depths**

[(1)]For Conveyance Analysis

Curve Number

The curve number represents runoff potential from the ground. The major factors for determining runoff curve numbers (CN) are hydrologic soil group, cover type, treatment, hydrologic condition, and antecedent runoff condition. Table 2-2a from the TR-55 *Urban Hydrology for Small Watersheds* manual was used to determine the appropriate curve numbers (See Technical Appendix: Exhibits – Curve Numbers).

As indicated previously, the site is underlain by soil type C. In predeveloped conditions, pervious areas were modeled with a CN of 72, which is associated with woods-grass combination in good condition. Per CWS standards, modified impervious areas were modeled with a CN of 75. In post-developed conditions, pervious areas were modeled with a CN of 74, which is associated with lawn in good condition. Impervious areas were modeled with a CN of 98. The undeveloped portion of the site will be modeled with a CN of 72.

Time of Concentration

In accordance with the CWS standards, the predeveloped time of concentration (Tc) was evaluated per the USDA's TR-55 manual. The Tc's for Basins 1, 2, and 3 were calculated to be 27, 22, 20 minutes, respectively. A Tc of 5 minutes is assumed for all post-developed basins.

### Basin Runoff

Pre- and post-developed peak runoff rates and resulting increase for each basin are shown in Table 4.

| Recurrence Interval (yr) | Basin 1 Peaks Flows (cfs) | | | Basin 2 Peaks Flows (cfs) | | | Basin 3 Peaks Flows (cfs) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pre | Post | Incr. | Pre | Post | Incr. | Pre | Post | Incr. |
| 2 | 0.55 | 5.65 | 5.10 | 0.16 | 1.96 | 1.80 | 0.07 | 0.64 | 0.57 |
| 5 | 1.24 | 7.37 | 6.13 | 0.39 | 2.50 | 2.11 | 0.16 | 0.83 | 0.67 |
| 10 | 1.75 | 8.39 | 6.64 | 0.56 | 2.82 | 2.26 | 0.22 | 0.95 | 0.73 |

**Table 4 – Peak Runoff Rates**

## WATER QUALITY TREATMENT

### Design Guidelines & Criteria

Per CWS standards, water quality approaches are required due to the new and modified impervious area planned to be generated by this project. Stormwater treatment facilities are required to be designed to treat all runoff produced during the water quality storm event. CWS defines this event as 0.36" of precipitation falling over 4 hours with a return period of 96-hours.

LIDA Feasibility

Per Section 4.05 of the CWS standards, new development shall reduce its hydrologic impacts through Low Impact Development Approaches (LIDA) unless the criteria in 4.05.2 apply. Due to vertical constraints, LIDA facilities cannot be implemented while providing sufficient positive drainage. As a result, proprietary treatment devices are proposed.

### Required Treatment Area

Per CWS standards, the impervious area requiring water quality treatment is evaluated as the new impervious area plus three times the modified impervious area; the calculation is shown below. It was previously indicated that the project results in 598,141 and 7,971 sf of new and modified impervious area, respectively.

Required Treatment Area = New Impervious Area + 3 x Modified Impervious Area
= 587,586 sf + 3 X 7,971 sf = 611,499 sf

The calculated treatment area exceeds the post-developed impervious area (i.e., 595,557 sf); therefore, the required treatment area is 595,557sf.

### Water Quality Approaches

Proprietary Treatment Devices

BayFilter Catch Basins, Manholes, and Vaults are proposed to treat post-developed runoff from all basin prior to discharging to respective detention facilities. The BayFilter structures will be equipped with BayFilter 522

cartridges, which have a treatment capacity of 22.5 gpm (0.05 cfs). The following equation was used in conjunction with the water quality storm event to determine the water quality flow rate for the treatment manhole.

Water Quality Flow (WQF) = ( Required Treatment Area, sf ) x 0.36" x (1 ft/12 in) / (4 hr x 3600 sec/1 hr)

At this preliminary phase of design, the distribution of treatment facilities is in flux. Basin 1, the residential development, will tentatively discharge to four (4) BayFilter Vaults and a BayFilter Catch Basin. The contributing drainage areas, denoted as Subbasins 1-1 through 1-5, for these facilities were delineated (see "Exhibits – Post-Developed Conditions" in Technical Appendix). Tentatively, Basins 2 and 3 will each discharge to a BayFilter Vault. Table 5 outlines the BayFilter 522 cartridges needed to sufficiently treat runoff from the post-developed basins/subbasins.

| Basin / Subbasin | Imp. Area Treated (sf) | Water Quality Quantities | | Req. No. of Cartridges | Treatment Capacity (cfs) |
|---|---|---|---|---|---|
| | | Volume (cf) | Flow (cfs) | | |
| 1-1 | 41,869 | 1,256 | 0.09 | 2 | 0.10 |
| 1-2 | 22,789 | 684 | 0.05 | 1 | 0.05 |
| 1-3 | 137,912 | 4,137 | 0.29 | 6 | 0.30 |
| 1-4 | 193,938 | 5,818 | 0.40 | 9 | 0.45 |
| 1-5 | 8,336 | 250 | 0.02 | 1 | 0.05 |
| 2 | 145,247 | 4,357 | 0.30 | 7 | 0.35 |
| 3 | 45,466 | 1,364 | 0.10 | 2 | 0.10 |
| Total | 595,557 | | | | |

**Table 5 – BayFilter Facilities**

The table above demonstrates that the proposed facilities will sufficiently treat runoff per CWS standards.

Pretreatment Manholes

Pretreatment manholes, per CWS Standard Dwg. No. 250, are proposed upstream of BayFilter Vaults and are sized based on the 25-year contributing peak flow rate. Pretreatment for treatment catch basins is not required. Per CWS standards, the following equation was used to determine required sump volumes.

Sump Volume = ( 20 cf / 1 cfs ) x ( 25-yr Peak Flow )

Table 6 outlines the required sump depths based on assumed 60" pretreatment manholes. Sump depths shall be a minimum 3 ft and will be proposed below the invert of the snout.

| Basin / Subbasin | 25-yr Peak Flow[(1)] (cfs) | Required Sump Dimensions | |
|---|---|---|---|
| | | Volume (cf) | Depth (ft) |
| 1-1 | 0.88 | 17.6 | 0.9 → 3 |
| 1-2 | 0.48 | 9.6 | 0.5 → 3 |
| 1-3 | 2.90 | 58.0 | 3.0 |
| 1-4 | 4.08 | 81.6 | 4.2 |
| 2 | 3.23 | 64.6 | 3.3 |
| 3 | 1.10 | 22.0 | 1.1 → 3 |

**Table 6 – Pretreatment Manholes**

[(1)]See "H&H Modeling – Onsite Analysis – Hydrographs" in Technical Appendix.

# WATER QUANTITY MANAGEMENT

## Design Guidelines

Per CWS standards, water quantity management depends on two components, hydromodification and downstream deficiencies. The amount of new and modified impervious area resulting from this project requires that a Hydromodification Assessment and Downstream Analysis be performed. Depending on the results from these evaluations, this project may be required to mitigate post-developed 2-, 5-, 10-, and/or 25-yr peak flow (24-hr duration) to predeveloped levels.

## Hydromodification Assessment

Per CWS standards, a Hydromodification Assessment was performed to determine the Project Category of the project site. It was established previously that runoff from the project site ultimately discharges to Council Creek. The assessment was based on the following factors.

- Reach-Specific Risk Level – The CWS Hydromod Planning Tool indicates that this project's receiving reach has a "Low" Risk Level.
- Development Class – The CWS Hydromod Planning Tool indicates that the entire project site has a Development Class of "Developed".
- Project Size – Project Size is based on the new & modified impervious areas created by the project. The total new and modified impervious area results in a "Large" Project Size.

Based on the contributing factors above, this project is considered to be Category 2 (Moderate Risk).

## Downstream Analysis

Please refer to "H&H Modeling – Downstream Analysis" in Technical Appendix for support documentation of this subsection.

Methodology

In accordance with CWS standards, a downstream analysis was performed to demonstrate sufficient conveyance during the 25-yr storm event. XPStorm was used to perform the SBUH for hydrologic analyses in conjunction with dynamic wave routing for hydraulics analyses. The analysis shall extend downstream to a point in the drainage system where the additional flow from the proposed development site constitutes 10% or less of the total contributing flow. Then the analysis will extend downstream for at least 1/4-mile or until the additional flow constituted less than 5% of the total tributary drainage flow.

System Overview

Seven (7) basins, denoted as Basins A through F, were delineated for the downstream analysis using publicly available LiDAR-based topographic data from DOGAMI, and the City's most recent zoning map was referenced to model the simulate "full build-out" conditions.

The northernmost residential development will discharge to a roadside ditch in the northwest corner of the intersection of Sunset Drive and Highway 47, which also captures runoff from a basin in the right-of-way (ROW). The ditch discharges to a cross culvert that conveys flow across Sunset Drive to another drainage ditch, which also captures runoff from a separate basin within the ROW and the proposed commercial development. This ditch outlets to a culvert that drains east across Highway 47 and outfalls into Council Creek.

The southern residential development will discharge to an unnamed tributary to Council Creek to comingle with runoff from a 212.56-ac drainage area, which was delineated via USGS StreamStats. The time of concentration (Tc) of this drainage area was estimating cumulative travel times within the basin's piped and natural watercourses by assuming average flow velocities conveyance. The average velocities through piped and natural conveyances were assumed to be 5 and 2 fps, respectively. Cumulative flowpath lengths for each

conveyance were estimated using the aforementioned LiDAR data and CWS' Public Sanitary and Storm Sewers Map. The Tc of the contributing basin area was estimated to be 32 minutes.

The three onsite basins (cumulative area of 18.78 ac) discharge directly or almost immediately into Council Creek. Including the basins in the ROW and the contributing drainage area within the unnamed tributary, this analysis consists of 231.81 ac; meaning this project constitutes 4% of the area analyzed. Using StreamStats, the contributing drainage area to Council Creek just upstream of the creek's crossing at Beal Road (east of the project site) is estimated to be 4.61 sq-mi (2,950.4 ac). Consequently, this results in the project site constituting 0.3% of the total contributing drainage area for Council Creek at the downstream end of this analysis. Therefore, it is assumed that the extents of this downstream analysis are sufficient.

Lastly, the 100-yr water surface elevations in the receiving reach for the project range between 166 and 167 ft. Therefore, for added conservativeness, the 25- and 100-yr analyses were performed assuming a fixed backwater elevation of 167 ft at both outfalls into Council Creek.

Results

The minimum freeboard in the downstream system was determined to be 2.40 ft for both the 25- and 100-yr analysis. This was primarily due to the fixed backwater assumption in Council Creek; nonetheless, the downstream system demonstrates sufficient conveyance. To mitigate backwater impacts, it is proposed that the bottom of onsite detention facilities be at or above 167 ft.

### Flow Control Criteria

Based on hydromodification risk and the downstream analysis results above, Table 7 outlines the required release rates for each basin's detention facility.

| Post-Dev. Release Rate | Predev. Runoff Rates (Target) |
|---|---|
| 2-yr, 24-hr | 50% of 2-yr, 24-hr |
| 5-yr, 24-hr | 5-yr, 24-hr |
| 10-yr, 24-hr | 10-yr, 24-hr |

**Table 7 – Required Release Rates**

### Water Quantity Approaches

Three (3) Underground Detention Facilities, tentatively ADS StormTech Chambers, in conjunction with flow control manholes are proposed to meet the flow control criteria indicated above. Tentatively, the required detention volumes for Basins 1; 2; and 3 are 64,000; 21,800; and 7,300 cf; respectively. The final Stormwater Report will provide full details for these water quantity approaches.

## CONVEYANCE ANALYSIS

A conveyance analysis will be performed and included in the final Stormwater Report. The analysis will demonstrate sufficient flow capacity in proposed storm drain systems during the 25- and 100-yr storms in accordance with CWS standards.

## OPERATIONS & MAINTENANCE

An Operations & Maintenance (O&M) Plan will be prepared and provided in the final Stormwater Report for any proposed privately maintained stormwater management facilities. The O&M Plan will be prepared per CWS standards.

# REFERENCES

1. *Design & Construction Standards for Sanitary Sewer & Surface Water Management*. December 2019, Clean Water Services
2. *Urban Hydrology for Small Watersheds (Technical Release 55)*. June 1986, U.S. Department of Agriculture

# TECHNICAL APPENDIX

**Exhibits**

- Existing Conditions
- Post-Developed Conditions
- Hydrologic Soil Group
- FIRMette

**Hydrology & Hydraulics (H&H) Modeling**

- Onsite Analysis
  - Curve Numbers
  - Time of Concentration
  - Hydrographs
- Downstream Analysis
  - Basins Exhibit
  - StreamStats – Council Creek at Beal Road
  - StreamStats – Basin F (Tributary at Hwy 47)
  - Time of Concentration (Basin F)
  - Basin F Hydrology
  - XPStorm Hydraulic Layout
  - XPStorm Runoff Data
  - XPStorm Conveyance Data

**Operations & Maintenance (O&M) Plan**

**Geotechnical Report**

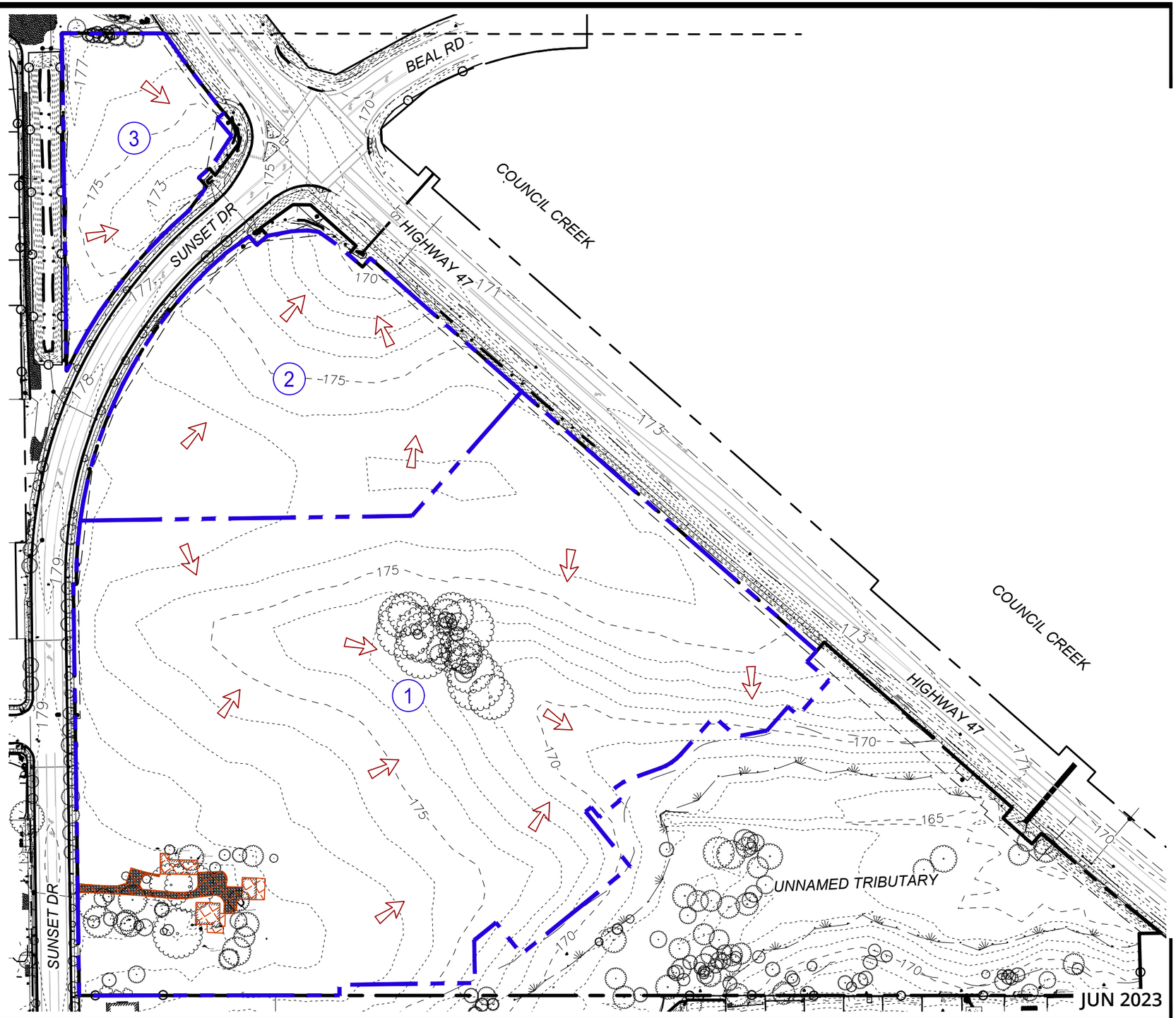
# EXHIBITS

## LEGEND

- BASIN BOUNDARY
- # BASIN TAG
- IMPERVIOUS AREA
- FLOW DIRECTION

## EXISTING BASINS

| Basin | Total | Impervious | Pervious |
|---|---|---|---|
| | ac | ac | ac |
| 1 | 13.35 | 0.18 | 13.17 |
| 2 | 3.92 | 0.00 | 3.92 |
| 3 | 1.51 | 0.00 | 1.51 |
| Total | 18.78 | 0.18 | 18.60 |

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SCALE: 1" = 150'
0 150 FT

# BROWN'S FARM MIXED USE DEVELOPMENT

JTSC, LLC

JUN 2023

EXISTING CONDITIONS

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

## LEGEND

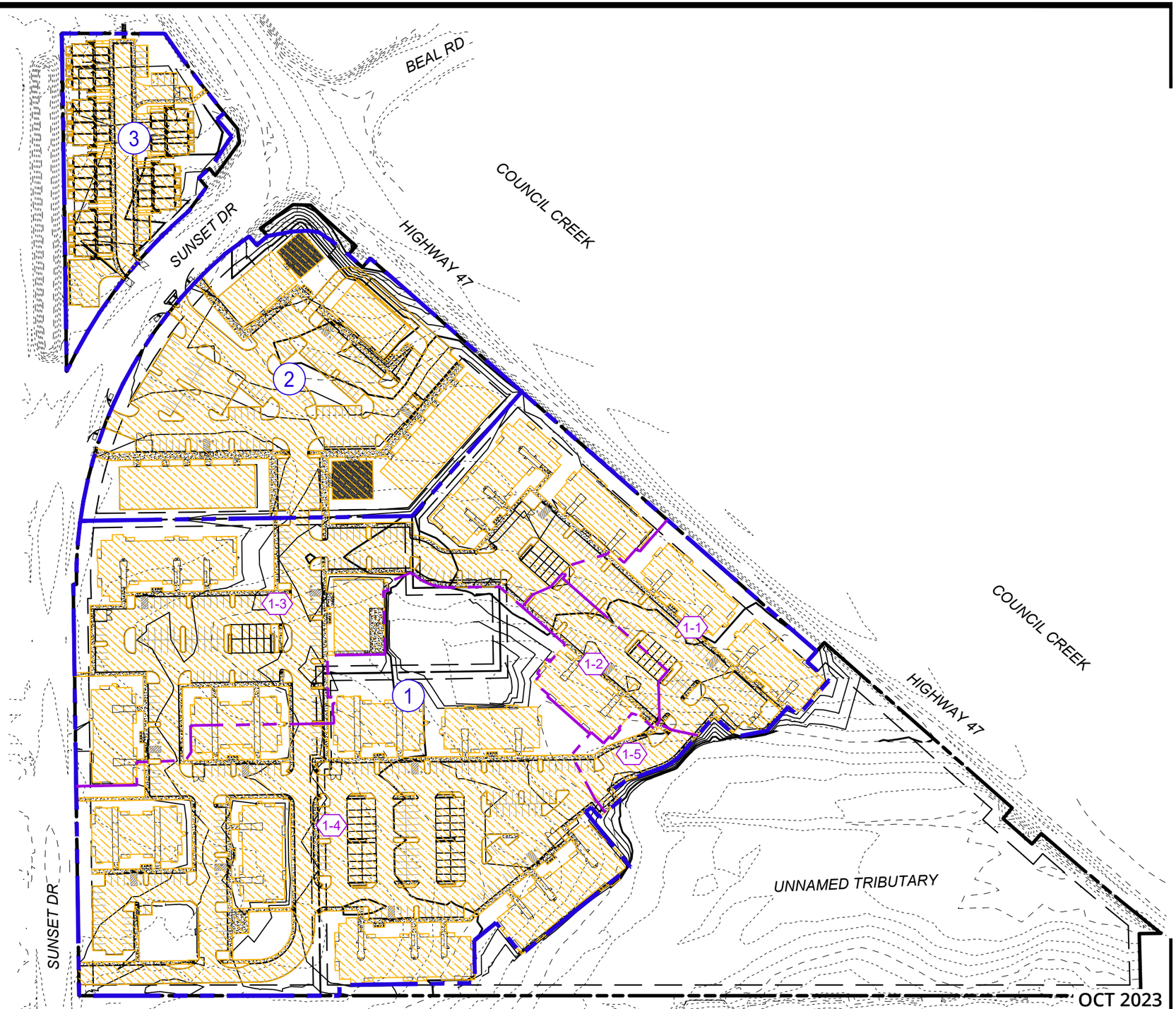
- BASIN BOUNDARY
- # BASIN TAG
- SUBBASIN BOUNDARY
- #-# SUBBASIN TAG
- IMPERVIOUS AREA

## POST-DEVELOPED BASINS

| Basin | Total | Impervious | Landscape | Undisturbed |
|---|---|---|---|---|
| | ac | ac | ac | ac |
| 1 | 13.35 | 9.29 | 3.54 | 0.51 |
| 2 | 3.92 | 3.33 | 0.59 | 0.00 |
| 3 | 1.51 | 1.04 | 0.47 | 0.00 |
| Total | 18.78 | 13.67 | 4.60 | 0.51 |

## BASIN 1 BREAKDOWN

| Subbasin | Total | Impervious | Pervious |
|---|---|---|---|
| | sf | sf | sf |
| 1-1 | 56,373 | 41,869 | 14,504 |
| 1-2 | 26,889 | 22,789 | 4,100 |
| 1-3 | 191,723 | 137,912 | 53,811 |
| 1-4 | 295,518 | 193,938 | 101,580 |
| 1-5 | 10,963 | 8,336 | 2,627 |
| Subtotal | 581,466 | 404,844 | 176,622 |

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SCALE: 1" = 150'
0 150 FT

**BROWN'S FARM MIXED USE DEVELOPMENT**

OCT 2023

*JTSC, LLC*

*POST-DEVELOPED CONDITIONS*

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

# Hydrologic Soil Group—Washington County, Oregon

Map Scale: 1:3,510 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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: Washington County, Oregon
Survey Area Data: Version 22, Sep 14, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 16, 2021—Apr 18, 2021

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 |
|---|---|---|---|---|
| 2 | Amity silt loam | C/D | 5.7 | 10.1% |
| 44A | Willamette silt loam, 0 to 3 percent slopes | B | 1.1 | 1.9% |
| 44B | Willamette silt loam, 3 to 7 percent slopes | B | 2.5 | 4.4% |
| 45A | Woodburn silt loam, 0 to 3 percent slopes | C | 16.4 | 29.4% |
| 45B | Woodburn silt loam, 3 to 7 percent slopes | C | 18.1 | 32.3% |
| 2027A | Verboort silty clay loam, 0 to 3 percent slopes | D | 12.2 | 21.8% |
| **Totals for Area of Interest** | | | **55.9** | **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

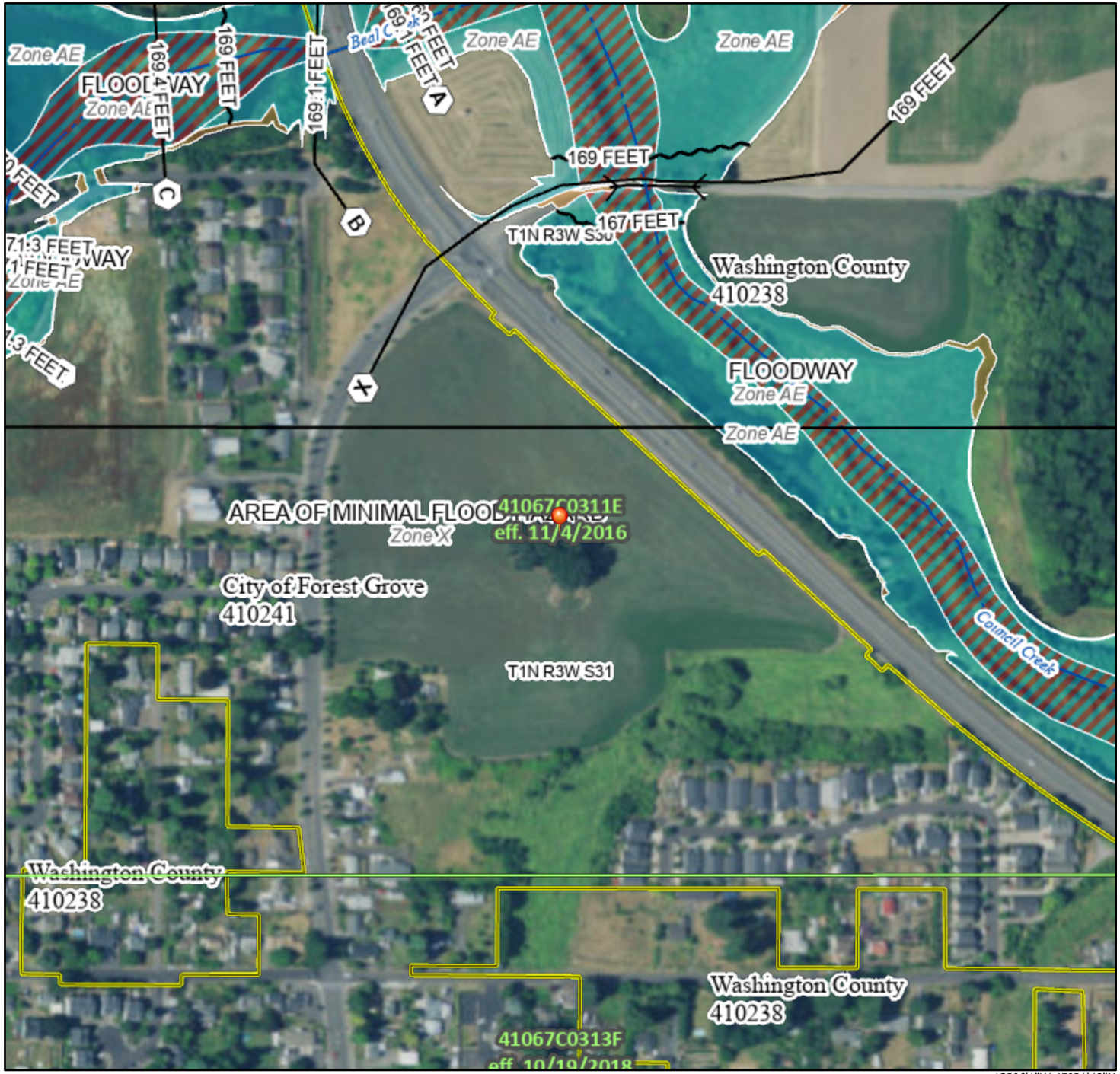
*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# National Flood Hazard Layer FIRMette

123°6'38"W 45°32'13"N




123°6'1"W 45°31'48"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

*Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020*

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

**OTHER AREAS**
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/25/2022 at 2:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

H&H MODELING

# H&H Modeling – Onsite Analysis

**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). | | | | | |

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.

**Table 2-2c** Runoff curve numbers for other agricultural lands [1/]

| Cover description | | Curve numbers for hydrologic soil group | | | |
|---|---|---|---|---|---|
| Cover type | Hydrologic condition | A | B | C | D |
| Pasture, grassland, or range—continuous forage for grazing. [2/] | Poor | 68 | 79 | 86 | 89 |
| | Fair | 49 | 69 | 79 | 84 |
| | Good | 39 | 61 | 74 | 80 |
| Meadow—continuous grass, protected from grazing and generally mowed for hay. | — | 30 | 58 | 71 | 78 |
| Brush—brush-weed-grass mixture with brush the major element. [3/] | Poor | 48 | 67 | 77 | 83 |
| | Fair | 35 | 56 | 70 | 77 |
| | Good | 30 [4/] | 48 | 65 | 73 |
| Woods—grass combination (orchard or tree farm). [5/] | Poor | 57 | 73 | 82 | 86 |
| | Fair | 43 | 65 | 76 | 82 |
| | Good | 32 | 58 | 72 | 79 |
| Woods. [6/] | Poor | 45 | 66 | 77 | 83 |
| | Fair | 36 | 60 | 73 | 79 |
| | Good | 30 [4/] | 55 | 70 | 77 |
| Farmsteads—buildings, lanes, driveways, and surrounding lots. | — | 59 | 74 | 82 | 86 |

1 Average runoff condition, and $I_a = 0.2S$.

2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
*Fair:* 50 to 75% ground cover and not heavily grazed.
*Good:* > 75% ground cover and lightly or only occasionally grazed.

3 *Poor*: <50% ground cover.
*Fair:* 50 to 75% ground cover.
*Good:* >75% ground cover.

4 Actual curve number is less than 30; use CN = 30 for runoff computations.

5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
*Fair:* Woods are grazed but not burned, and some forest litter covers the soil.
*Good:* Woods are protected from grazing, and litter and brush adequately cover the soil.

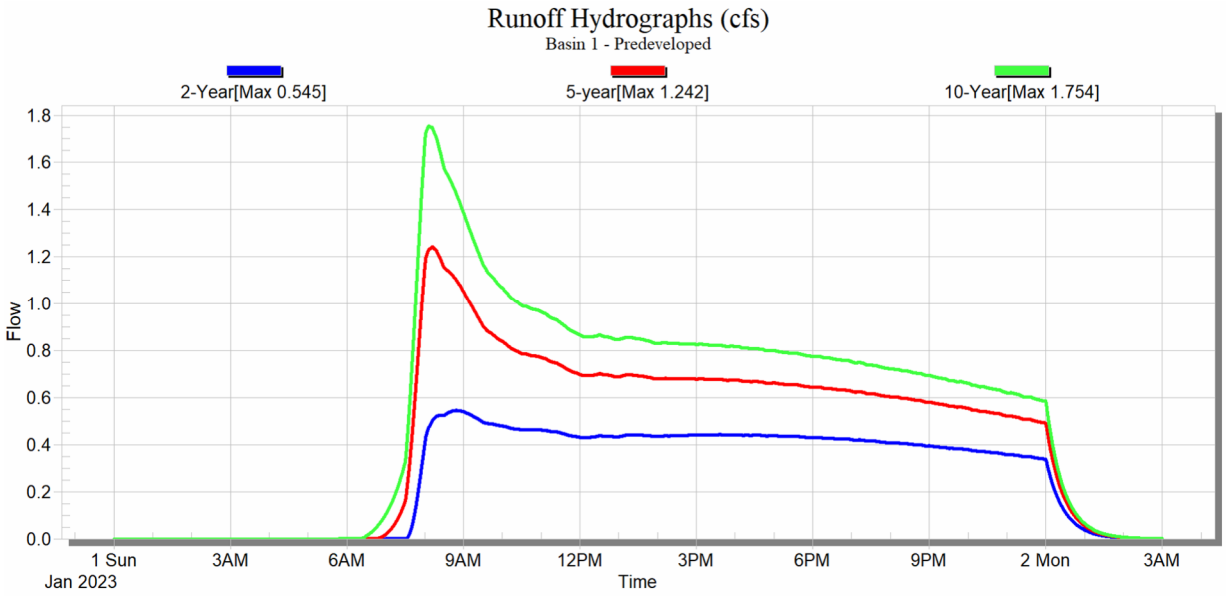
# TIME OF CONCENTRATION

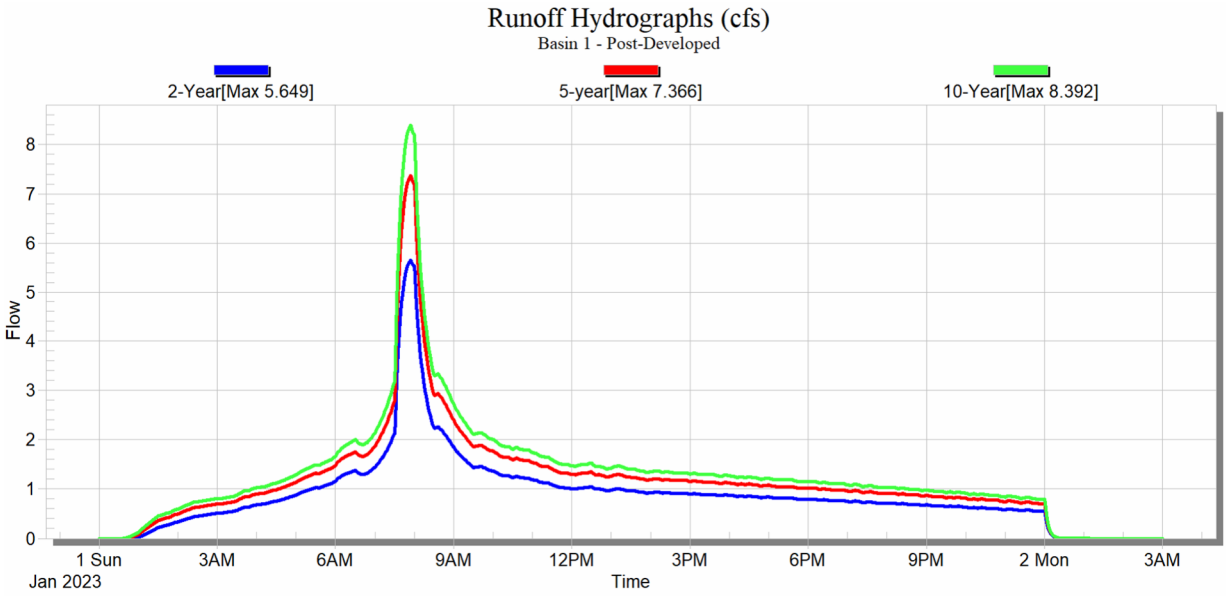
| PROJECT NO. 22807 | BY PJP | DATE Jun 2023 |
|---|---|---|

| SHEET FLOW | | | |
|---|---|---|---|
| **INPUT** | **Predeveloped Basin 1** | **Predeveloped Basin 2** | **Predeveloped Basin 3** |
| Surface Description | Type 9 **Woods (Light Underbrush)** | Type 9 **Woods (Light Underbrush)** | Type 9 **Woods (Light Underbrush)** |
| Manning's "n" | **0.4** | **0.4** | **0.4** |
| Flow Length, L | **50** ft | **50** ft | **50** ft |
| 2-Yr 24 Hour Rainfall, $P_2$ | **2.5** in | **2.5** in | **2.5** in |
| Land Slope, s | **0.01** ft/ft | **0.01** ft/ft | **0.010** ft/ft |
| **OUTPUT** | | | |
| Travel Time | 0.31 hr | 0.31 hr | 0.31 hr |
| **SHALLOW CONCENTRATED FLOW** | | | |
| **INPUT** | **VALUE** | **VALUE** | **VALUE** |
| Surface Description | **Unpaved** | **Unpaved** | **Unpaved** |
| Flow Length, L | **890** ft | **438** ft | **243** ft |
| Watercourse Slope*, s | **0.010** ft/ft | **0.018** ft/ft | **0.018** ft/ft |
| **OUTPUT** | | | |
| Average Velocity, V | 1.65 ft/s | 2.19 ft/s | 2.17 ft/s |
| Travel Time | 0.150 hr | 0.055 hr | 0.031 hr |
| **CHANNEL FLOW** | | | |
| **INPUT** | **VALUE** | **VALUE** | **VALUE** |
| Cross Sectional Flow Area, a | **0** $ft^2$ | **0** $ft^2$ | **0** $ft^2$ |
| Wetted Perimeter, $P_w$ | **0** ft | **0** ft | **0** ft |
| Channel Slope, s | **0** ft/ft | **0** ft/ft | **0** ft/ft |
| Manning's "n" | **0.24** | **0.24** | **0.24** |
| Flow Length, L | **0** ft | **0** ft | **0** ft |
| **OUTPUT** | | | |
| Average Velocity | 0.00 ft/s | 0.00 ft/s | 0.00 ft/s |
| Hydraulic Radius, r = a / $P_w$ | 1.00 ft | 1.00 ft | 1.00 ft |
| Travel Time | 0.00 hr | 0.00 hr | 0.00 hr |
| **Watershed or Subarea $T_c$ =** | **0.46 hr** | **0.36 hr** | **0.34 hr** |
| **Watershed or Subarea $T_c$ =** | **27 min** | **22 min** | **20 min** |

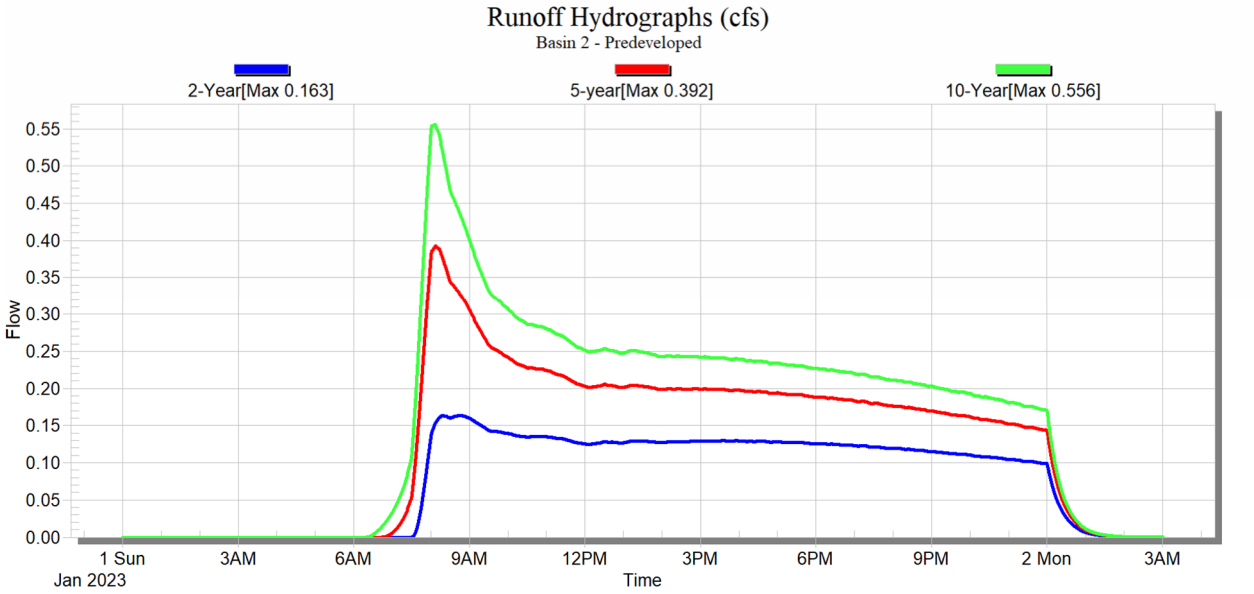
## Hydrographs

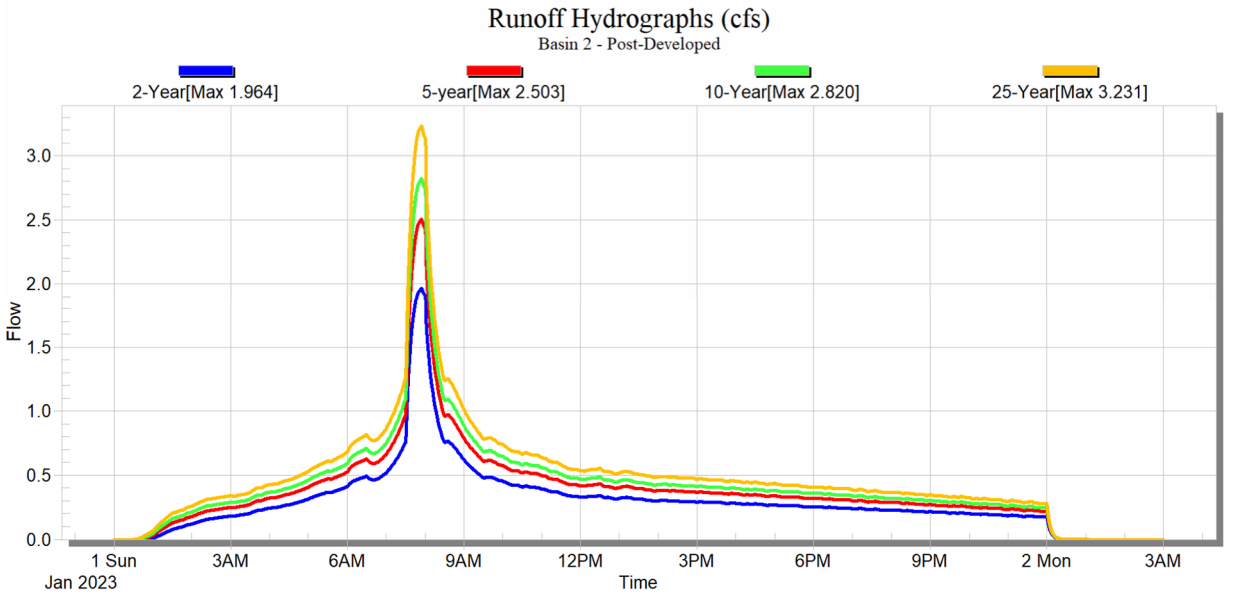
Basin 1



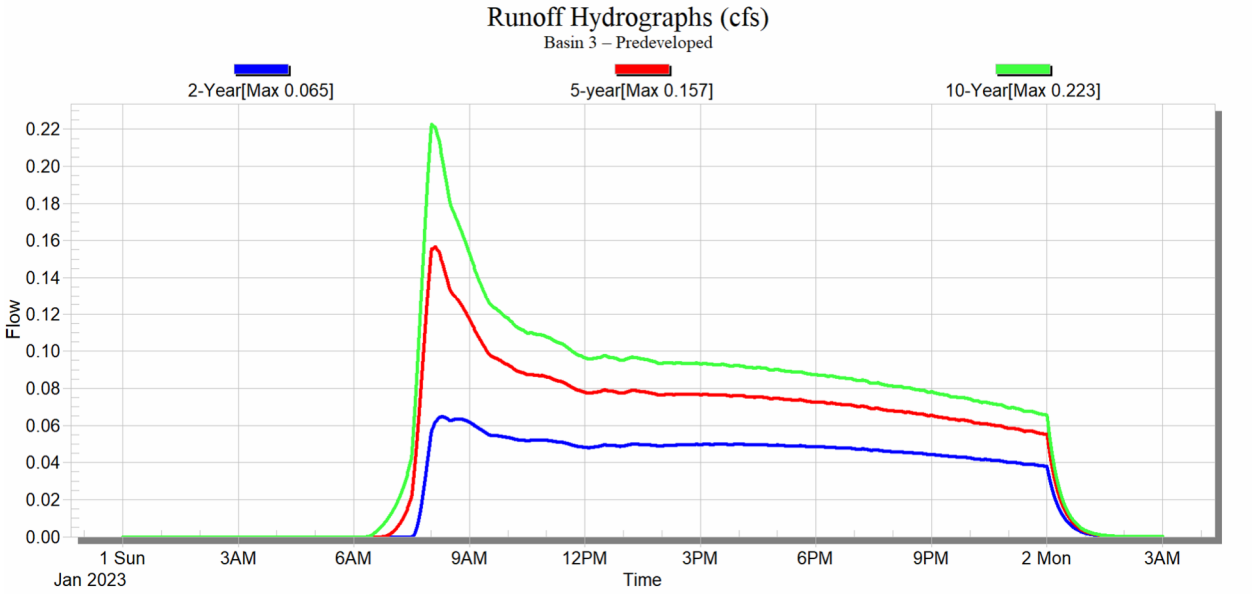



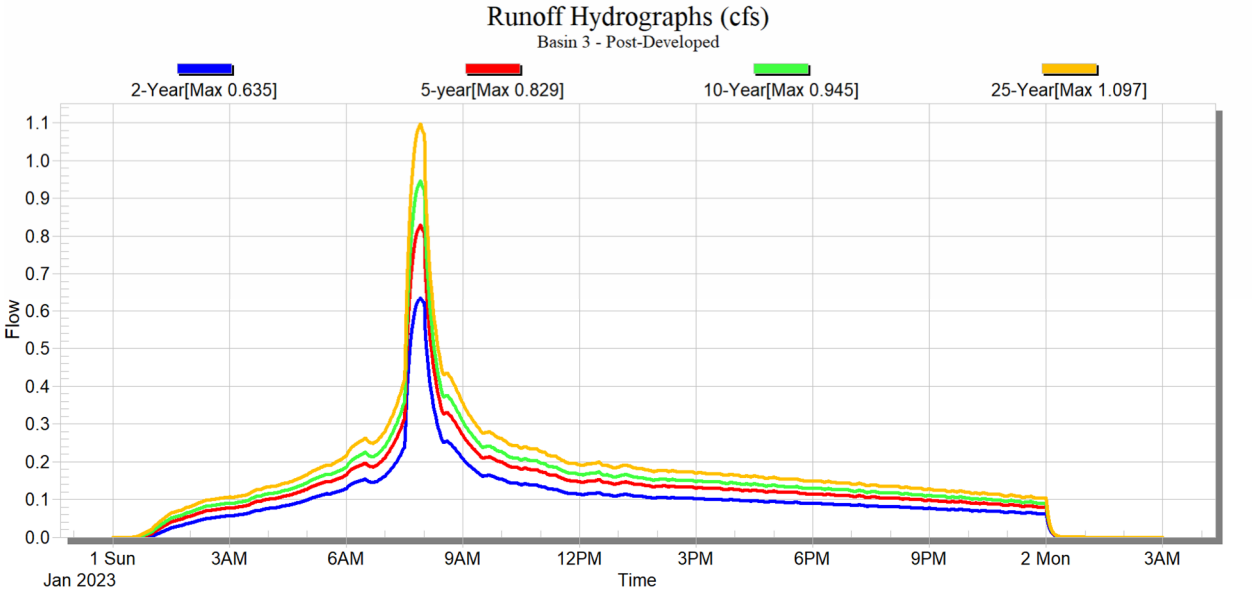
Basin 2


Runoff Hydrographs (cfs)
Basin 2 - Predeveloped
2-Year[Max 0.163]
5-year[Max 0.392]
10-Year[Max 0.556]
Flow
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1 Sun
Jan 2023
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Mon
3AM
Time

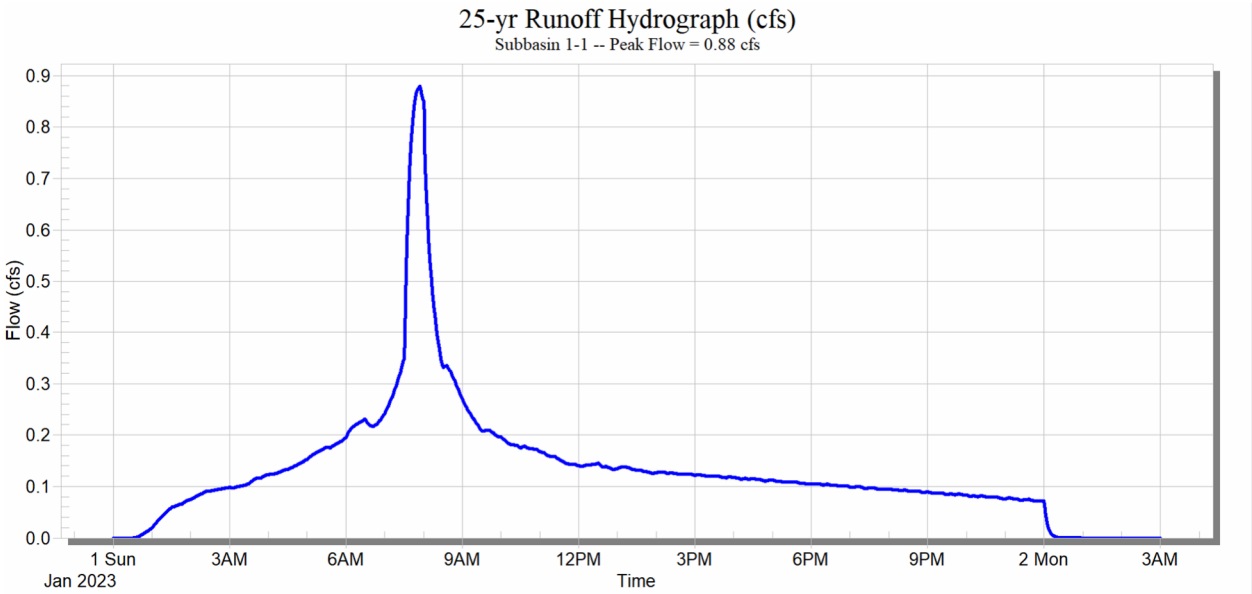

Runoff Hydrographs (cfs)
Basin 2 - Post-Developed
2-Year[Max 1.964]
5-year[Max 2.503]
10-Year[Max 2.820]
25-Year[Max 3.231]
Flow
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1 Sun
Jan 2023
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Mon
3AM
Time

Basin 3

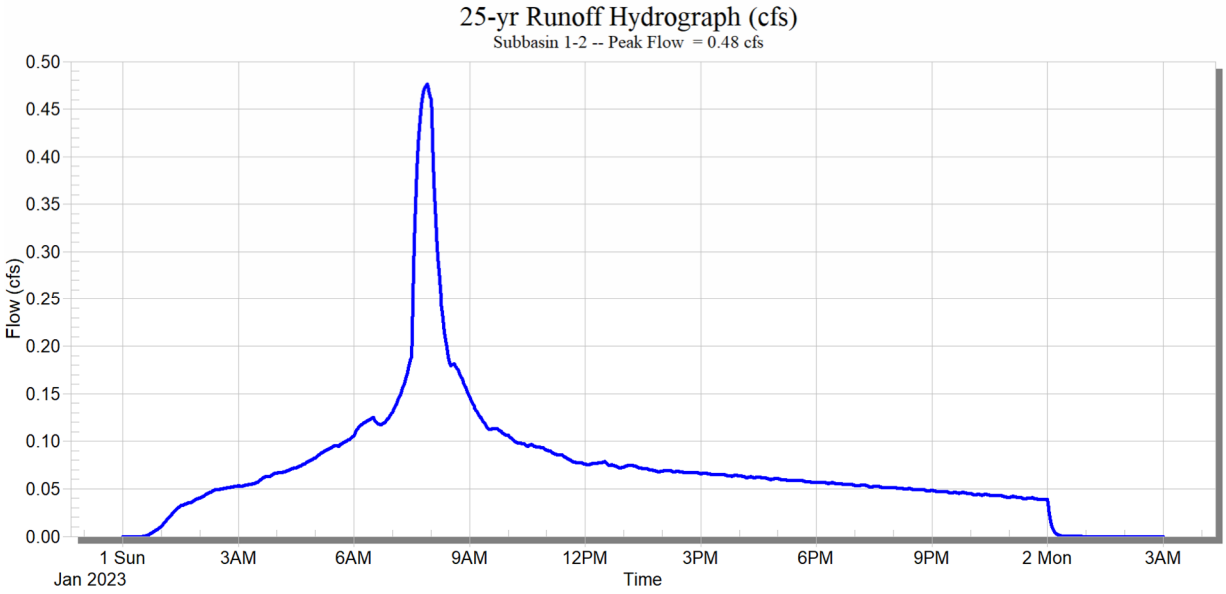

Runoff Hydrographs (cfs)
Basin 3 – Predeveloped
2-Year[Max 0.065]
5-year[Max 0.157]
10-Year[Max 0.223]
Flow
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1 Sun
Jan 2023
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Mon
3AM
Time


Runoff Hydrographs (cfs)
Basin 3 - Post-Developed
2-Year[Max 0.635]
5-year[Max 0.829]
10-Year[Max 0.945]
25-Year[Max 1.097]
Flow
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 Sun
Jan 2023
3AM
6AM
9AM
12PM
3PM
6PM
9PM
2 Mon
3AM
Time

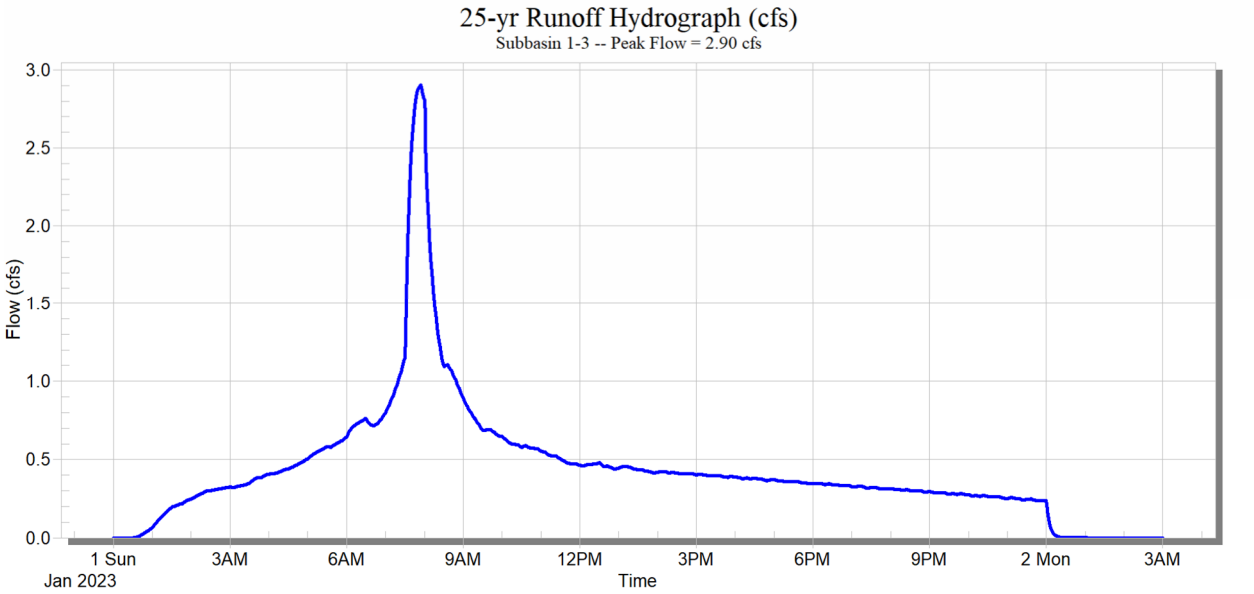
Subbasin 1-1



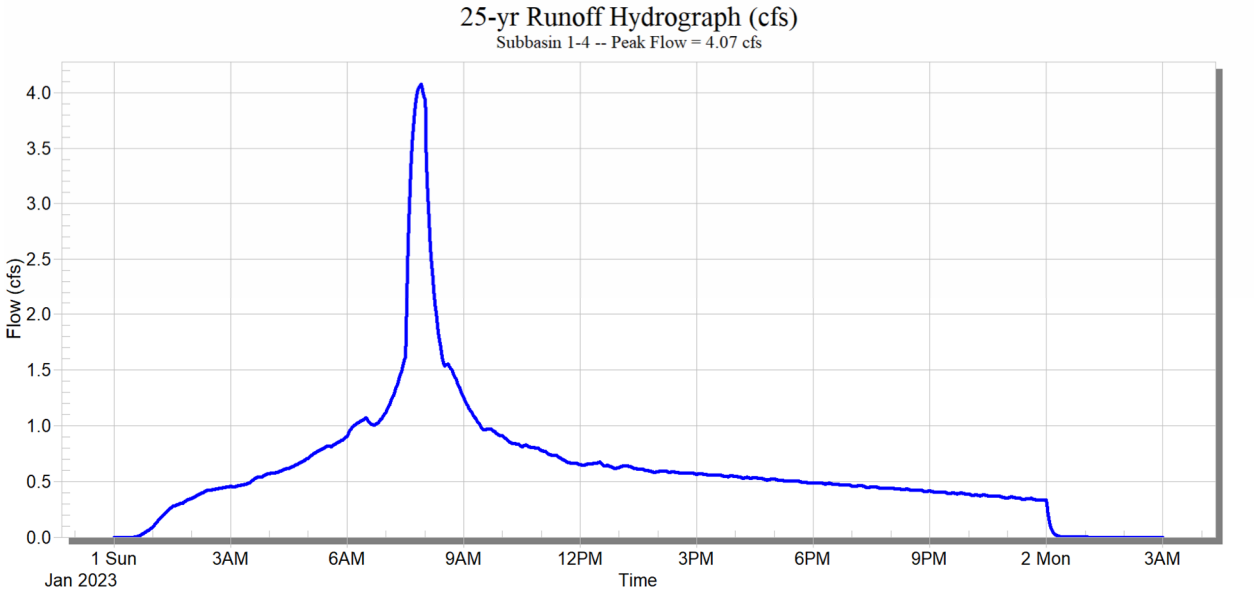

Subbasin 1-2



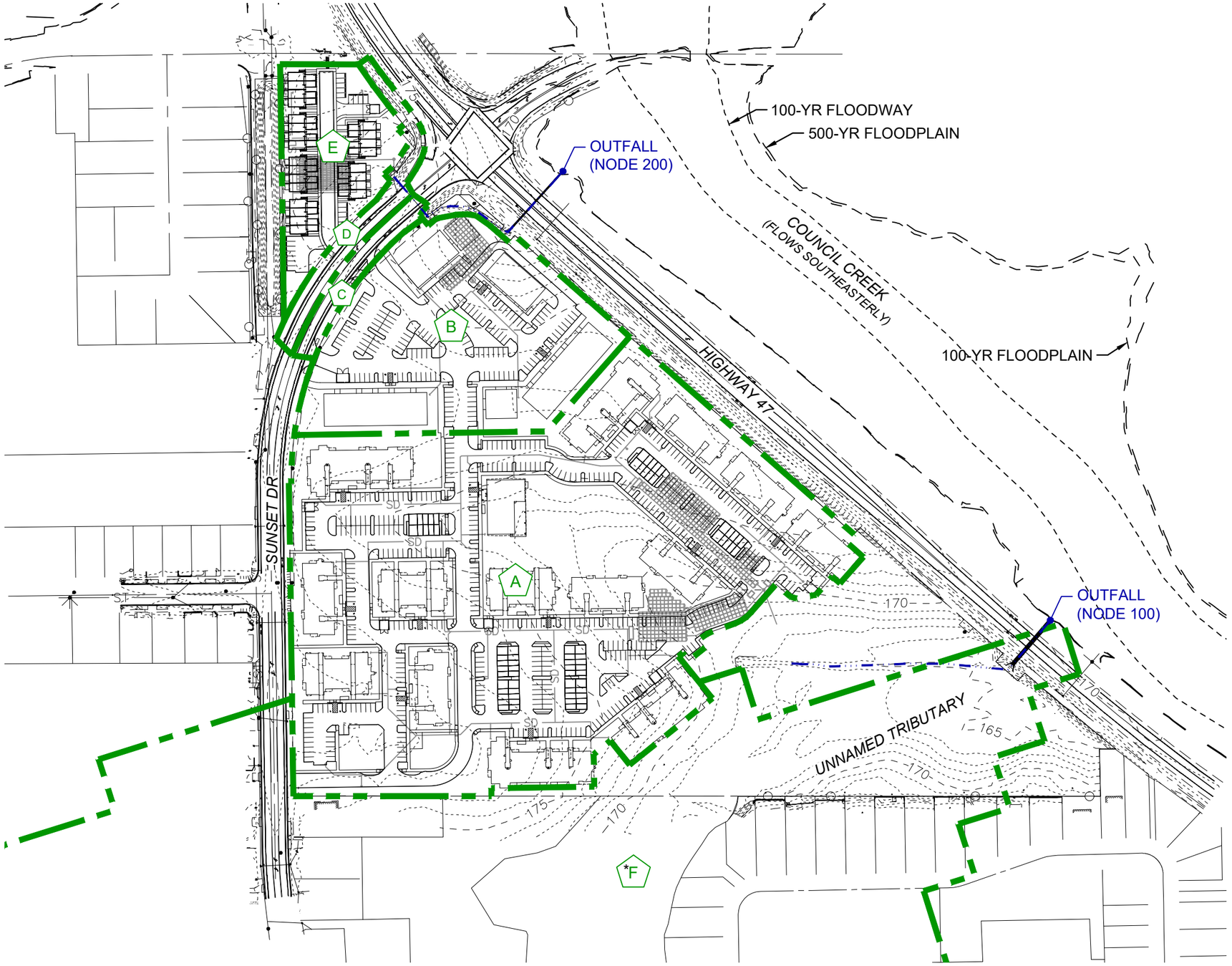
Subbasin 1-3




Subbasin 1-4



# H&H Modeling – Downstream Analysis




## LEGEND

- BASIN BOUNDARY
- # BASIN TAG
- SYSTEM ANALYZED

## DOWNSTREAM ANALYSIS BASINS

| Basin | Total | Impervious | Pervious | Undist. | XP |
|---|---|---|---|---|---|
| | ac | ac | ac | ac | Node |
| A | 13.35 | 9.29 | 3.54 | 0.51 | 102 |
| B | 3.92 | 3.33 | 0.59 | 0.00 | 201 |
| C | 0.33 | 0.28 | 0.06 | 0.00 | 202 |
| D | 0.53 | 0.30 | 0.23 | 0.00 | 203 |
| E | 1.51 | 1.04 | 0.47 | 0.00 | 203 |
| *F | 212.16 | See "Basin F Hydrology" | | | 101 |

*ALSO SEE "STREAMSTATS FOR BASIN F" FOR FULL EXTENT OF CONTRIBUTING AREA.

N
W E
S

SCALE: 1" = 200'
0 200 FT

# *BROWN'S FARM MIXED USE DEVELOPMENT*

OCT 2023

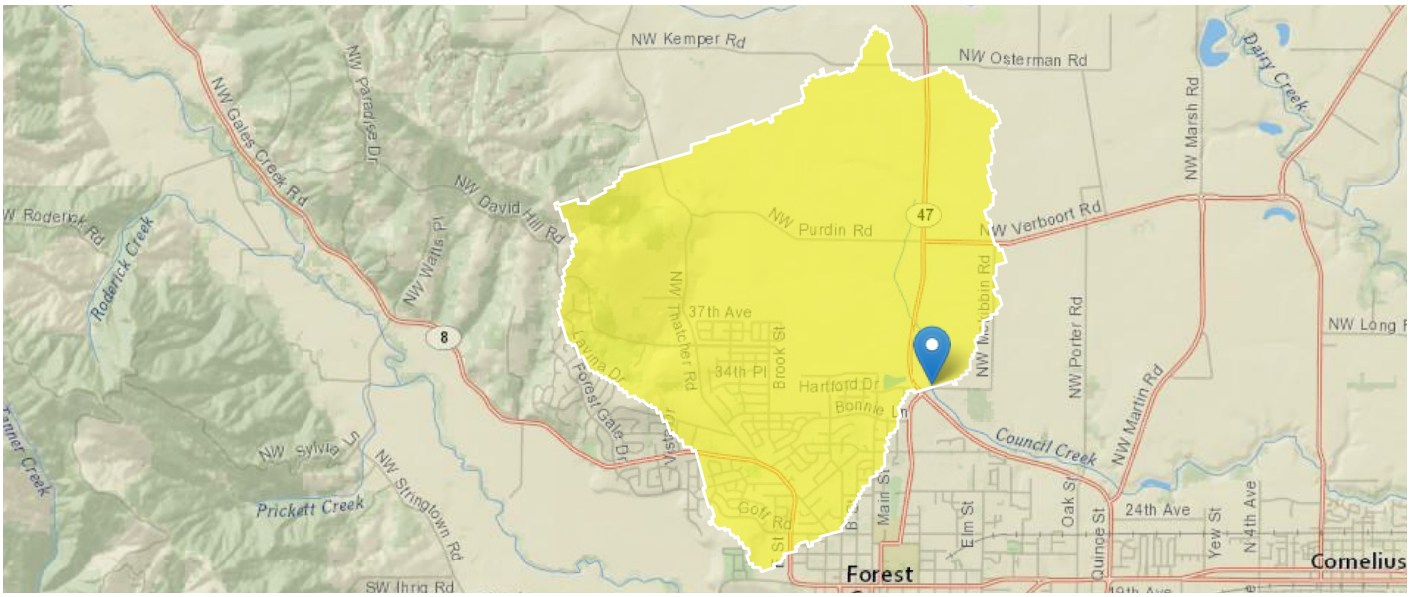
*JTSC, LLC*

*DOWNSTREAM ANALYSIS - BASINS EXHIBIT*

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

# StreamStats Report

**Region ID:** OR
**Workspace ID:** OR20230606051028359000
**Clicked Point (Latitude, Longitude):** 45.53595, -123.10503
**Time:** 2023-06-05 22:10:51 -0700




Contributing drainage area at Council Creek culvert crossing at Beal Road.

Collapse All

## Basin Characteristics

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| DRNAREA | Area that drains to a point on a stream | 4.61 | square miles |
| IMPERV | Percentage of impervious area | 8.84 | percent |

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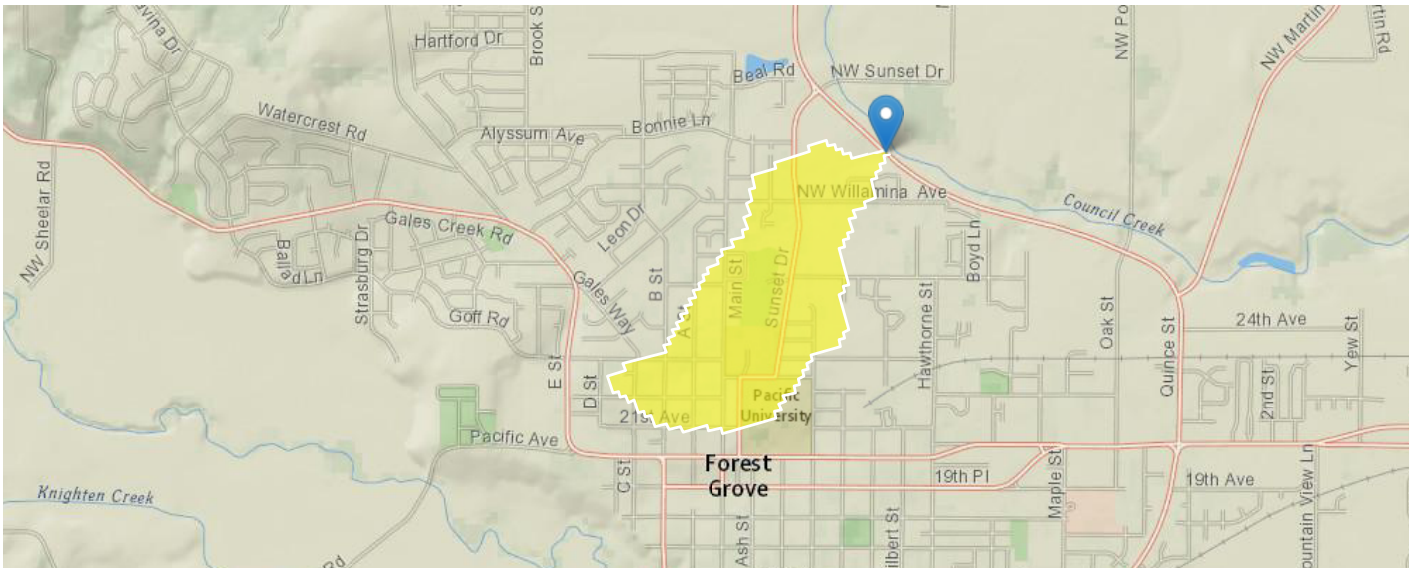
Application Version: 4.15.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

# StreamStats Report

**Region ID:** OR
**Workspace ID:** OR20230404165221625000
**Clicked Point (Latitude, Longitude):** 45.53267, -123.10202
**Time:** 2023-04-04 09:52:44 -0700




Contributing drainage area at Council Creek's unnamed tributary culvert crossing at Highway 47 (Downstream Analysis - Basin F).

Collapse All

## Basin Characteristics

| Parameter Code | Parameter Description | Value | Unit |
|---|---|---|---|
| DRNAREA | Area that drains to a point on a stream | 0.34 | square miles |
| IMPERV | Percentage of impervious area | 32.6 | percent |

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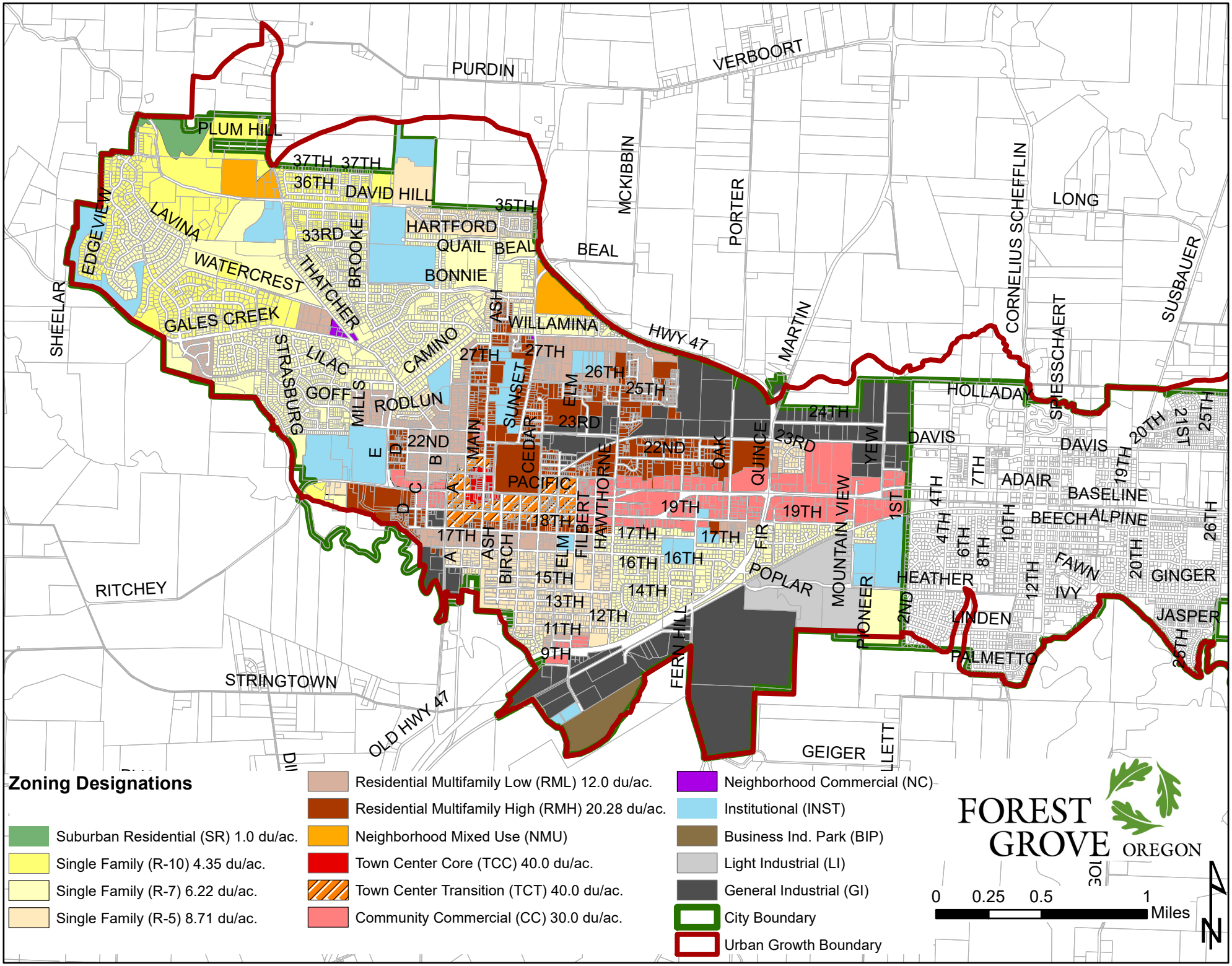
Application Version: 4.14.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

# TIME OF CONCENTRATION (BASIN F)

| PROJECT NO. 22807 | BY PJP | DATE Jun 2023 |
|---|---|---|

| Description | Unit | Value |
|---|---|---|
| Flow through Pipes | | |
| Sum Flowlengths through Conveyance | ft | 4060 |
| Average velocity | fps | 5 |
| Travel Time in Conveyance | min | 13.5 |
| Flow through Natural Watercourses (e.g., creeks) | | |
| Sum Flowlengths through Conveyance | ft | 2280 |
| Average velocity | fps | 2 |
| Travel Time in Conveyance | min | 19.0 |
| Resulting Time of Concentration | | |
| Time of Concentration, Tc (rounded down) | min | ***32*** |




**Zoning Designations**

- Suburban Residential (SR) 1.0 du/ac.
- Single Family (R-10) 4.35 du/ac.
- Single Family (R-7) 6.22 du/ac.
- Single Family (R-5) 8.71 du/ac.
- Residential Multifamily Low (RML) 12.0 du/ac.
- Residential Multifamily High (RMH) 20.28 du/ac.
- Neighborhood Mixed Use (NMU)
- Town Center Core (TCC) 40.0 du/ac.
- Town Center Transition (TCT) 40.0 du/ac.
- Community Commercial (CC) 30.0 du/ac.
- Neighborhood Commercial (NC)
- Institutional (INST)
- Business Ind. Park (BIP)
- Light Industrial (LI)
- General Industrial (GI)
- City Boundary
- Urban Growth Boundary

FOREST GROVE OREGON

0 0.25 0.5 1 Miles

N

Downstream Analysis

Basin F - Zoning, Impervious Fraction, and Composite CN

| Zoning | Area | Description | Imp. Frac. | Landscaped | Assumed |
|---|---|---|---|---|---|
| | ac | | per TR-55 | Area (min.)[1] | Imp. Frac.[2] |
| EFU | 0.003 | Exclusive Farm Use | 0 | | 0 |
| CC | 1.713 | Community Commercial | 0.85 | 15% | 0.85 |
| GI | 0.674 | General Industrial | 0.72 | 15% | 0.85 |
| INST | 22.263 | Institutional | | 20% | 0.80 |
| NC | 0.202 | Neighborhood Commecial | | 15% | 0.85 |
| NMU | 3.492 | Neighborhood Mixed Use | | 0% | 0.85 |
| R-7 | 19.359 | Single Family - 6.22 du/ac | 0.38 | | 0.50 |
| RMH | 82.859 | Res. Multifamily High - 20.28 du/ac | 0.65 | | 0.65 |
| RML | 44.122 | Res. Multifamily Low - 12.0 du/ac | 0.50 | | 0.65 |
| TCC | 1.645 | Town Center Core - 40 du/ac | | 5% | 0.95 |
| TCT | 4.262 | Town Center Transition - 40 du/ac | | 5% | 0.95 |
| - | 31.561 | Streets | | | 0.90 |
| Total | 212.156 | | | | |

[1]Based on City Development Code

[2]Either use TR-55, City DC, or estimated (from CAD) impervious fraction

Curve Numbers, CN (per TR-55 Manual)

| | |
|---|---|
| Pervious | 74 |
| Impervious | 98 |

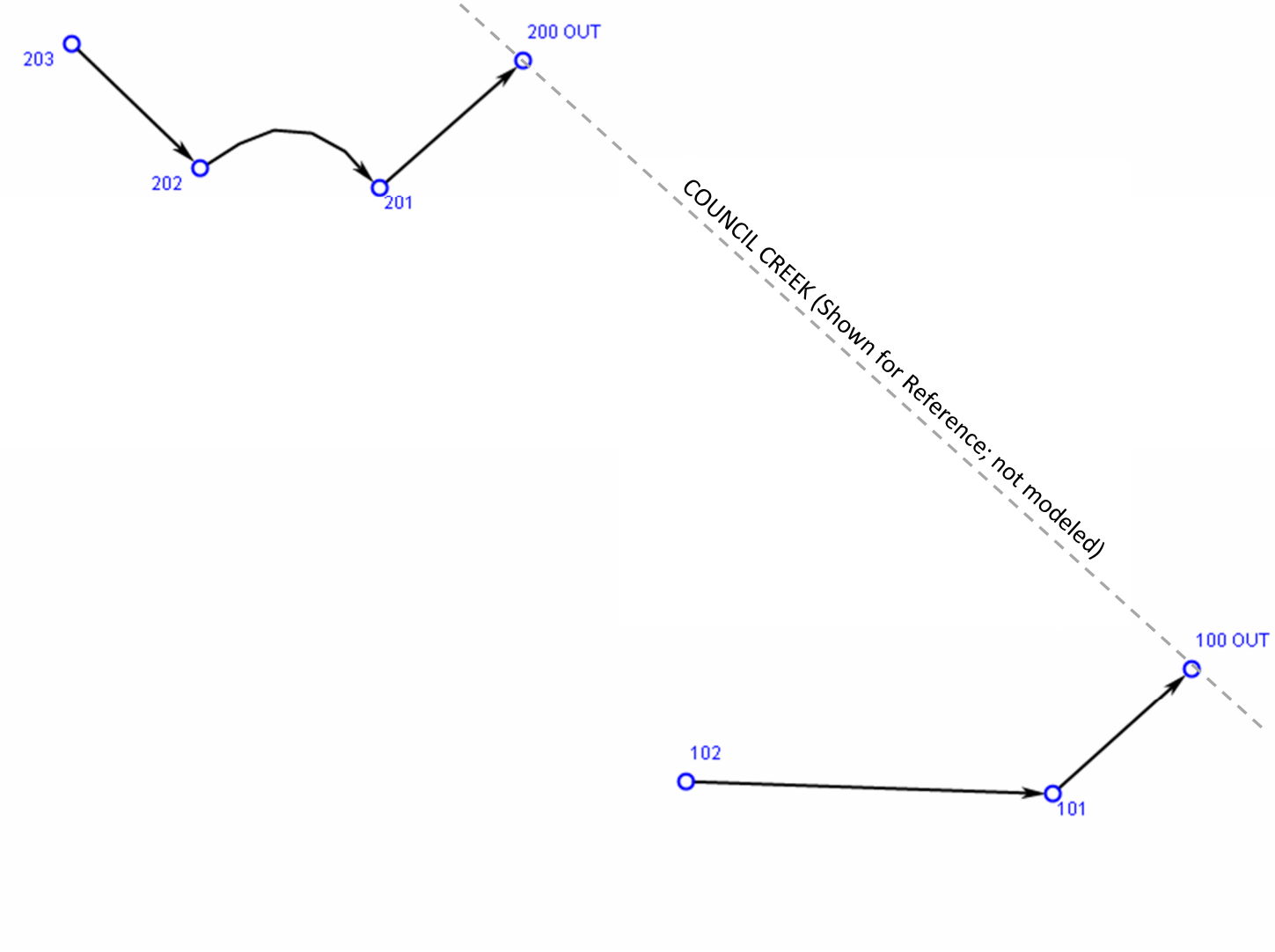
Development of Composite CN

| | | |
|---|---|---|
| Imp. Frac. | 0.70 | < < Spatially-weighted |
| CN,comp | ***91*** | |

Watershed Area Breakdown by Zoning

| ZONE | CLASS | ZONEGEN_CL | ZoneArea | ZONE | CLASS | ZONEGEN_CL | ZoneArea |
|---|---|---|---|---|---|---|---|
| EFU | EFU | RUR | 0.003 | RMH | MFR3 | MFR | 0.042 |
| CC | MUR3 | MUR | 1.117 | RMH | MFR3 | MFR | 10.592 |
| CC | MUR3 | MUR | 0.596 | RMH | MFR3 | MFR | 1.083 |
| GI | IH | IND | 0.674 | RML | SFR12 | SFR | 3.286 |
| INST | PF | PF | 22.263 | RML | SFR12 | SFR | 2.865 |
| NC | CN | COM | 0.200 | RML | SFR12 | SFR | 0.091 |
| NMU | MUR3 | MUR | 8.356 | RML | SFR12 | SFR | 5.014 |
| R-7 | SFR6 | SFR | 13.167 | RML | SFR12 | SFR | 5.125 |
| R-7 | SFR6 | SFR | 6.191 | RML | SFR12 | SFR | 2.781 |
| RMH | MFR3 | MFR | 11.031 | RML | SFR12 | SFR | 0.156 |
| RMH | MFR3 | MFR | 2.163 | RML | SFR12 | SFR | 5.119 |
| RMH | MFR3 | MFR | 0.923 | RML | SFR12 | SFR | 19.685 |
| RMH | MFR3 | MFR | 0.917 | TCC | MUR3 | MUR | 0.157 |
| RMH | MFR3 | MFR | 4.055 | TCC | MUR3 | MUR | 0.078 |
| RMH | MFR3 | MFR | 1.219 | TCC | MUR3 | MUR | 0.532 |
| RMH | MFR3 | MFR | 6.187 | TCC | MUR3 | MUR | 0.878 |
| RMH | MFR3 | MFR | 1.069 | TCT | MUR3 | MUR | 0.000 |
| RMH | MFR3 | MFR | 2.013 | TCT | MUR3 | MUR | 0.145 |
| RMH | MFR3 | MFR | 2.599 | TCT | MUR3 | MUR | 0.535 |
| RMH | MFR3 | MFR | 9.868 | TCT | MUR3 | MUR | 0.598 |
| RMH | MFR3 | MFR | 5.496 | TCT | MUR3 | MUR | 2.983 |
| RMH | MFR3 | MFR | 15.919 | NC | CN | COM | 0.002 |
| RMH | MFR3 | MFR | 1.307 | RMH | MFR3 | MFR | 0.002 |
| RMH | MFR3 | MFR | 0.515 | NMU | MUR3 | MUR | 0.001 |
| RMH | MFR3 | MFR | 5.861 | R-7 | SFR6 | SFR | 0.001 |

## Downstream Analysis – XPstorm Hydraulic Layout



| DOWNSTREAM ANALYSIS - XPSTORM RUNOFF DATA - 25-YR STORM | | | | | |
|---|---|---|---|---|---|
| BROWN'S FARM - PROPOSED CONDITIONS | | | | | |
| XP | Area | CN | Tc | Precip | Q |
| Node | ac | | min | in | cfs |
| 102 | 9.29 | 98 | 5 | 3.90 | 9.71 |
| | 3.54 | 74 | 5 | | |
| | 0.51 | 70 | 5 | | |
| 203 | 0.30 | 98 | 5 | 3.90 | 1.44 |
| | 0.23 | 74 | 5 | | |
| | 1.04 | 98 | 5 | | |
| | 0.47 | 74 | 5 | | |
| 202 | 0.28 | 98 | 5 | 3.90 | 0.28 |
| | 0.06 | 74 | 5 | | |
| 201 | 3.33 | 98 | 5 | 3.90 | 3.23 |
| | 0.59 | 74 | 5 | | |
| 101 | 212.16 | 91 | 32 | 3.90 | 112.02 |

| DOWNSTREAM ANALYSIS - XPSTORM RUNOFF DATA - 100-YR STORM | | | | | |
|---|---|---|---|---|---|
| BROWN'S FARM - PROPOSED CONDITIONS | | | | | |
| XP | Area | CN | Tc | Precip | Q |
| Node | ac | | min | in | cfs |
| 102 | 9.29 | 98 | 5 | 4.50 | 11.53 |
| | 3.54 | 74 | 5 | | |
| | 0.51 | 70 | 5 | | |
| 203 | 0.30 | 98 | 5 | 4.50 | 1.72 |
| | 0.23 | 74 | 5 | | |
| | 1.04 | 98 | 5 | | |
| | 0.47 | 74 | 5 | | |
| 202 | 0.28 | 98 | 5 | 4.50 | 0.32 |
| | 0.06 | 74 | 5 | | |
| 201 | 3.33 | 98 | 5 | 4.50 | 3.78 |
| | 0.59 | 74 | 5 | | |
| 101 | 212.16 | 91 | 32 | 4.50 | 135.01 |

| DOWNSTREAM ANALYSIS - XPSTORM CONVEYANCE DATA - BROWN'S FARM - PROPOSED CONDITIONS - 25-YR STORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | Conduit Properties | | | Conduit Results | | | | | |
| Link | Station | | $d_0$ | L | S | $Q_{design}$ | $Q_{max}$ / $Q_{design}$ | $Q_{max}$ | $V_{max}$ | $y_{max}$ | $y_{max}$ / $d_0$ |
| | From | To | ft | ft | % | cfs | | cfs | ft/s | ft | |
| Link66 | 102 | 101 | 11.84 | 241.00 | 0.6 | 15482.20 | 0.00 | -29.20 | -0.26 | 5.12 | 0.43 |
| Link62 | 203 | 202 | 2.00 | 97.20 | 1.0 | 23.17 | 0.06 | 1.44 | 3.81 | 0.44 | 0.22 |
| Link63 | 202 | 201 | 2.30 | 168.00 | 3.2 | 231.28 | 0.01 | 1.72 | 0.11 | 3.38 | 1.00 |
| Link64 | 201 | 200 OUT | 3.00 | 149.00 | 0.7 | 54.91 | 0.51 | -27.99 | -4.69 | 4.09 | 1.36 |
| Link67 | 101 | 100 OUT | 3.00 | 108.00 | 0.5 | 66.33 | 1.45 | 96.20 | -4.59 | 5.12 | 1.71 |

| DOWNSTREAM ANALYSIS - XPSTORM CONVEYANCE DATA - BROWN'S FARM - PROPOSED CONDITIONS - 25-YR STORM | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | Conduit Profile | | | | | | | |
| Link | Station | | US EG/FG | DS EG/FG | US IE | DS IE | US Fb | DS Fb | US HGL | DS HGL |
| | From | To | ft | ft | ft | ft | ft | ft | ft | ft |
| Link66 | 102 | 101 | 176.72 | 175.38 | 164.87 | 163.54 | 8.06 | 6.72 | 168.66 | 168.66 |
| Link62 | 203 | 202 | 176.04 | 175.19 | 170.26 | 169.24 | 5.34 | 5.71 | 170.70 | 169.48 |
| Link63 | 202 | 201 | 175.19 | 169.70 | 169.24 | 163.92 | 5.71 | 2.40 | 169.48 | 167.30 |
| Link64 | 201 | 200 OUT | 169.70 | 170.44 | 163.92 | 162.91 | 2.40 | 3.44 | 167.30 | 167.00 |
| Link67 | 101 | 100 OUT | 175.38 | 169.20 | 163.54 | 162.98 | 6.72 | 2.20 | 168.66 | 167.00 |

| DOWNSTREAM ANALYSIS - XPSTORM CONVEYANCE DATA - BROWN'S FARM - PROPOSED CONDITIONS - 100-YR STORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | Conduit Properties | | | Conduit Results | | | | | |
| Link | Station | | $d_0$ | L | S | $Q_{design}$ | $Q_{max}$ / $Q_{design}$ | $Q_{max}$ | $V_{max}$ | $y_{max}$ | $y_{max}$ / $d_0$ |
| | From | To | ft | ft | % | cfs | | cfs | ft/s | ft | |
| Link66 | 102 | 101 | 11.84 | 241.00 | 0.6 | 15482.20 | 0.00 | -29.20 | -0.26 | 5.68 | 0.48 |
| Link62 | 203 | 202 | 2.00 | 97.20 | 1.0 | 23.17 | 0.07 | 1.72 | 3.99 | 0.49 | 0.24 |
| Link63 | 202 | 201 | 2.30 | 168.00 | 3.2 | 231.28 | 0.01 | 2.04 | 0.13 | 3.38 | 1.00 |
| Link64 | 201 | 200 OUT | 3.00 | 149.00 | 0.7 | 54.91 | 0.51 | -27.99 | -4.69 | 4.09 | 1.36 |
| Link67 | 101 | 100 OUT | 3.00 | 108.00 | 0.5 | 66.33 | 1.68 | 111.31 | 5.28 | 5.68 | 1.89 |

| DOWNSTREAM ANALYSIS - XPSTORM CONVEYANCE DATA - BROWN'S FARM - PROPOSED CONDITIONS - 100-YR STORM | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | | | Conduit Profile | | | | | | | |
| Link | Station | | US EG/FG | DS EG/FG | US IE | DS IE | US Fb | DS Fb | US HGL | DS HGL |
| | From | To | ft | ft | ft | ft | ft | ft | ft | ft |
| Link66 | 102 | 101 | 176.72 | 175.38 | 164.87 | 163.54 | 7.50 | 6.16 | 169.22 | 169.22 |
| Link62 | 203 | 202 | 176.04 | 175.19 | 170.26 | 169.24 | 5.30 | 5.69 | 170.75 | 169.50 |
| Link63 | 202 | 201 | 175.19 | 169.70 | 169.24 | 163.92 | 5.69 | 2.40 | 169.50 | 167.30 |
| Link64 | 201 | 200 OUT | 169.70 | 170.44 | 163.92 | 162.91 | 2.40 | 3.44 | 167.30 | 167.00 |
| Link67 | 101 | 100 OUT | 175.38 | 169.20 | 163.54 | 162.98 | 6.16 | 2.20 | 169.22 | 167.00 |

# O&M PLAN

(Will be included in Final Stormwater Report)

# GEOTECHNICAL REPORT

# Geotechnical Engineering Report

Sunset Drive Mixed Use Development
Forest Grove, Oregon

*for*
**J.T. Smith Companies**

November 21, 2022

GeoEngineers
Earth Science + Technology

# Geotechnical Engineering Report

Sunset Drive Mixed Use Development
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November 21, 2022

GeoEngineers

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# Geotechnical Engineering Report

# Sunset Drive Mixed Use Development
# Forest Grove, Oregon

**File No. 6748-006-00**

**November 21, 2022**

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## 1.0 INTRODUCTION

This geotechnical report summarizes our geotechnical engineering services provided for the proposed Sunset Drive Mixed Use development in Forest Grove, Oregon. The proposed project is located at 3081 Sunset Drive in Forest Grove, Oregon.

A preliminary site development drawing for Sunset Drive Mixed Use development by 3J Consulting Engineers (3J) was provided to us by JT Smith Companies. The plan is titled "Brown's Farm Mixed Use – Preliminary Site Plan," dated August 25, 2022. The preliminary site plan indicates the project will consist of approximately twelve multi-story apartment buildings, residential lots, four commercial buildings, new on-site paved parking and shared access roadways, utilities associated with site development and a stormwater water quality pond. Additionally, a village center is planned on the approximately 1.55 acres across Sunset Boulevard to the northwest.

Our recommendations for earthwork and retaining structures assume that maximum cuts and fills will be less than 15 feet each and that on-site retaining walls will be less than 10 feet in height.

Our recommendations for structural development on the site are based on typical light wood-frame structural loads consistent with development of small lots and wood framed one-and two-story structures, and masonry or light wood frame construction for low- to mid-rise multifamily development such as proposed in the south portion of the site. We have assumed that maximum column and wall loads will be on the order of 40 kips per column and 2 kips per linear foot (klf) respectively, and that floor loads for slabs on grade will be 100 pounds per square foot (psf) or less.

The purpose of our services was to provide geotechnical design and construction recommendations for general site development (infrastructure development, overall site grading and design recommendations) and for proposed commercial and apartment buildings. Our report should not be used for individual residential lot development. Depending on building type, lot configuration and location, and final grading and site development as it varies across the site, lot-specific evaluation and additional geotechnical investigations may be required for future development for individual residential lots and near retaining walls, or for critical facilities if they are developed on site.

## 2.0 SCOPE OF SERVICES

Our specific scope of services is detailed in our August 18, 2022, proposal to you. Our services were authorized on September 28, 2022. In general, our scope of services included: reviewing selected geotechnical information about the site; performing a geologic reconnaissance; exploring subsurface soil and groundwater conditions; collecting representative soil samples; performing infiltration testing; completing relevant laboratory testing and geotechnical analyses; and providing this geotechnical report with our conclusions, findings, and design recommendations.

## 3.0 SITE CONDITIONS

### 3.1. Site Geology

The *Engineering Geology of the Tualatin Valley Region, Oregon* (Schlicker and Deacon 1967) shows the Forest Grove area mantled by "Willamette Silt," the term used by this publication for what is now more typically referred to as "fine-grained flood deposits" (Madin 1990), or by younger quaternary alluvial deposits. This alluvial sediment is described as "unconsolidated beds and lenses of fine sand, silt and clay." Schlicker and Wilson suggest that the Willamette Silt may be up to 75 feet thick in the Tualatin Valley. Schlicker et. al. (1967), describe the Young Alluvium as silt, sand, clay, and peat of present flood plains that has an average thickness of 20 to 30 feet. The topography of the site and our field investigation suggests that the that the near-surface site geology is generally consistent with published geologic mapping.

### 3.2. Surface Conditions

A representative of GeoEngineers performed a general visual reconnaissance of the site. The site was accessed from a driveway located at 3081 Sunset Drive that leads up to the single-family residence and equipment storage structures at the address.

The site is approximately 25 acres of generally undeveloped land aside from the single-family residence and small equipment storage structures within the southwest portion. The site appears to have been farmland that was used for pasture/hay. Site vegetation is variable and consists of short grasses, brush, shrubs and trees. The trees are generally large (mature) individual trees existing in a dense stand in the central portion of the site. The site is bounded to the west and northwest by Sunset Drive, to the north and northeast by Nehalem Highway, and to the south by a mix of wetland area and residential properties. Site topography is generally undulatory to gently sloping down to the northwest in the northwest portion of the site, and to the east along the east portion of the site.

### 3.3. Subsurface Conditions

Subsurface conditions at the site were explored by excavating 18 test pits (TP-1 through TP-18) on October 19 and 20, 2022. Infiltration testing was performed in two of the test pits at a depth of approximately 4 feet below ground surface (bgs). The approximate locations of the explorations completed at the site are presented in Figure 2. The logs of GeoEngineers explorations completed for this study are presented in Appendix A.

Soil samples obtained during excavation were taken to GeoEngineers laboratory for further evaluation. Selected samples were tested for determination of moisture content. A description of the laboratory testing and the test results are presented in Appendix A.

#### 3.3.1. Soil Conditions

In general, subsurface conditions at the site consist of native, yellowish brown medium stiff to very stiff silt with varying sand content observed to extend up to 12 feet bgs, underlain by medium dense, gray fine sand with varying silt and clay content.

### 3.3.2. Groundwater

Areal groundwater was not observed in our explorations, although soil conditions observed in our explorations suggest that seasonal groundwater or perched groundwater may be encountered at or just below 5 feet bgs. we expect that groundwater will be present at shallow depths in a perched condition during wet times of the year or during extended periods of wet weather. Some exfiltrating groundwater conditions (upward flowing from perched conditions upslope) may be encountered in downslope areas, especially after prolonged periods of wet weather. Groundwater conditions at the site are expected to vary seasonally due to rainfall events and other factors not observed in our explorations. For example, our experience with agricultural sites indicates that remnant drainage features, such as buried clay tiles and cisterns, can produce local groundwater and temporary strong flow into excavations where drain tiles are pierced.

## 4.0 INFILTRATION TESTING

As requested by the project team, we conducted two on-site infiltration tests to assist in evaluation of site for stormwater infiltration design at the exploration locations as shown in Figure 2. We conducted infiltration testing in general accordance with the Clean Water Services Design and Construction Standards at approximately 4 feet bgs, marked as IT-1 and IT-2 in Figure 2. Testing was conducted using the encased falling head infiltration testing procedure.

The general procedure consisted of excavating a 4-foot-square area for inserting a 4.5- to 6-inch-diameter polyvinyl chloride (PVC) pipe. The encased PVC pipes were filled with clean water to approximately 1 foot above the soil at the bottom of the test pit. The initial fill of water did not drain into the soil within 10 minutes, so the water level was maintained, and the soil allowed to saturate for 2 hours at each location. The levels were checked, and the test pits were refilled the following morning to 12 inches above the soil in the bottom of the test pits. The drop in water level was measured during three, hour-long iterations. Field test results are summarized in Table 1.

**TABLE 1. INFILTRATION RESULTS**

| Infiltration Test No. | Location | Depth (feet) | USCS Material Type | Field Measured Infiltration Rate[1] (inches/hour) |
|---|---|---|---|---|
| TP-16/IT-1 | See Site Plan | 6 | ML | 2.1 |
| TP-8/IT-2 | See Site Plan | 5½ | ML | 0.0 |

Notes:

[1] Appropriate factors should be applied to the field-measured infiltration rate, based on the design methodology and specific system used.

USCS = Unified Soil Classification System

in/hr = inches per hour

The infiltration rate shown in Table 1 represents a field-measured infiltration rate. The rate summarized for IT-2 indicates 0.0 inches per hour because minimal to no infiltration (drop in water levels) was observed during the testing period. Similar tests that are performed during drier times of the year in similar soils may yield field-measured rates of 1 to 3 inches per hour, but do not necessarily reflect the conditions when these facilities are to perform (during rain events in the wet times of the year). Field measurements are limited to accuracy of equipment employed to conduct the test. Actual long-term infiltration rates of the on-

site soils are likely greater than 0.0 inches per hour if measured out over very long-time frames (much longer than the time frames prescribed in the testing standards). A field-measured rate of zero inches per hour generally indicates infiltration less than 1/8 inches per hour, which is about the limit of the field measuring equipment.

In addition, field-measured rates represent a relatively short-term infiltration rate, and factors of safety have not been applied for the type of infiltration system being considered, or for variability that may be present across large areas in the on-site soil. In our opinion, and consistent with the state of the practice, correction factors should be applied to this measured rate to reflect the localized area of testing relative to the field sizes.

Appropriate correction factors should also be applied by the project civil engineer to account for long-term infiltration parameters. From a geotechnical perspective, we recommend a factor of safety (correction factor) of at least 2 be applied to the field infiltration values to account for potential soil variability with depth and location within the area tested. In addition, the stormwater system design engineer should determine and apply appropriate remaining correction factor values, or factors of safety, to account for repeated wetting and drying that occur in this area, degree of in-system filtration, frequency and type of system maintenance, vegetation, potential for siltation and bio-fouling, etc., as well as system design correction factors for overflow or redundancy, and base and facility size.

The actual depths, lateral extent and estimated infiltration rates can vary from the values presented above. Field testing/confirmation during construction is often required in large or long systems or other situations where soil conditions may vary within the area where the system is constructed. The results of this field testing might necessitate that the infiltration locations be modified to achieve the design infiltration rate.

The infiltration flow rate of a focused stormwater system like a drywell or small infiltration box or pond typically diminishes over time as suspended solids and precipitates in the stormwater further clog the void spaces between the soil particles or cake on the infiltration surface or in the engineered media. The serviceable life of an infiltration media in a stormwater system can be extended by pre-filtering or with on-going accessible maintenance. Eventually, most systems will fail and will need to be replaced or have media regenerated or replaced.

We recommend that infiltration systems include an overflow that is connected to a suitable discharge point. Also, infiltration systems can cause localized, high groundwater levels and should not be located near basement walls, retaining walls, or other embedded structures unless these are specifically designed to account for the resulting hydrostatic pressure. Infiltration locations should not be located on sloping ground, unless it is approved by a geotechnical engineer, and should not be infiltrated at a location that allows for flow to travel laterally toward a slope face, such as a mounded water condition or too close to a slope face that could cause instability of the slope.

## 5.0 CONCLUSIONS

Based on our explorations, testing and analyses, it is our opinion that the site is suitable for the proposed project from a geotechnical standpoint, provided the recommendations in this report are incorporated into project design, and implemented during construction. We offer the following conclusions regarding geotechnical engineering design and construction at the site.

- Existing site structures and structural features designated for removal should be demolished and completely removed from the site.
- Existing utilities below proposed structural areas, including proposed buildings and roads, should be relocated or abandoned and grouted full if left in place.
- Surface conditions at the site consist primarily of vegetated areas covered with grasses, shrubs and trees; therefore, clearing, stripping and grubbing will be required. We anticipate a stripping depth of approximately 6 inches bgs to remove the topsoil layer. Grubbing and deeper excavations up to several feet will be required to remove the root zones of areas of thick shrubs and trees. Portions of the site are heavily vegetated and previously buried roots are also expected, even in the current grassy areas of the site.

  Cleared, stripped and grubbed materials should be hauled off-site and properly disposed unless otherwise allowed by the project specifications for other uses such as landscaping, stockpiling or on-site burning.
- A "tilled zone" mantels the site from previous agricultural use. The tilled zone consists of moist loose (loosened by tilling/farming activities) silt with trace roots and extends to a depth of approximately 18 inches bgs. The tilled zone is too loose/disturbed in its current state to support structures, including buildings, foundations, floor slabs, pavements and other settlement-sensitive structures. Therefore, in areas designated to receive fill, and in areas where site cuts do not extend below the tilled zone, it should be either: (1) scarified, moisture-conditioned and compacted in place during the dry season; or (2) removed and replaced with Imported Select Structural Fill if construction occurs during the wet season or at other times when the material cannot be compacted in place.
- The soils at the site below the topsoil zone are suitable to use as structural fill if they are properly moisture conditioned and compacted. Because the site soils have a moisture content that is currently wet of optimum, they will become significantly disturbed from construction traffic, particularly during wet weather. Wet weather construction practices will be required over exposed native soils and to protect exposed subgrades, except during the dry summer months.
- Previously farmed areas can have buried features that are not encountered in geotechnical borings and test pits, for example: old foundations, structures, agricultural drainpipes, and cisterns. We recommend a budget contingency be in place to remove old, buried features.
- Groundwater was not encountered during our explorations conducted after months of predominantly dry weather, but based on our experience and our observations, perched groundwater and shallow groundwater conditions may be present during periods of persistent rainfall.
- Proposed commercial and apartment structures can be satisfactorily supported on continuous and isolated shallow foundations supported on the firm native soils encountered below the tilled zone, or on structural fill that extends to the firm native soils.
- Slabs on grade for proposed commercial and apartment structures can be satisfactorily supported on Aggregate Base that is founded on the firm native soils encountered below the tilled zone, or on structural fill that extends to the firm native soils. We recommend that slabs-on-grade be provided with proper moisture control by constructing the aggregate base as a capillary break and providing a vapor barrier for moisture-sensitive applications.

- Based on the assumed design loads described in the "Introduction" section of this report, we estimate total settlements will be less than 1 inch for foundations constructed as recommended. If larger structural loads are anticipated, we should review and reassess the estimated settlement.
- As stated earlier, our report should not be used for individual residential lot development. Lot-specific studies and additional geotechnical assessment/investigations may be required for future development for individual residential lots, or developed per applicable sections of the 2018 International Building Code (IBC).
- Standard pavement sections as summarized in this report, consisting of AC over Aggregate Base and/or Aggregate Subbase, over properly prepared subgrade, can be used to support the estimated traffic loads provided the pavement sections are designed and constructed as recommended in this report.

# 6.0 EARTHWORK RECOMMENDATIONS

## 6.1. Site Preparation

In general, initial site preparation and primary earthwork operations will include; stripping and grubbing of upper organics; light logging, mass grading to create level working surfaces; excavating and filling for roads pavements, foundations, and utilities; demolition of existing structures; recompacting (dry weather) or replacing (wet weather) the tilled zone; fine-grading to establish final grades, and relocating live utilities.

All existing utilities in the proposed earthwork construction areas should be identified prior to excavation. Live utility lines beneath proposed structures should be completely removed or filled with grout to reduce potential settlement of new structures. Soft or loose soil encountered in utility line excavations should be removed and replaced with structural fill where it is located within structural areas.

Debris materials generated during demolition of existing improvements or relocation of utilities should be transported off site for disposal. Existing voids and new depressions created during site preparation, and resulting from removal of existing utilities, or other subsurface elements, should be cleaned of loose soil or debris down to firm soil and backfilled with compacted structural fill. Disturbance to a greater depth should be expected if site preparation and earthwork are conducted during period of wet weather.

### 6.1.1. Demolition

All structures and belowground structures to be demolished should be completely removed from proposed structural areas and for a margin of at least 3 feet around proposed structural areas. Proposed structural areas are areas where new structures will be built, including building pads and roadways. Existing utilities that will be abandoned on site should be identified prior to construction. Abandoned utility lines should be completely removed or filled with grout if abandoned and left in place to reduce potential settlement or caving in the future. Materials generated during demolition should be transported off site and properly disposed.

### 6.1.2. Clearing and Grubbing

Site clearing will be required to remove site vegetation, including grass, shrubs and trees that are designated for removal. Following clearing, grubbing and excavations up to several feet will be required to remove the root zones of shrubs and trees. Deeper excavations, up to 6 or 8 feet may be required to remove the root zones of large trees. Roots larger than ½ inch in diameter should be removed. Excavations to

remove root zones should be done with a smooth-bucket to minimize subgrade disturbance. Portions of the site are heavily vegetated and previously buried roots are also expected, even in the current grassy areas of the site. Grubbed materials should be hauled off site and properly disposed unless otherwise allowed by the project specifications for other uses such as landscaping, stockpiling or on-site burning.

Existing voids and new depressions created during demolition, clearing, grubbing or other site preparation activities, should be excavated to firm soil and backfilled with Imported Select Structural Fill. Greater depths of disturbance should be expected if site preparation and earthwork are conducted during periods of wet weather.

#### 6.1.3. Stripping

Based on our observations at the site, we estimate that the depth of stripping should be on the order of about 6 inches. Greater stripping depths may be required to remove localized zones of loose or organic soil, and in areas where moderate to heavy vegetation are present, or where surface disturbance from prior use has occurred. The actual stripping depth should be based on field observations at the time of construction. Stripped material should be transported off site for disposal unless otherwise allowed by the project specifications for other uses such as landscaping.

### 6.2. Subgrade Improvement for the Tilled Zone

A tilled zone mantels the site from previous agriculture land use. The tilled zone consists of disturbed soil comprised of moist, generally disturbed in place (soft or loose) and soft to medium stiff silt with trace roots and extends to a depth of approximately 18 to 24 inches bgs. The tilled zone is too loose in its currently disturbed state to support structures, including buildings, foundations, floor slabs, pavements, and other settlement-sensitive structures. Therefore, if the tilled zone remains in place to receive site fills during mass grading, it should be either: (1) scarified, moisture-conditioned and compacted in-place during the dry season; or (2) removed and replaced with Imported Select Structural Fill if construction occurs during the wet season, or at other times when the material cannot be compacted in place. If the tilled zone is cut away (cuts extend below the tilled zone) as a part of mass grading, recompaction or removal of in-place undisturbed soils is not required.

The tilled zone soil will be generally loose, especially when wet and will provide marginal to poor support for construction equipment. Wet weather construction practices will be required when improving the tilled zone, except during the dry summer months.

Subgrade improvement for the tilled zone can be accomplished by removing and replacing or scarifying and re-compacting the tilled zone. Scarification is typically performed by ripping with agricultural discs and aerating the soils to dry them during dry weather periods. Considerable soil processing, including moisture conditioning should be expected to adequately compact the tilled zone. If the soil cannot be properly moisture conditioned, the subgrade should be removed and replaced with Imported Select Structural Fill. If the project specifications allow, the tilled zone can be cement amended as described in “Soil Amendment with Cement” section of this report. Cement amendment is typically performed to depths of 12 to 18 inches. When performed in silty soils, such as those at the site, multiple tilling and application passes may be required to adequately blend and amend the soils.

### 6.3. Subgrade Evaluation

As described above, disturbed material may be present after demolition and site stripping are complete. Subgrade areas to be developed should be prepared to be in a uniformly firm and unyielding condition prior to placing structural fill or structural elements. We recommend that prepared subgrades be observed by a member of our firm, who will evaluate the suitability of the subgrade and identify areas of yielding, which are indicative of soft or loose soil.

Subgrades, including subgrades to receive fill, should be proof-rolled with heavy rubber-tired equipment and/or probed with a ½-inch-diameter steel rod, as appropriate depending on prevailing conditions. If soft, yielding or otherwise unsuitable areas revealed during probing or proof-rolling cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the subgrade soils be scarified, aerated and recompacted; or (2) the unsuitable soils be removed and replaced with Structural Fill.

### 6.4. Subgrade Protection and Wet Weather Considerations

The soils at the site are highly susceptible to moisture. Wet weather construction practices will be necessary if work is performed during periods of wet weather. If site grading will occur during wet weather conditions, it will be necessary to use track-mounted equipment, load removed material into trucks supported on gravel haul roads, use gravel working pads and employ other methods to reduce ground disturbance. The contractor should be responsible to protect the subgrade during construction.

Earthwork planning should include considerations for minimizing subgrade disturbance. We provide the following recommendations if wet weather construction is considered:

- The ground surface in and around the work area should be sloped so that surface water is directed to a sump or discharge location. The ground surface should be graded such that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work areas.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting or similar means.
- The site soils should not be left in a disturbed or uncompacted state and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation may reduce the extent to which these soils become wet or unstable.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practicable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are not susceptible to wet weather disturbance such as haul roads and areas that are adequately surfaced with working pad materials.
- When on-site soils are wet of optimum, they are easily disturbed and will not provide adequate support for construction traffic nor for the proposed development. The use of granular haul roads and staging areas will be necessary to support heavy construction traffic. Generally, a 12- to 16-inch-thick mat of Imported Select Structural Fill should be sufficient for light staging areas for the building pad and light staging activities but is not expected to be adequate to support repeated heavy equipment or truck

traffic. The thickness of the Imported Select Structural Fill for haul roads and areas with repeated heavy construction traffic should be increased to between 18 and 24 inches. The actual thickness of haul roads and staging areas should be determined at the time of construction and based on the contractor's approach to site development and the amount and type of construction traffic.

- The base rock (Aggregate Base and Aggregate Subbase) thicknesses described in the "Pavement Recommendations" sections of this report are intended to support post-construction design traffic loads. The design base rock thicknesses will likely not support repeated heavy construction traffic during site construction or during pavement construction. A thicker base rock section as described above for haul roads will likely be required to support construction traffic.
- During periods of wet weather, concrete should be placed as soon as practical after preparing foundation excavations. Foundation bearing surfaces should not be exposed to standing water. Should water infiltrate and pool in the excavation, the water should be removed, and the foundation subgrade should be re-evaluated before placing reinforcing steel or concrete. Foundation subgrade protection, such as a 3- to 4-inch thickness of Aggregate Base/Aggregate Subbase or lean concrete, may be necessary if footing excavations are exposed to extended wet weather conditions.

During wet weather, or when the exposed subgrade is wet or unsuitable for proof-rolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations and probing should be performed by a member of our staff. Wet soil that has been disturbed due to site preparation activities, or soft or loose zones identified during probing, should be removed, and replaced with Imported Select Structural Fill.

### 6.5. Soil Amendment with Cement

As an alternative to the using Imported Select Structural Fill material for wet weather structural fill, an experienced contractor may be able to amend the on-site soil with portland cement concrete (PCC) to obtain suitable support properties. It is often less costly to amend on-site soils than to remove and replace soft soils with imported granular materials. We also considered lime amendment for the site soils. However, based on our experience on nearby sites, in-place soil moisture contents, observed soil types and processing speed, cement amendment would be more suitable at this site than lime amendment. Single pass tilling depths for cement amendment equipment is typically 18 inches or less. However, multiple tilling passes may be required to adequately blend in the cement with the soils and to sufficiently process the soils. It may also be necessary to place the recommended cement quantities in multiple passes between tilling passes, which requires intermediate compaction.

The contractor should be responsible for selecting the means and methods to construct the amended soil without disturbing exposed subgrades. We recommend low ground-pressure (such as balloon-tired) cement spreading equipment be required. We have observed other methods used for spreading that have resulted in significant site disturbance and high remedial costs. For example, we have observed amendment efforts using a spreader truck equipped with road tires pulled by track-mounted equipment that resulted in significant disturbance to the work area and required re-working large areas of cement-amended product at additional expense.

Areas of standing water, or areas where traffic patterns are concentrated and disturbing the subgrade, will also create a need for higher amounts of cement to be applied and additional tilling for better mixing and cement hydration prior to final compaction.

Successful use of soil amendment depends on the use of correct mixing techniques, the soil moisture content at the time of amendment and amendment quantities. Specific recommendations, based on exposed site conditions for soil amending, can be provided if necessary. However, for preliminary planning purposes, it may be assumed that a minimum of 5 percent cement (by dry weight, assuming a unit weight of 100 pounds per cubic foot [pcf]) will be sufficient for improving on-site soils. Treatment depths of 12 to 16 inches are typical (assuming a seven-day unconfined compressive strength of at least 80 pounds per square inch [psi]), although they may be adjusted in the field depending on site conditions. Soil amending should be conducted in accordance with the specifications provided in Oregon Structural Specialty Code (OSSC) 00344 (Treated Subgrade).

We recommend a target strength for cement-amended soils of 80 psi. The amount of cement used to achieve this target generally varies with moisture content and soil type. It is difficult to predict field performance of soil-to-cement amendment due to variability in soil response and we recommend laboratory testing to confirm expectations. However, for preliminary design purposes, 4 to 5 percent cement by weight of dry soil can generally be used when the soil moisture content does not exceed approximately 20 percent. If the soil moisture content is in the range of 20 to 35 percent, 5 to 7 percent by weight of dry soil is recommended. The amount of cement added to the soil should be adjusted based on field observations and performance.

PCC-amended soil is hard and has low permeability; therefore, this soil does not drain well nor is it suitable for planting. Future landscape areas should not be cement amended, if practical, or accommodations should be planned for drainage and planting. Cement amendment should not be used if runoff during construction cannot be directed away from adjacent low-lying wet areas and active waterways and drainage paths.

When used for constructing pavement, staging, or haul road subgrades, the amended surface should be protected from abrasion by placing a minimum 4-inch thickness of base rock material (Aggregate Base/Aggregate Subbase). To prevent strength loss during curing, cement-amended soil should be allowed to cure for a minimum of four days prior to placing the base rock. The base rock typically becomes contaminated with soil during construction. Contaminated base rock should be removed and replaced with clean base rock in pavement areas to meet the required thickness(es) in the “Pavement Recommendations” section to this report.

It is not possible to amend soil during heavy or continuous rainfall. Work should be completed during suitable weather conditions.

### 6.6. Erosion Control

Erosion control measures should be implemented in accordance with the City of Forest Grove’s applicable Construction and Design Standard Details.

### 6.7. Excavation

Based on the materials encountered in our subsurface exploration, it is our opinion that conventional earthmoving equipment in proper working condition should be capable of making necessary general excavations.

The earthwork contractor should be responsible for reviewing this report, including the boring logs, providing their own assessments and providing equipment and methods needed to excavate the site soils while protecting subgrades.

### 6.8. Dewatering

As discussed in the "Groundwater" section of this report, groundwater was not encountered in our explorations, and we do not expect groundwater to be a major factor during shallow excavations and earthwork. Excavations that extend into saturated/wet soils, or excavations that extend into perched groundwater, should be dewatered. Sump pumps are expected to adequately address groundwater encountered in shallow excavations. In addition to groundwater seepage, surface water inflow to the excavations during the wet season can be problematic. Provisions for surface water control during earthwork and excavations should be included in the project plans and should be installed prior to commencing earthwork.

### 6.9. Permanent Slopes

Permanent cut and fill slopes, where incorporated into the grading plan, should not exceed 2H:1V. The slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Buildings, access roads and pavements should be located at least 10 feet from the top of new fill slopes or existing slopes. Placement of fill near the top of the existing slope should be limited to 2 feet or less in thickness. If the grading plan requires additional fill, we should be contacted to evaluate the impact of the additional loading on the slope. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

### 6.10. Trench Shoring

All trench excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. In our opinion, native soils are generally OSHA Type B. Temporary excavations deeper than 4 feet should be shored or laid back at an inclination of 1H:1V or flatter if workers are required to enter. Excavations made to construct footings or other structural elements should be laid back or shored at the surface as necessary to prevent soil from falling into excavations.

It should be expected that unsupported cut slopes will experience some sloughing and raveling if exposed to water. Plastic sheeting, placed over the exposed slope and directing water away from the slope, will reduce the potential for sloughing and erosion of cut slopes during wet weather.

The contractor is responsible for shoring methods and shoring system design. Shoring systems should be designed by a professional engineer before installation.

In our opinion, the contractor will be in the best position to observe subsurface conditions continuously throughout the construction process and to respond to the soil and groundwater conditions. Construction site safety is generally the sole responsibility of the contractor, who also is solely responsible for the means, methods, and sequencing of the construction operations and choices regarding excavations and shoring.

Under no circumstances should the information provided by GeoEngineers be interpreted to mean that GeoEngineers is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

## 6.11. Structural Fill and Backfill

### 6.11.1. General

Structural areas include areas beneath foundations, floor slabs, pavements, and any other areas intended to support structures or within the influence zone of structures. Fill intended for use in structural areas should meet the criteria for structural fill presented below. All structural fill soils should be free of debris, clay balls, roots, organic matter, frozen soil, man-made contaminants, particles with greatest dimension exceeding 4 inches (3-inch-maximum particle size in building footprints) and other deleterious materials.

The suitability of soil for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines in the soil matrix increases, the soil becomes increasingly more sensitive to small changes in moisture content and achieving the required degree of compaction becomes more difficult or impossible. Recommendations for suitable fill material are provided in the following sections.

### 6.11.2. On-Site Soils

On-site near surface soil consists of native yellowish-brown silt. On-site soils can be used as structural fill, provided the material meets the above requirements, although due to moisture sensitivity, this material will likely be unsuitable as structural fill during most of the year. If the soil is too wet to achieve satisfactory compaction, moisture conditioning by drying back the material will be required. If the material cannot be properly moisture conditioned, we recommend using imported material for structural fill. The properly prepared and compacted on-site soils in the tilled zone qualify as structural fill provided, they meet the recommendations in the “Subgrade Improvement for the Tilled Zone” section 6.2 of this report.

An experienced geotechnical engineer from GeoEngineers should determine the suitability of on-site soil encountered during earthwork activities for reuse as structural fill.

### 6.11.3. Imported Select Structural Fill

Imported Select Structural Fill may be used as structural fill and should consist of pit or quarry run rock, crushed rock, or crushed gravel and sand that is fairly well-graded between coarse and fine sizes (approximately 25 to 65 percent passing the U.S. No. 4 sieve). It should have less than 5 percent passing the U.S. No. 200 sieve and have a minimum of 75 percent fractured particles according to American Association of State Highway and Transportation Officials (AASHTO) TP-61.

### 6.11.4. Aggregate Base

Aggregate base material located under floor slabs and pavements and crushed rock used in footing overexcavations should consist of imported clean, durable, crushed angular rock. Such rock should be well-graded, have a maximum particle size of 1 inch and have less than 5 percent passing the U.S. No. 200 sieve (3 percent for retaining walls). In addition, aggregate base shall have a minimum of 75 percent fractured particles according to American Association of State Highway and Transportation Officials (AASHTO) TP-61 and a sand equivalent of not less than 30 percent based on AASHTO T-176.

### 6.11.5. Aggregate Subbase

Aggregate Subbase material should consist of imported, clean, durable, crushed angular rock. Such rock should be well-graded, have a maximum particle size of 1½ inches, have less than 5 percent passing the U.S. No. 200 sieve and meet the gradation requirements in Oregon Department of Transportation (ODOT)

Standard Section 00331. In addition, aggregate base shall have a minimum of 75 percent fractured particles according to AASHTO TP-61 and a sand equivalent of not less than 30 percent based on AASHTO T-176.

### 6.11.6. Trench Backfill

Backfill for pipe bedding and in the pipe zone should consist of well-graded granular material with a maximum particle size of ¾ inch and less than 5 percent passing the U.S. No. 200 sieve. The material should be free of organic matter and other deleterious materials. Further, the backfill should meet the pipe manufacturer's recommendations. Above the pipe zone backfill, Imported Select Structural Fill may be used as described above.

### 6.11.7. Fill Placement and Compaction

Structural fill should be compacted at moisture contents that are within 3 percent of the optimum moisture content as determined by ASTM Test Method D 1557 (Modified Proctor). The optimum moisture content varies with gradation and should be evaluated during construction. Fill material that is not near the optimum moisture content should be moisture conditioned prior to compaction.

Fill and backfill material should be placed in uniform, horizontal lifts and compacted with appropriate equipment. The appropriate lift thickness will vary depending on the material and compaction equipment used. Fill material should be compacted in accordance with Table 2. It is the contractor's responsibility to select appropriate compaction equipment and place the material in lifts that are thin enough to meet these criteria. However, in no case should the loose lift thickness exceed 18 inches.

**TABLE 2. COMPACTION CRITERIA**

| Fill Type | Compaction Requirements | | |
|---|---|---|---|
| | Percent Maximum Dry Density Determined by ASTM Test Method D 1557 at ± 3% of Optimum Moisture | | |
| | 0 to 2 Feet Below Subgrade | > 2 Feet Below Subgrade | Pipe Zone |
| Fine-grained soils (non-expansive) | 92 | 92 | ----- |
| Imported Granular, maximum particle size < 1¼ inch | 95 | 95 | ----- |
| Imported Granular, maximum particle size 1¼ inch to 6 inches (3-inch-maximum under building footprints) | n/a (proof-roll) | n/a (proof-roll) | ----- |
| Retaining Wall Backfill* | 92 | 92 | ------ |
| Nonstructural Zones | 90 | 90 | 90 |
| Trench Backfill | 95 | 90 | 90 |

Note:

* Measures should be taken to prevent overcompaction of the backfill behind retaining walls. We recommend placing the zone of backfill located within 5 feet of the wall in lifts not exceeding about 6 inches in loose thickness and compacting this zone with hand-operated equipment such as a vibrating plate compactor or a jumping jack.

A representative from GeoEngineers should evaluate compaction of each lift of fill. Compaction should be evaluated by compaction testing unless other methods are proposed for oversized materials and are approved by GeoEngineers during construction. These other methods typically involve procedural placement and compaction specifications together with verification requirements such as proof-rolling.

## 7.0 PAVEMENT RECOMMENDATIONS

### 7.1. Dynamic Cone Penetrometer (DCP) Field Testing and Resilient Modulus ($M_R$)

We conducted four DCP tests in general accordance with ASTM D 6951 to estimate the subgrade resilient modulus ($M_R$) at each test location as shown in Figure 2. We recorded penetration depth of the cone versus hammer blow count and terminated testing at depths of approximately 32 inches below the existing ground surface.

We plotted depth of penetration versus blow count and visually assessed regions where slopes of the data were relatively constant using equation from the Oregon Department of Transportation (ODOT) Pavement Design Guide to estimate the moduli using a conversion coefficient, $C_f$ = 0.35. Table 6 lists our estimate of the subgrade resilient modulus at each test location based on data obtained in the upper 18 inches below the upper topsoil. Field data are summarized in Figures A-20 through A-23.

**TABLE 3. ESTIMATED SUBGRADE RESILIENT MODULI BASED ON DCP TESTING**

| Boring Number | Estimated Resilient Modulus (psi) |
|---|---|
| TP-10/DCP-1 | 5,650 |
| TP-6/DCP-2 | 4,650 |
| TP-13/DCP-3 | 5,500 |
| TP-1/DCP-4 | 5,500 |

### 7.2. Drainage

Long-term performance of pavements is influenced significantly by drainage conditions beneath the pavement section. Positive drainage can be accomplished by crowning the subgrade with a minimum 2 percent cross slope and establishing grades to promote drainage.

### 7.3. On-site Local Roads Asphalt Concrete Pavement Sections

Pavement subgrades should be prepared in accordance with Section 6.0 of this report. Our pavement recommendations assume that traffic at the site will consist of occasional truck traffic and passenger cars. We do not have specific information on the frequency and type of vehicles that will use the area; however, we have based our design analysis on traffic consisting of two heavy trucks per day to account for delivery- and service-type vehicles and passenger car traffic for the heavy-duty pavement sections, and passenger car traffic only for the light-duty pavement sections.

Our pavement recommendations are based on the following assumptions:

- The pavement subgrades, fill subgrades and site earthwork used to establish road grades below the Aggregate Subbase and Aggregate Base materials have been prepared as described in the "Earthwork Recommendations" section of this report.
- A resilient modulus of 20,000 psi has been estimated for compacted Aggregate Subbase and Aggregate Base materials.
- A resilient modulus of 5,500 psi was estimated for firm native soils below the tilled zone or structural fill placed on firm native soils below the tilled zone.
- Initial and terminal serviceability indices of 4.2 and 2.0, respectively.
- Reliability and standard deviations of 75 percent and 0.45, respectively.
- Structural coefficients of 0.42 and 0.10 for the asphalt and base rock, respectively.
- A 20-year design life.

If any of the noted assumptions vary from project design use, our office should be contacted with the appropriate information so that the pavement designs can be revised or confirmed adequate.

The recommended minimum pavement sections are provided in Table 5. Pavement recommendations for "On-Site Local Roads" are for roadways within the development only.

The alternate pavement section using Aggregate Subbase material is provided because it may be more applicable during wet-weather construction where a gravel haul road or working surface is needed to support construction traffic. Wet weather construction recommendations are provided in the "Earthworks Recommendations" section of this report. The sub-base material can be incorporated into the gravel working blankets and haul roads provided the material meets the minimum thickness in Table 5 and meets the specifications for Aggregate Subbase. Working blanket and haul road materials that pump excessively, or have excessive fines from construction traffic, should be removed and replaced with specified materials prior to constructing roadways over those areas.

If cement amendment is used during site development, as described in the "Earthwork Recommendations" section of this report, it may be possible to reduce the amount of aggregate base for the pavement sections. This will depend on several factors, including the prevailing weather conditions, depth of amendment and condition of the subgrade after amendment. GeoEngineers can provide additional information for on-site pavement sections if cement amendment will be used during construction.

The recommended pavement sections assume that final improvements surrounding the pavement will be designed and constructed such that stormwater or excess irrigation water from landscape areas does not infiltrate below the pavement section into the crushed base.

**TABLE 4. MINIMUM AC PAVEMENT SECTIONS FOR LOCAL RESIDENTIAL ROADS**

| Section | Minimum Asphalt Thickness (inches) | Minimum Aggregate Base Thickness (inches) | Minimum Aggregate Sub-Base Thickness (inches) |
|---|---|---|---|
| Light Duty (general automobile parking areas) | 3.0 | 6.0 | - |
| Heavy Duty (drive aisles and heavy delivery areas) | 3.5 | 7.0 | - |
| Light Duty (general automobile parking areas) | 3.0 | 4.0 | 8.0 |
| Heavy Duty (drive aisles and heavy delivery areas) | 3.5 | 4.0 | 8.0 |

The aggregate base course should conform to the "Aggregate Base" section of this report and be compacted to at least 95 percent of the maximum dry density (MDD) determined in accordance with AASHTO T-180/ASTM Test Method D 1557.

The AC pavement should conform to Section 00745 of the most current edition of the ODOT Standard Specifications for Highway Construction. The Job Mix Formula should meet the requirements for a ½-inch Dense Graded Level 2 Mix. The AC should be PG 64-22 grade meeting the ODOT Standard Specifications for Asphalt Materials. AC pavement should be compacted to 92.0 percent at Maximum Theoretical Unit Weight (Rice Gravity) of AASHTO T-209.

**TABLE 5. PAVEMENT SECTION RECOMMENDATIONS WITH CEMENT AMENDED SUB-BASE**

| Minimum Asphalt Thickness (inches) | Minimum Aggregate Base Thickness (inches) | Minimum Cement Amended Subgrade Thickness (inches) |
|---|---|---|
| 3.0 | 4 | 12 |

Cement amendment may be used during site development, as described above, or to reduce the pavement section thickness. The exact design of the amount of cement to be used should be determined based on the condition of the subgrade at the time of construction and the prevailing weather conditions but should likely be between 3 and 6 percent. We recommend the minimum thickness of amendment be 12 inches. GeoEngineers can provide additional information regarding cement volumes at the time of construction. The minimum pavement sections, with a 12-inch-thick cement amended soil section, are provided in Table 5 above.

## 8.0 STRUCTURAL DESIGN RECOMMENDATIONS

### 8.1. Foundation Support Recommendations

Proposed commercial and apartment structures can be satisfactorily founded on continuous wall or isolated column footings supported on firm native soils encountered below the tilled zone, or on structural fill placed over firm native soils. Exterior footings should be established at least 18 inches below the lowest

adjacent grade. The recommended minimum footing depth is greater than the anticipated frost depth. Interior footings can be founded a minimum of 12 inches below the top of the first-floor slab. Isolated column and continuous wall footings should have minimum widths of 24 and 18 inches, respectively. We have assumed that the column loads will be 40 kips or less, wall loads will be 2 klf or less, and floor loads for slabs on grade will be 100 psf or less for the proposed buildings. If design loads exceed these values, our recommendations may need to be revised.

#### 8.1.1. Foundation Subgrade Preparation

The subgrades beneath proposed structural elements should be prepared as described below and in the "Earthworks Recommendations" section of this report. We recommend loose or disturbed soils resulting from foundation excavation be removed before placing reinforcing steel and concrete. Foundation bearing surfaces should not be exposed to standing water. If water infiltrates and pools in the excavation, the water, along with any disturbed soil, should be removed before placing reinforcing steel and concrete. A thin gravel layer consisting of Aggregate Base or Aggregate Subbase material can be placed at the base of foundation excavations to help protect the subgrade from weather and light foot traffic. The layer thickness for the gravel layer should be determined at the time of construction but is typically 3 to 4 inches. The gravel layer should be compacted as described in the "Fill Placement and Compaction" section.

We recommend GeoEngineers observe all foundation subgrades before placing concrete forms and reinforcing steel to determine that bearing surfaces have been adequately prepared and the soil conditions are consistent with those observed during our explorations.

#### 8.1.2. Isolated Spread Footings

We recommend conventional footings be proportioned using a maximum allowable bearing pressure of 2,500 psf if supported on firm native soils below the tilled zone, or on structural fill placed over firm native soils. This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third when considering earthquake or wind loads. This is a net bearing pressure. The weight of the footing and overlying backfill can be ignored in calculating footing sizes.

#### 8.1.3. Foundation Settlement

Foundations designed and constructed as recommended are expected to experience settlements of less than 1 inch. Differential settlements of up to one half of the total settlement magnitude can be expected between adjacent footings supporting comparable loads.

#### 8.1.4. Lateral Resistance

Lateral loads can be resisted by a combination of friction between the footing and the supporting soil, and by the passive lateral resistance of the soil surrounding the embedded portions of the footings. A coefficient of friction between the concrete and soil of 0.35 and a passive lateral resistance corresponding to an equivalent fluid density of 250 pcf may be used for design. These values are appropriate for foundation elements that are poured directly against the native soils or surrounded by compacted structural fill.

The passive earth pressure and friction components may be combined, provided the passive component does not exceed two-thirds of the total.

The passive earth pressure value is based on the assumptions that the adjacent grade is level and static groundwater remains below the base of the footing throughout the year. The top 1 foot of soil should be neglected when calculating passive lateral earth pressures unless the adjacent area is covered with pavement. The lateral resistance values do not include safety factors.

## 8.2. Drainage Consideration

We recommend the ground surface be sloped away from the buildings at least 5 percent for a minimum distance of 10 feet measured perpendicular to the face of the wall in accordance with section 1804.4 of the 2018 IBC. All downspouts should be tightlined away from the building foundation areas and should also be discharged into a stormwater disposal system. Downspouts should not be connected to footing drains.

Although not required based on groundwater depths observed in our explorations, if perimeter footing drains are used for below-grade structural elements or crawlspaces, they should be installed at the base of the exterior footings. The perimeter footing drains should be provided with cleanouts and should consist of at least 4-inch-diameter perforated pipe placed on a 3-inch bed of and surrounded by 6 inches of drainage material enclosed in a non-woven geotextile such as Mirafi 140N (or approved equivalent) to prevent fine soil from migrating into the drain material. We recommend against using flexible tubing for footing drainpipes. The perimeter drains should be sloped to drain by gravity to a suitable discharge point, preferably a storm drain. We recommend that the cleanouts be covered and placed in flush-mounted utility boxes. Water collected in roof downspout lines must not be routed to the footing drain lines.

## 8.3. Floor Slabs

Satisfactory subgrade support for floor slabs on grade supporting the planned 100 psf floor loads can be obtained provided the floor slab subgrade is described in the “Earthworks Recommendations” section of this report. Slabs should be reinforced according to their proposed use and per the structural engineer’s recommendations. Subgrade support for concrete slabs can be obtained from the firm native soils underlying the tilled zone or on structural fill placed over firm native soils.

We recommend that on-grade slabs be underlain by a minimum 6-inch-thickness of Aggregate Base acting as a capillary break material to reduce the potential for moisture migration into the slab. The capillary break material should be placed as recommended in the “Fill Placement and Compaction” section of this report.

If dry on-grade slabs are required, for example at interior spaces where adhesives are used to anchor carpet or tile to the slab, a waterproof liner may be placed as a vapor barrier below the slab. The vapor barrier should be selected by the structural engineer and should be accounted for in the design floor section and mix design selection for the concrete, to accommodate the effect of the vapor barrier on concrete slab curing. Load-bearing concrete slabs should be designed assuming a modulus of subgrade reaction (k) of 150 psi per inch. We estimate that concrete slabs constructed as recommended will settle less than ½ inch. Floor slab subgrades should be evaluated according to the “Subgrade Evaluation” section of this report.

## 8.4. Conventional Retaining Walls

### 8.4.1. Drainage

Positive drainage is imperative behind retaining structures. This can be accomplished by providing a drainage zone behind the wall consisting of free-draining material and perforated pipes to collect and

dispose the water. The drainage material should consist of Aggregate Base having less than 3 percent passing the U.S. No. 200 sieve. The wall drainage zone should extend horizontally at least 18 inches from the back of the wall.

A perforated smooth-walled rigid drainpipe having a minimum diameter of 4 inches should be placed at the bottom of the drainage zone along the entire length of the wall, with the pipe invert at or below the base of the wall footing. The drainpipes should discharge to a tightline leading to an appropriate collection and disposal system. An adequate number of cleanouts should be incorporated into the design of the drains to provide access for regular maintenance. Roof downspouts, perimeter drains, or other types of drainage systems should not be connected to retaining wall drain systems.

#### 8.4.2. Concrete Retaining Walls

Retaining structures free to rotate slightly around the base should be designed for active earth pressures using an equivalent fluid unit weight (efp) of 35 pcf when the ground surface extends level behind the wall equal to a distance of at least twice the height of the wall, and 55 pcf for an inclined slope of 2H:1V above the wall. For lesser slopes between flat and 2H:1V, the efp can be linearly interpolated between the recommended values. The efp value is based on the following assumptions.

- The walls will not be restrained against rotation when the backfill is placed.
- Walls are 12 feet or less in total wall support height.
- The backfill within 2 feet of the wall consists of free-draining granular materials.
- Grades above the top of the walls are no steeper than a 2H:1V slope.
- Total wall heights are determined based on a level front slope from the base of the wall.
- Hydrostatic pressures do not develop, and drainage will be provided behind the wall.

Seismically induced lateral forces on permanent below-grade building walls can be calculated using a dynamic force equal to 11.5H psf, where H is the wall height. This seismic force should be applied with the centroid located at 0.6H from the wall base. These values assume that the wall is vertical and unrestrained and the backfill behind the wall is horizontal.

For site retaining walls, seismic lateral earth pressures should be computed as a part of retaining wall design using the Mononobe-Okabe equation or another method appropriate to the selected wall system.

Retaining walls, including foundation walls that are restrained against rotation during backfilling, should be designed for an at-rest equivalent fluid unit weight of 57 pcf when the ground surface extends level behind the wall equal to a distance of at least twice the height of the wall, and 82 pcf for an inclined slope of 2H:1V above the wall. For lesser slopes between flat and 2H:1V, the efp can be linearly interpolated between the recommended values.

Surcharge loads applied closer than one-half of the wall height should be considered as uniformly distributed horizontal pressures equal to one-third of the distributed vertical surcharge pressure. Footings for retaining walls should be designed as recommended for shallow foundations. Backfill should be placed and compacted as recommended for structural fill.

Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project vary from these assumptions.

We recommend that GeoEngineers be retained to review the retaining wall design to confirm that it meets the requirements in our report. The retaining wall designer should perform global stability analysis of the proposed wall.

## 8.5. Seismic Design

Parameters provided on Table 6 are based on the conditions encountered during our subsurface exploration program and the procedure and requirements outlined in the 2018 International Building Code (IBC) and the 2019 State of Oregon Structural Specialty Code (OSSC) Chapters 1 and 18. Per ASCE 7-16 Section 11.4.8, a site specific response analysis is required for site class F sites, and a ground motion hazard analysis or site-specific response analysis is required to determine the design ground motions for structures on Site Class D and E sites with $S_1$ greater than or equal to 0.2g.

For this project, the site is classified as site class D; therefore, the provisions of 11.4.8 are applicable. Alternatively, the parameters listed on Table 6 may be used to determine the design ground motions if Exception 2 of Section 11.4.8 of ASCE 7-16 is used. Using this exception, the seismic response coefficient ($C_s$) is determined by Equation (Eq.) (12.8-2) for values of $T \leq 1.5T_S$, and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $T_L \geq T > 1.5T_s$ or Eq. (12.8-4) for $T > T_L$, where T represents the fundamental period of the structure and $T_S$=0.803 sec. If requested, we can complete a site-specific seismic response analysis which might provide somewhat reduced seismic demands from the parameters in Table 6 and the requirements for using Exception 2 of Section 11.4.8 in ASCE 7-16. The reduced values will likely not be significant enough to warrant the additional cost of further evaluation if designing to the 2018 IBC.

**TABLE 6. SEISMIC DESIGN PARAMETERS**

| Parameter | Value |
|---|---|
| Site Class | D |
| Spectral Response Acceleration, $S_s$ | 0.921 g |
| Spectral Response Acceleration, $S_1$ | 0.453 g |
| Site Coefficient, $F_a$ | 1.132 |
| Site Coefficient, $F_v$ | 1.847 |
| Spectral Response Acceleration (Short Period), $S_{DS}$ | 0.695 g |
| Spectral Response Acceleration (1-Second Period) $S_{D1}$ | 0.558 g |

Notes:

[1] Parameters developed based on Latitude 45.533419° and Longitude -123.104971° using the ATC Hazards online tool.

[2] These values are only valid if the structural engineer utilizes Exception 2 of Section 11.4.8 (ASCE 7-16).

### 8.5.1. Liquefaction Potential

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. The excessive buildup of pore water pressure results in the sudden loss of shear strength in a soil. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at

the ground surface after an earthquake are the result of excess pore pressures dissipating upwards, carrying soil particles with the draining water. In general, loose, saturated sand soil with low silt and clay contents is the most susceptible to liquefaction. Low plasticity, silty sand may be moderately susceptible to liquefaction under relatively higher levels of ground shaking.

Based on our analysis, the site soils are not prone to liquefaction during the design level earthquake. Accordingly, lateral spreading or liquefaction induced deformations are not expected.

## 9.0 DESIGN REVIEW AND CONSTRUCTION SERVICES

Recommendations provided in this report are based on the assumptions and preliminary design information stated herein. We welcome the opportunity to review and discuss construction plans and specifications for this project as they are being developed. In addition, GeoEngineers should be retained to review the geotechnical-related portions of the plans and specifications to evaluate whether they are in conformance with the recommendations provided in this report.

Satisfactory foundation and earthwork performance depends to a large degree on quality of construction. Sufficient monitoring of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions often requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

We recommend that GeoEngineers be retained to observe construction at the site to confirm that subsurface conditions are consistent with the site explorations, and to confirm that the intent of project plans and specifications relating to earthwork, pavement and foundation construction are being met.

## 10.0 LIMITATIONS

We have prepared this report for the exclusive use of J.T. Smith Companies and their authorized agents and/or regulatory agencies for the proposed Sunset Drive Mixed Use Development at located 3081 Sunset Drive in Forest Grove, Oregon.

This report is not intended for use by others and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in the area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

## 11.0 REFERENCES

International Code Council. 2018. 2018 International Building Code.

International Code Council. 2019. 2019 Oregon Structural Specialty Code.

Madin, I. P. 1990. Earthquake Hazard Geology Maps of the Portland Metropolitan Area, Oregon: Test and Map Explanation, DOGAMI Open File Report 0-90-2.

Occupational Safety and Health Administration (OSHA) Technical Manual Section V: Chapter 2, Excavations: Hazard Recognition in Trenching and Shoring: http://www.osha.gov/dts/osta/otm/otm_v/otm_v_2.html.

Schlicker, H.G. and R.J. Deacon. 1967. Engineering Geology of the Tualatin Valley Region, Oregon: Oregon Department of Geology and Mineral Industries, Bulletin 60, p. 103, 4 plates, 1:62,500 scale.

FIGURES

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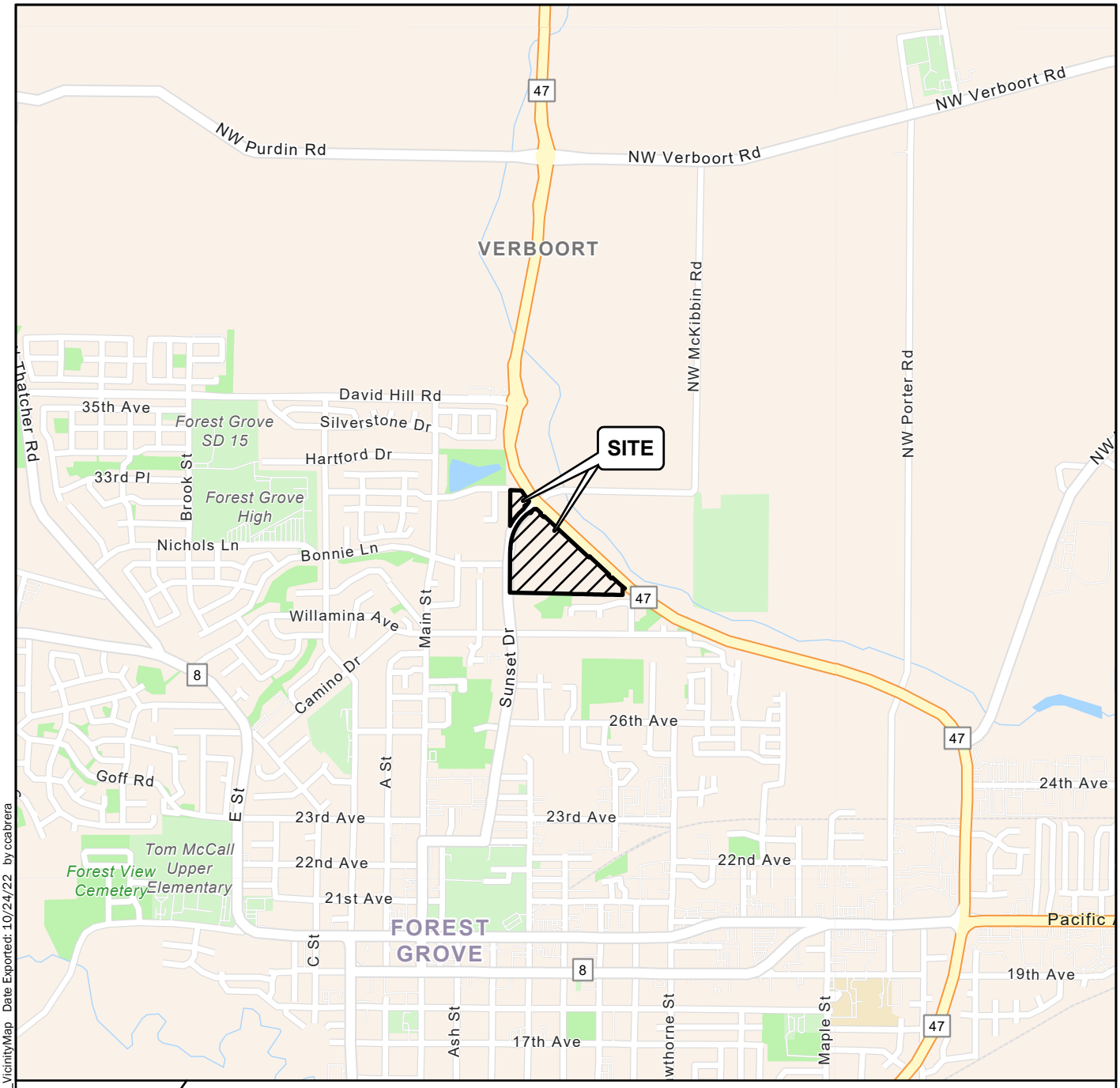


Source(s):
- ESRI

Coordinate System: NAD 1983 UTM Zone 10N

**Disclaimer:** This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

**Vicinity Map**

Sunset Drive Mixed Use Development
Forest Grove, Oregon

GeoEngineers

**Figure 1**

P:\6\6748006\GIS\6748006_Project\6748006_Project.aprx\6748006600_F01_VicinityMap Date Exported: 10/24/22 by:ccabrera

P:\6\6748006\GIS\6748006_Project\6748006_Project.aprx\6748006_Project Date Exported: 11/08/22 by maugust

**Legend**

- Test Pit Number and Approximate Location
- Test Pit/DCP Number and Approximate Location
- Test Pit/Infiltration Test Number and Approximate Location

N

0 200

Feet

Source(s):
- METRO
- ESRI

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

**Disclaimer:** This figure was created for a specific purpose and project. Any use of this figure for any other project or purpose shall be at the user's sole risk and without liability to GeoEngineers. The locations of features shown may be approximate. GeoEngineers makes no warranty or representation as to the accuracy, completeness, or suitability of the figure, or data contained therein. The file containing this figure is a copy of a master document, the original of which is retained by GeoEngineers and is the official document of record.

**Site Plan**

Sunset Drive Mixed Use Development
Forest Grove, Oregon

GeoEngineers

**Figure 2**

APPENDICES

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# APPENDIX A
## Field Explorations and Laboratory Testing

# APPENDIX A
# FIELD EXPLORATIONS AND LABORATORY TESTING

## Field Explorations

Soil and groundwater conditions at the proposed Sunset Drive Mixed Use Development locations were explored on October 19 and 20, 2022, by completing eighteen test pits (TP-1 through TP-18), two infiltration tests (IT-1 and IT-2) and four DCP soundings. Test pits were extended to depths between 5 and 13.5 feet bgs and DCP soundings were extended to depths between 2 to 3 feet bgs at the approximate locations shown in Figure 2.

Test pits were excavated using a CAT 316 excavator owned and operated by K&E Excavating out of Salem, Oregon. The test pit excavations were continuously monitored by a staff geotechnical II from our office who maintained a detailed log of subsurface explorations, visually classified the soil encountered and obtained representative soil samples from the test pits, from the sidewalls above a depth of 4 feet bgs and from excavation spoil below that depth.

DCP soundings were performed by a staff geotechnical II from our office who recorded blow count versus cumulative penetration depth. This penetration resistance data was compared to the nearby borings where a detailed log of subsurface explorations was maintained, the soils encountered were visually classified and representative soil samples from the borings were obtained. The results of the DCP soundings are presented in Figures A- through A-10.

Recovered soil samples from exploratory borings were visually classified in the field in general accordance with ASTM D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the borings are presented in Figures A-20 through A-23. Logs of the test pits are presented in Figures A-2 through A-19. The logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials or their characteristics change, although these changes might actually be gradual.

## Laboratory Testing

Soil samples obtained from the explorations were visually classified in the field and in our laboratory using the USCS and ASTM classification methods. ASTM Test Method D 2488 was used to visually classify the soil samples, while ASTM D 2487 was used to classify the soils based on laboratory tests results. Moisture content tests were performed in general accordance with ASTM D 2216-05. Results of the moisture contents testing are presented in the appropriate exploration logs at the respective sample depths.

## SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS | | | SYMBOLS GRAPH | SYMBOLS LETTER | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS | GRAVEL AND GRAVELLY SOILS | CLEAN GRAVELS (LITTLE OR NO FINES) | | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES |
| | | | | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES |
| | MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | | | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| MORE THAN 50% RETAINED ON NO. 200 SIEVE | SAND AND SANDY SOILS | CLEAN SANDS (LITTLE OR NO FINES) | | SW | WELL-GRADED SANDS, GRAVELLY SANDS |
| | | | | SP | POORLY-GRADED SANDS, GRAVELLY SAND |
| | MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE | SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) | | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | | | | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| FINE GRAINED SOILS | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 | | ML | INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| MORE THAN 50% PASSING NO. 200 SIEVE | SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 | | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS |
| | | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | | | OH | ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY |
| HIGHLY ORGANIC SOILS | | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

## ADDITIONAL MATERIAL SYMBOLS

| SYMBOLS GRAPH | SYMBOLS LETTER | TYPICAL DESCRIPTIONS |
|---|---|---|
| | AC | Asphalt Concrete |
| | CC | Cement Concrete |
| | CR | Crushed Rock/ Quarry Spalls |
| | SOD | Sod/Forest Duff |
| | TS | Topsoil |

### Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

### Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

### Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

### Sampler Symbol Descriptions

2.4-inch I.D. split barrel / Dames & Moore (D&M)

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

### Laboratory / Field Tests

| | |
|---|---|
| %F | Percent fines |
| %G | Percent gravel |
| AL | Atterberg limits |
| CA | Chemical analysis |
| CP | Laboratory compaction test |
| CS | Consolidation test |
| DD | Dry density |
| DS | Direct shear |
| HA | Hydrometer analysis |
| MC | Moisture content |
| MD | Moisture content and dry density |
| Mohs | Mohs hardness scale |
| OC | Organic content |
| PM | Permeability or hydraulic conductivity |
| PI | Plasticity index |
| PL | Point load test |
| PP | Pocket penetrometer |
| SA | Sieve analysis |
| TX | Triaxial compression |
| UC | Unconfined compression |
| UU | Unconsolidated undrained triaxial compression |
| VS | Vane shear |

### Sheen Classification

| | |
|---|---|
| NS | No Visible Sheen |
| SS | Slight Sheen |
| MS | Moderate Sheen |
| HS | Heavy Sheen |

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

# Key to Exploration Logs

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Figure A-1

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 176<br>Vertical Datum NAVD88 | | Easting (X) 7534465<br>Northing (Y) 690915 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 175 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (medium stiff, dry) | | | |
| 174 | 2 | | | | | | | | |
| 173 | 3 | | | | | Becomes very stiff with trace cobbles | | | |
| 172 | 4 | ✓ | 1 MC | | | | 26 | | |
| 171 | 5 | | | | | | | | |
| 170 | 6 | | | | | | | | |
| 169 | 7 | | | | | | | | |
| 168 | 8 | | | | | | | | |
| 167 | 9 | | | | SM | Yellowish brown silty fine sand (medium dense, moist to wet) | | | |
| 166 | 10 | ✓ | 2 MC | | | | 37 | | |
| 165 | 11 | | | | | | | | |
| 164 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-1

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-2
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 11.5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 174<br>Vertical Datum NAVD88 | | Easting (X) 7534654<br>Northing (Y) 690995 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 173 | 1 | | | | ML | Yellowish brown sandy silt with trace organics | | | |
| 172 | 2 | | 1 | | | Becomes very stiff without organics | | | |
| 171 | 3 | | | | | Becomes moist | | | |
| 170 | 4 | | | | | | | | |
| 169 | 5 | | | | | | | | |
| 168 | 6 | | | | | | | | |
| 167 | 7 | | | | | | | | |
| 166 | 8 | | | | | | | | |
| 165 | 9 | | | | | | | | |
| 164 | 10 | | | | | | | | |
| 163 | 11 | | 2 | | SM | Gray silty fine sand (medium dense, moist to wet) | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-2

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-3
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 177<br>Vertical Datum NAVD88 | | Easting (X) 7534347<br>Northing (Y) 691067 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 176 | 1 | | | | ML | Yellowish brown silt with sand, clay and trace organics (medium stiff, dry to moist) | | | |
| 175 | 2 | | | | | | | | |
| 174 | 3 | | | | | Becomes very stiff and moist | | | |
| 173 | 4 | | 1 | | | | | | |
| 172 | 5 | | | | | With trace mottling | | | |
| 171 | 6 | | | | | | | | |
| 170 | 7 | | | | | | | | |
| 169 | 8 | | | | | | | | |
| 168 | 9 | | | | | | | | |
| 167 | 10 | | | | | | | | |
| 166 | 11 | | 2 MC | | | Becomes sandy and moist to wet | 42 | | |
| 165 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-3

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-4
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 176<br>Vertical Datum NAVD88 | | Easting (X) 7534092<br>Northing (Y) 691416 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 175 | 1 | | 1 | | ML | Yellowish brown silt with sand and trace organics (medium stiff, moist) | | | |
| 174 | 2 | | | | | Becomes very stiff without organics | | | |
| 173 | 3 | | | | | | | | |
| 172 | 4 | | | | | | | | |
| 171 | 5 | | | | | | | | |
| 170 | 6 | | | | | | | | |
| 169 | 7 | | | | | | | | |
| 168 | 8 | | | | | | | | |
| 167 | 9 | | | | | | | | |
| 166 | 10 | | 2 | | | Becomes moist to wet with trace mottling | | | |
| 165 | 11 | | | | | | | | |
| 164 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-4

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-5
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 13.5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 174<br>Vertical Datum NAVD88 | | Easting (X) 7534276<br>Northing (Y) 691353 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 173 | 1 | | | | ML | Yellowish brown silt with sand and trace organics (medium stiff, dry) | | | |
| 172 | 2 | | 1 | | | Becomes very stiff without trace organics | | | |
| 171 | 3 | | | | | | | | |
| 170 | 4 | | | | | With trace mineral staining | | | |
| 169 | 5 | | | | | | | | |
| 168 | 6 | | | | | | | | |
| 167 | 7 | | | | | | | | |
| 166 | 8 | | | | | | | | |
| 165 | 9 | | | | | | | | |
| 164 | 10 | | | | | | | | |
| 163 | 11 | | | | SM | Gray silty fine sand (medium dense, moist to wet) | | | |
| 162 | 12 | | 2<br>MC | | | | 39 | | |
| 161 | 13 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-5

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-6
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12.5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 177<br>Vertical Datum NAVD88 | | Easting (X) 7534245<br>Northing (Y) 691585 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 176 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (medium stiff, dry) | | | |
| 175 | 2 | | 1 | | | Becomes very stiff without organics | | | |
| 174 | 3 | | | | | | | | |
| 173 | 4 | | | | | | | | |
| 172 | 5 | | | | | | | | |
| 171 | 6 | | | | | Becomes medium stiff and moist | | | |
| 170 | 7 | | | | | | | | |
| 169 | 8 | | | | | | | | |
| 168 | 9 | | | | | | | | |
| 167 | 10 | | 2 | | | Becomes moist to wet and mottled | | | |
| 166 | 11 | | | | | | | | |
| 165 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-6/DCP-2

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-7
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 173<br>Vertical Datum NAVD88 | | Easting (X) 7534324<br>Northing (Y) 691833 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 172 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (medium stiff, dry) | | | |
| 171 | 2 | | 1 | | | Becomes very stiff without trace organics | | | |
| 170 | 3 | | | | | | | | |
| 169 | 4 | | | | | | | | |
| 168 | 5 | | 2 MC | | | | 30 | | |
| 167 | 6 | | | | | | | | |
| 166 | 7 | | | | | Becomes medium stiff and moist | | | |
| 165 | 8 | | | | | | | | |
| 164 | 9 | | | | | | | | |
| 163 | 10 | | | | | | | | |
| 162 | 11 | | | | | | | | |
| 161 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-7

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-8
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 169<br>Vertical Datum NAVD88 | | Easting (X) 7534929<br>Northing (Y) 691159 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 168 | 1 | | | | ML | Yellowish brown mottled sandy silt with clay and trace organics (soft to medium stiff, moist) | | | |
| 167 | 2 | | | | | Without organics | | | |
| 166 | 3 | | 1 | | | | | | |
| 165 | 4 | | 2 | | | | | | |
| 164 | 5 | | | | | Becomes bluish gray and stiff with clay and trace sand | | | |
| 163 | 6 | | 3 | | | | | | |
| 162 | 7 | | | | | | | | |
| 161 | 8 | | | | | | | | |
| 160 | 9 | | | | | | | | |
| 159 | 10 | | | | | Grades to sandy, becomes moist to wet | | | |
| 158 | 11 | | | | | | | | |
| 157 | 12 | | 4 MC | | | | 34 | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-8/IT-2

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-9
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 177<br>Vertical Datum NAVD88 | | Easting (X) 7534618<br>Northing (Y) 691589 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 176 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (soft to medium stiff, dry) | | | |
| 175 | 2 | | 1 | | | Becomes very stiff without trace organics | | | |
| 174 | 3 | | | | | | | | |
| 173 | 4 | | | | | | | | |
| 172 | 5 | | | | | | | | |
| 171 | 6 | | 2 MC | | | Becomes medium stiff and moist | 42 | | |
| 170 | 7 | | | | | | | | |
| 169 | 8 | | | | | | | | |
| 168 | 9 | | | | | | | | |
| 167 | 10 | | 3 | | | Becomes moist to wet | | | |
| 166 | 11 | | | | | | | | |
| 165 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-9

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-10
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 178<br>Vertical Datum NAVD88 | | Easting (X) 7534116<br>Northing (Y) 691162 | | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name / Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 177 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (medium stiff, dry) | | | |
| 176 | 2 | | | | | Becomes very stiff without trace organics | | | |
| 175 | 3 | ■ | 1 MC | | | | 21 | | |
| 174 | 4 | | | | | | | | |
| 173 | 5 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-10/DCP-1

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-11
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006O.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 176<br>Vertical Datum NAVD88 | | Easting (X) 7534813<br>Northing (Y) 691444 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 175 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (soft to medium stiff, dry) | | | |
| 174 | 2 | | 1 | | | Becomes very stiff without organics | | | |
| 173 | 3 | | | | | | | | |
| 172 | 4 | | | | | | | | |
| 171 | 5 | | 2 | | | Becomes medium stiff to stiff and moist | | | |
| 170 | 6 | | | | | | | | |
| 169 | 7 | | | | | | | | |
| 168 | 8 | | | | | | | | |
| 167 | 9 | | | | | | | | |
| 166 | 10 | | | | | | | | |
| 165 | 11 | | 3 | | | | | | |
| 164 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-11

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-12
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 13 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 175<br>Vertical Datum NAVD88 | | Easting (X) 7534983<br>Northing (Y) 691293 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name / Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 174 | 1 | | | | ML | Yellowish brown sandy silt with organics (medium stiff, dry) | | | |
| 173 | 2 | | | | | Without trace organics | | | |
| 172 | 3 | | | | | Becomes very stiff and moist | | | |
| 171 | 4 | | 1 | | | | | | |
| 170 | 5 | | | | | | | | |
| 169 | 6 | | | | | | | | |
| 168 | 7 | | | | | | | | |
| 167 | 8 | | | | | Becomes soft to medium stiff and moist to wet | | | |
| 166 | 9 | | | | | | | | |
| 165 | 10 | | | | | | | | |
| 164 | 11 | | 2 | | | | | | |
| 163 | 12 | | | | | | | | |
| 162 | 13 | | 3 | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-12

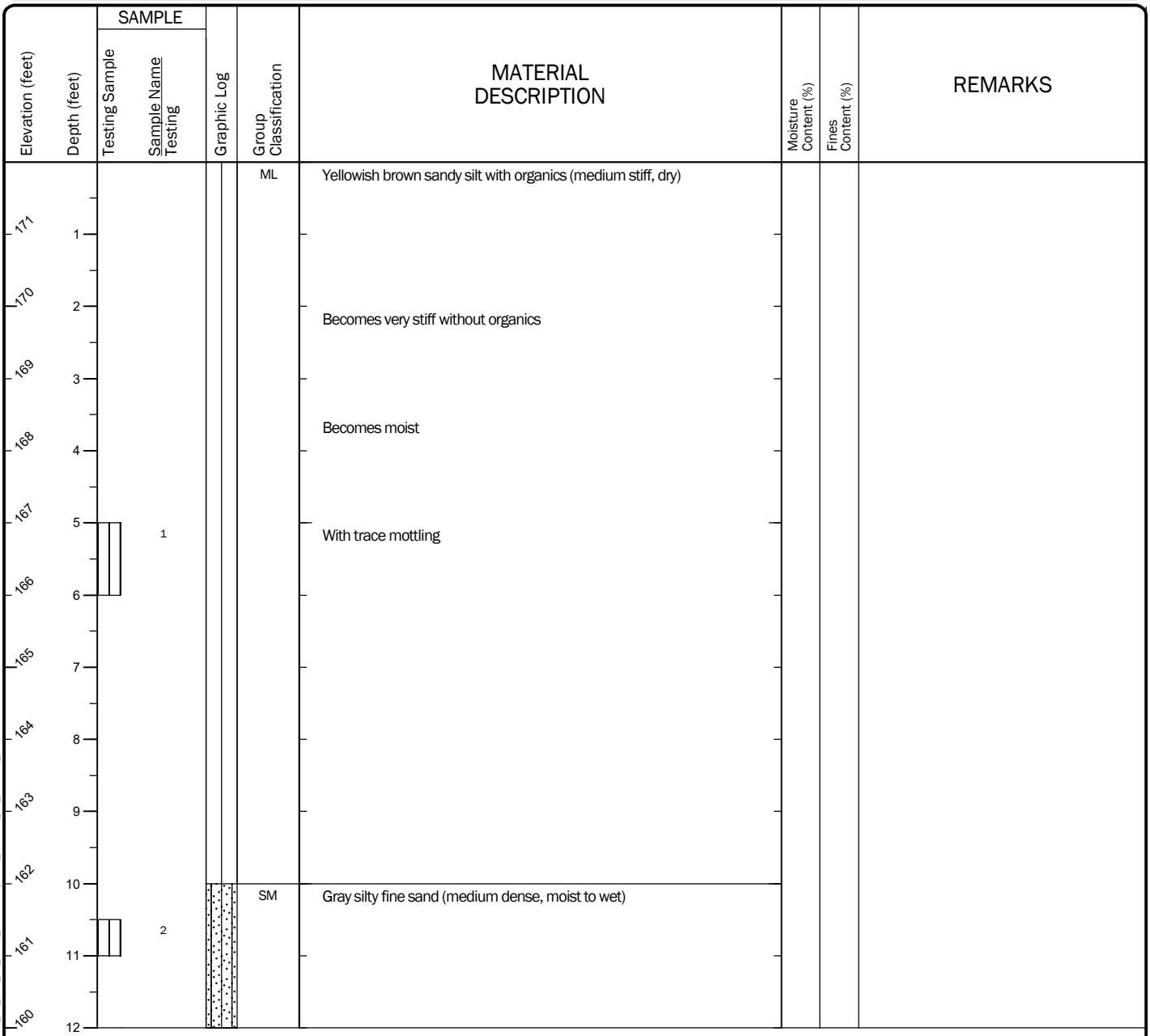
GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-13
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006O.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 172<br>Vertical Datum NAVD88 | | Easting (X) 7534675<br>Northing (Y) 691331 | | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) |




Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-13/DCP-3

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-14
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006OO.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 173<br>Vertical Datum NAVD88 | | Easting (X) 7534556<br>Northing (Y) 691186 | | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 172 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (very stiff, dry to moist) | | | |
| 171 | 2 | | | | | | | | |
| 170 | 3 | | 1 | | | Without trace organics | | | |
| 169 | 4 | | | | | | | | |
| 168 | 5 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-14

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-15
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006O.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 176<br>Vertical Datum NAVD88 | | Easting (X) 7534476<br>Northing (Y) 691460 | | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 175 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (medium stiff, dry) | | | |
| 174 | 2 | | 1 | | | Becomes very stiff without trace organics | | | |
| 173 | 3 | | | | | | | | |
| 172 | 4 | | | | | | | | |
| 171 | 5 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-15

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-16
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006O.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/19/2022 | Total Depth (ft) 5.5 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 174<br>Vertical Datum NAVD88 | | Easting (X) 7534471<br>Northing (Y) 691728 | | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 173 | 1 | | | | ML | Yellowish brown sandy silt with trace organics (soft to medium stiff, moist) | | | |
| 172 | 2 | | | | | Without trace organics | | | |
| 171 | 3 | | | | | Becomes very stiff | | | |
| 170 | 4 | | | | | | | | |
| 169 | 5 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-16/IT-1

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-17
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006O.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/20/2002 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 175<br>Vertical Datum NAVD88 | | Easting (X) 7534143<br>Northing (Y) 692044 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 174 | 1 | | | | ML | Yellowish brown silt with sand, clay and trace organics (medium stiff, moist) | | | |
| 173 | 2 | | | | | Becomes stiff to very stiff without trace organics | | | |
| 172 | 3 | | | | | | | | |
| 171 | 4 | | | | | | | | |
| 170 | 5 | | 1 | | | | | | |
| 169 | 6 | | | | | Becomes moist | | | |
| 168 | 7 | | | | | | | | |
| 167 | 8 | | | | | | | | |
| 166 | 9 | | | | | | | | |
| 165 | 10 | | | | | | | | |
| 164 | 11 | | | | | | | | |
| 163 | 12 | | 2 | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-17

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-18
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

| | | | | |
|---|---|---|---|---|
| Date Excavated 10/20/2022 | Total Depth (ft) 12 | Logged By BCS<br>Checked By | Excavator<br>Equipment Cat 316 Excavator | Groundwater not observed<br>Caving not observed |
| Surface Elevation (ft) 175<br>Vertical Datum NAVD88 | Easting (X) 7534049<br>Northing (Y) 691871 | Coordinate System WA State Plane North<br>Horizontal Datum NAD83 (feet) | | |

| Elevation (feet) | Depth (feet) | SAMPLE: Testing Sample | SAMPLE: Sample Name Testing | Graphic Log | Group Classification | MATERIAL DESCRIPTION | Moisture Content (%) | Fines Content (%) | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 174 | 1 | | | | ML | Yellowish brown silt with sand clay and trace organics (stiff, dry) | | | |
| 173 | 2 | | | | | Becomes very stiff without trace organics | | | |
| 172 | 3 | | | | | | | | |
| 171 | 4 | | | | | | | | |
| 170 | 5 | | 1 | | | | | | |
| 169 | 6 | | | | | | | | |
| 168 | 7 | | | | | | | | |
| 167 | 8 | | | | | | | | |
| 166 | 9 | | | | | | | | |
| 165 | 10 | | | | | | | | |
| 164 | 11 | | | | | | | | |
| 163 | 12 | | | | | | | | |

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on USGS. Vertical approximated based on USGS.

# Log of Test Pit TP-18

GeoEngineers

Project: Sunset Drive Mixed Use Development
Project Location: Forest Grove, Oregon
Project Number: 6748-006-00

Figure A-19
Sheet 1 of 1

Date:11/8/22 Path:P:\6\6748006\GINT\6748006.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_TESTPIT_1P_GEOTEC_%F

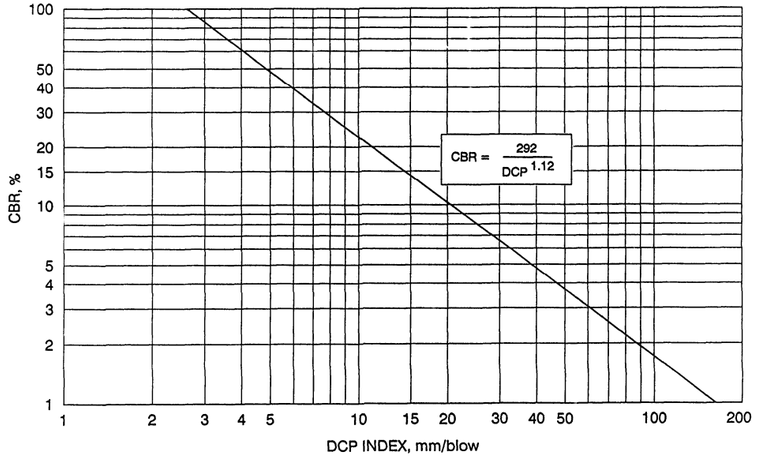
Location: Sunset Mixed Use Development
Depth to bottom: 32
Tester's Name: Blayne Sandau
Tester's Company: GeoEngineers, Inc.

Date: 10/20/2022
Location: Salem Oregon

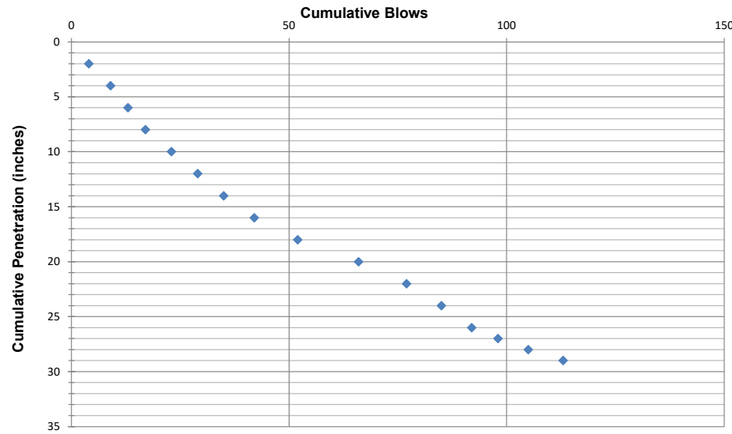
Test Hole Number: TP-10/DCP-1
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-006-00

| Depth, feet | Soil Texture |
|---|---|
| 0 - 3 | Yellowish Brown Silt with sand |
| | |
| | |
| | |

| Test increment | Number of blows | Cumulative blows | Depth below ground surface | Cumulative penetration | Cummulative Penetration | Penetration per blow set | Penetration per blow | Hammer blow factor | DCP Index | DCP Index | CBR | $M_R$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | (in) | (mm) | (in) | (in) | (in) | 1 for 8-kg 2 for 4.6-kg hammer | in/blow | mm/blow | % | psi |
| 1 | 4 | 4 | 2.0 | 50.8 | 2.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 2 | 5 | 9 | 4.0 | 101.6 | 4.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 3 | 4 | 13 | 6.0 | 152.4 | 6.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 4 | 4 | 17 | 8.0 | 203.2 | 8.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 5 | 6 | 23 | 10.0 | 254.0 | 10.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 6 | 6 | 29 | 12.0 | 304.8 | 12.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 7 | 6 | 35 | 14.0 | 355.6 | 14.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 8 | 7 | 42 | 16.0 | 406.4 | 16.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 9 | 10 | 52 | 18.0 | 457.2 | 18.0 | 2.0 | 0.20 | 2 | 0.40 | 10.16 | 22 | 6947 |
| 10 | 14 | 66 | 20.0 | 508.0 | 20.0 | 2.0 | 0.14 | 2 | 0.29 | 7.26 | 32 | 7921 |
| 11 | 11 | 77 | 22.0 | 558.8 | 22.0 | 2.0 | 0.18 | 2 | 0.36 | 9.24 | 24 | 7210 |
| 12 | 8 | 85 | 24.0 | 609.6 | 24.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 13 | 7 | 92 | 26.0 | 660.4 | 26.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 14 | 6 | 98 | 28.0 | 685.8 | 27.0 | 1.0 | 0.17 | 3 | 0.50 | 12.70 | 17 | 6368 |
| 16 | 7 | 105 | 30.0 | 711.2 | 28.0 | 1.0 | 0.14 | 4 | 0.57 | 14.51 | 15 | 6045 |
| 18 | 8 | 113 | 32.0 | 736.6 | 29.0 | 1.0 | 0.13 | 5 | 0.63 | 15.88 | 13 | 5837 |




(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



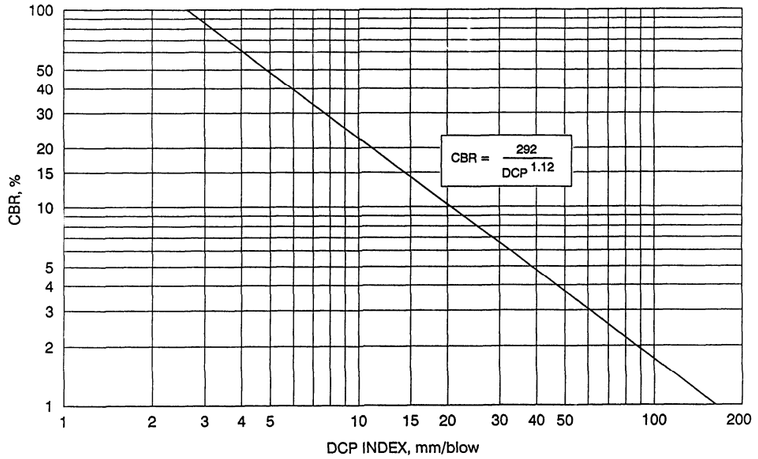
Location: Sunset Mixed Use Development
Depth to bottom: 32
Tester's Name: Blayne Sandau
Tester's Company: GeoEngineers, Inc.

Date: 10/20/2022
Location: Salem Oregon

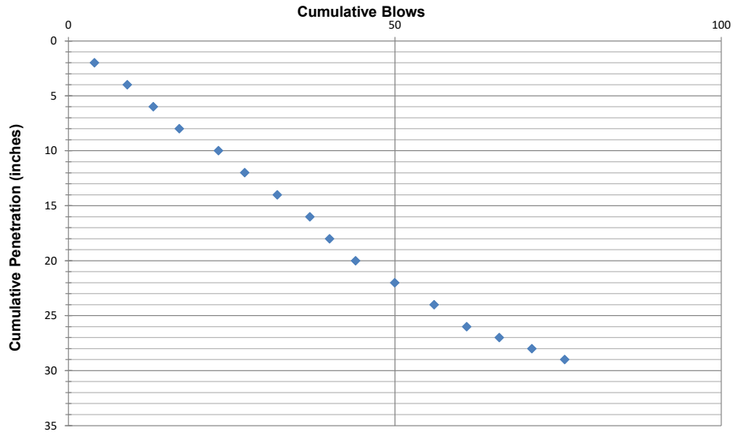
Test Hole Number: TP-6/DCP-2
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-006-00

| Depth, feet | Soil Texture |
|---|---|
| 0 - 3 | Yellowish Brown Silt with sand |
| | |
| | |
| | |

| Test increment | Number of blows | Cumulative blows | Depth below ground surface | Cumulative penetration | Cummulative Penetration | Penetration per blow set | Penetration per blow | Hammer blow factor | DCP Index | DCP Index | CBR | $M_R$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | (in) | (mm) | (in) | (in) | (in) | 1 for 8-kg 2 for 4.6-kg hammer | in/blow | mm/blow | % | psi |
| 1 | 4 | 4 | 2.0 | 50.8 | 2.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 2 | 5 | 9 | 4.0 | 101.6 | 4.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 3 | 4 | 13 | 6.0 | 152.4 | 6.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 4 | 4 | 17 | 8.0 | 203.2 | 8.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 5 | 6 | 23 | 10.0 | 254.0 | 10.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 6 | 4 | 27 | 12.0 | 304.8 | 12.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 7 | 5 | 32 | 14.0 | 355.6 | 14.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 8 | 5 | 37 | 16.0 | 406.4 | 16.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 9 | 3 | 40 | 18.0 | 457.2 | 18.0 | 2.0 | 0.67 | 2 | 1.33 | 33.87 | 6 | 4344 |
| 10 | 4 | 44 | 20.0 | 508.0 | 20.0 | 2.0 | 0.50 | 2 | 1.00 | 25.40 | 8 | 4859 |
| 11 | 6 | 50 | 22.0 | 558.8 | 22.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 12 | 6 | 56 | 24.0 | 609.6 | 24.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 13 | 5 | 61 | 26.0 | 660.4 | 26.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 14 | 5 | 66 | 28.0 | 685.8 | 27.0 | 1.0 | 0.20 | 3 | 0.60 | 15.24 | 14 | 5931 |
| 16 | 5 | 71 | 30.0 | 711.2 | 28.0 | 1.0 | 0.20 | 4 | 0.80 | 20.32 | 10 | 5301 |
| 18 | 5 | 76 | 32.0 | 736.6 | 29.0 | 1.0 | 0.20 | 5 | 1.00 | 25.40 | 8 | 4859 |




(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



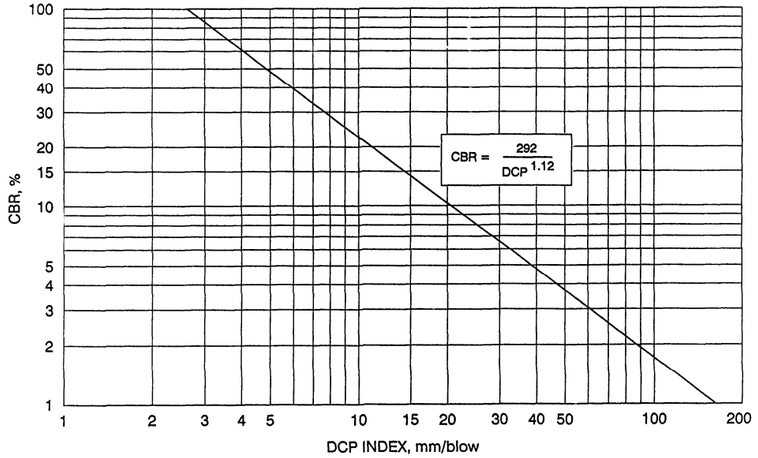
Location: Sunset Mixed Use Development
Depth to bottom: 32
Tester's Name: Blayne Sandau
Tester's Company: GeoEngineers, Inc.

Date: 10/20/2022
Location: Salem Oregon

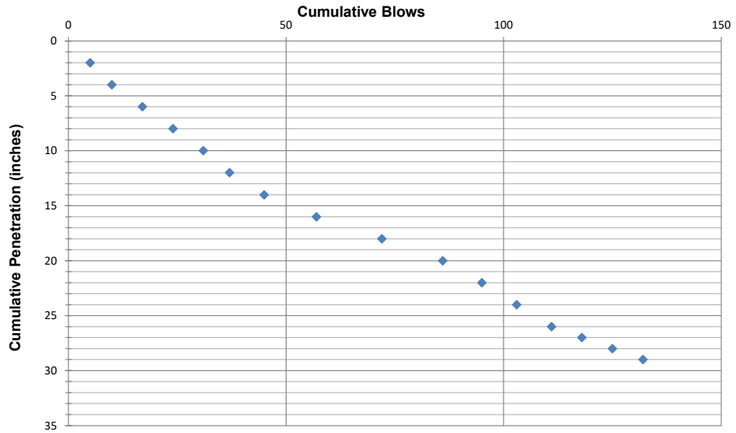
Test Hole Number: TP-13/DCP-3
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-006-00

| Depth, feet | Soil Texture |
|---|---|
| 0 - 3 | Yellowish Brown Silt with sand |
| | |
| | |
| | |

| Test increment | Number of blows | Cumulative blows | Depth below ground surface | Cumulative penetration | Cummulative Penetration | Penetration per blow set | Penetration per blow | Hammer blow factor | DCP Index | DCP Index | CBR | $M_R$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | (in) | (mm) | (in) | (in) | (in) | 1 for 8-kg 2 for 4.6-kg hammer | in/blow | mm/blow | % | psi |
| 1 | 5 | 5 | 2.0 | 50.8 | 2.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 2 | 5 | 10 | 4.0 | 101.6 | 4.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 3 | 7 | 17 | 6.0 | 152.4 | 6.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 4 | 7 | 24 | 8.0 | 203.2 | 8.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 5 | 7 | 31 | 10.0 | 254.0 | 10.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 6 | 6 | 37 | 12.0 | 304.8 | 12.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 7 | 8 | 45 | 14.0 | 355.6 | 14.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 8 | 12 | 57 | 16.0 | 406.4 | 16.0 | 2.0 | 0.17 | 2 | 0.33 | 8.47 | 27 | 7459 |
| 9 | 15 | 72 | 18.0 | 457.2 | 18.0 | 2.0 | 0.13 | 2 | 0.27 | 6.77 | 34 | 8137 |
| 10 | 14 | 86 | 20.0 | 508.0 | 20.0 | 2.0 | 0.14 | 2 | 0.29 | 7.26 | 32 | 7921 |
| 11 | 9 | 95 | 22.0 | 558.8 | 22.0 | 2.0 | 0.22 | 2 | 0.44 | 11.29 | 19 | 6667 |
| 12 | 8 | 103 | 24.0 | 609.6 | 24.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 13 | 8 | 111 | 26.0 | 660.4 | 26.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 14 | 7 | 118 | 28.0 | 685.8 | 27.0 | 1.0 | 0.14 | 3 | 0.43 | 10.89 | 20 | 6762 |
| 16 | 7 | 125 | 30.0 | 711.2 | 28.0 | 1.0 | 0.14 | 4 | 0.57 | 14.51 | 15 | 6045 |
| 18 | 7 | 132 | 32.0 | 736.6 | 29.0 | 1.0 | 0.14 | 5 | 0.71 | 18.14 | 11 | 5541 |




(after Webster et al., 1992)
Webster, S. L., Grau, R. H., and Williams, T. P. (1992). Description and application of dual mass dynamic cone penetrometer. Department of the Army Waterways Equipment Station, No. GL-92-3.



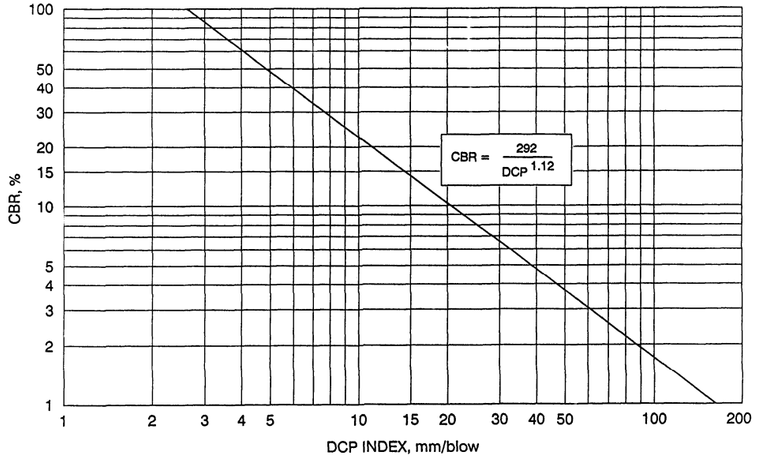
Location: Sunset Mixed Use Development
Depth to bottom: 32
Tester's Name: Blayne Sandau
Tester's Company: GeoEngineers, Inc.

Date: 10/20/2022
Location: Salem Oregon

Test Hole Number: TP-13/DCP-3
Test Method: Dynamic Cone Penetration
GeoEngineers Job: 6748-006-00

| Depth, feet | Soil Texture |
|---|---|
| 0 - 3 | Yellowish Brown Silt with sand |
| | |
| | |
| | |

| Test increment | Number of blows | Cumulative blows | Depth below ground surface | Cumulative penetration | Cummulative Penetration | Penetration per blow set | Penetration per blow | Hammer blow factor | DCP Index | DCP Index | CBR | $M_R$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | # | # | (in) | (mm) | (in) | (in) | (in) | 1 for 8-kg 2 for 4.6-kg hammer | in/blow | mm/blow | % | psi |
| 1 | 5 | 5 | 2.0 | 50.8 | 2.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 2 | 5 | 10 | 4.0 | 101.6 | 4.0 | 2.0 | 0.40 | 2 | 0.80 | 20.32 | 10 | 5301 |
| 3 | 7 | 17 | 6.0 | 152.4 | 6.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 4 | 7 | 24 | 8.0 | 203.2 | 8.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 5 | 7 | 31 | 10.0 | 254.0 | 10.0 | 2.0 | 0.29 | 2 | 0.57 | 14.51 | 15 | 6045 |
| 6 | 6 | 37 | 12.0 | 304.8 | 12.0 | 2.0 | 0.33 | 2 | 0.67 | 16.93 | 12 | 5692 |
| 7 | 8 | 45 | 14.0 | 355.6 | 14.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 8 | 12 | 57 | 16.0 | 406.4 | 16.0 | 2.0 | 0.17 | 2 | 0.33 | 8.47 | 27 | 7459 |
| 9 | 15 | 72 | 18.0 | 457.2 | 18.0 | 2.0 | 0.13 | 2 | 0.27 | 6.77 | 34 | 8137 |
| 10 | 14 | 86 | 20.0 | 508.0 | 20.0 | 2.0 | 0.14 | 2 | 0.29 | 7.26 | 32 | 7921 |
| 11 | 9 | 95 | 22.0 | 558.8 | 22.0 | 2.0 | 0.22 | 2 | 0.44 | 11.29 | 19 | 6667 |
| 12 | 8 | 103 | 24.0 | 609.6 | 24.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 13 | 8 | 111 | 26.0 | 660.4 | 26.0 | 2.0 | 0.25 | 2 | 0.50 | 12.70 | 17 | 6368 |
| 14 | 7 | 118 | 28.0 | 685.8 | 27.0 | 1.0 | 0.14 | 3 | 0.43 | 10.89 | 20 | 6762 |
| 16 | 7 | 125 | 30.0 | 711.2 | 28.0 | 1.0 | 0.14 | 4 | 0.57 | 14.51 | 15 | 6045 |
| 18 | 7 | 132 | 32.0 | 736.6 | 29.0 | 1.0 | 0.14 | 5 | 0.71 | 18.14 | 11 | 5541 |

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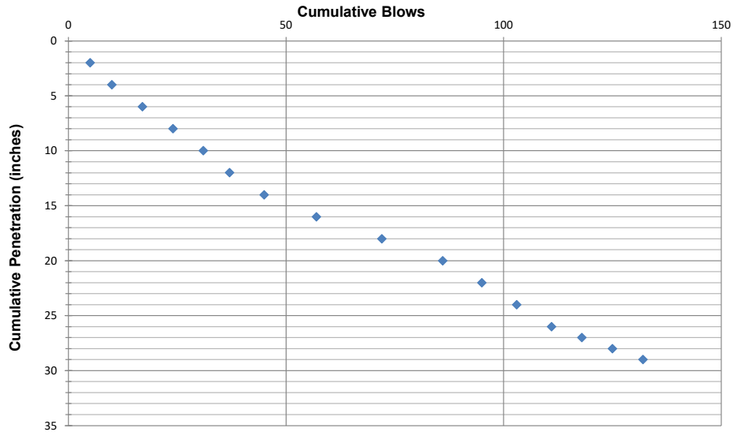


# APPENDIX B
## Report Limitations and Guidelines for Use

## APPENDIX B
## REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

### Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

### Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for J.T. Smith Companies and their authorized agents and/or regulatory agencies for the project specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with J.T. Smith Companies dated August 18, 2022 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

### A Geotechnical Engineering or Geologic Report is Based on a Unique Set of Project-Specific Factors

This report has been prepared for the proposed Sunset Drive Mixed Use Development located at 3081 Sunset Drive in Forest Grove, Oregon. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

### Environmental Concerns Are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

### Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

### Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

### Geotechnical Engineering Report Recommendations Are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work

differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

### A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

### Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable but separating logs from the report can create a risk of misinterpretation.

### Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

### Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

### Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

GeoEngineers

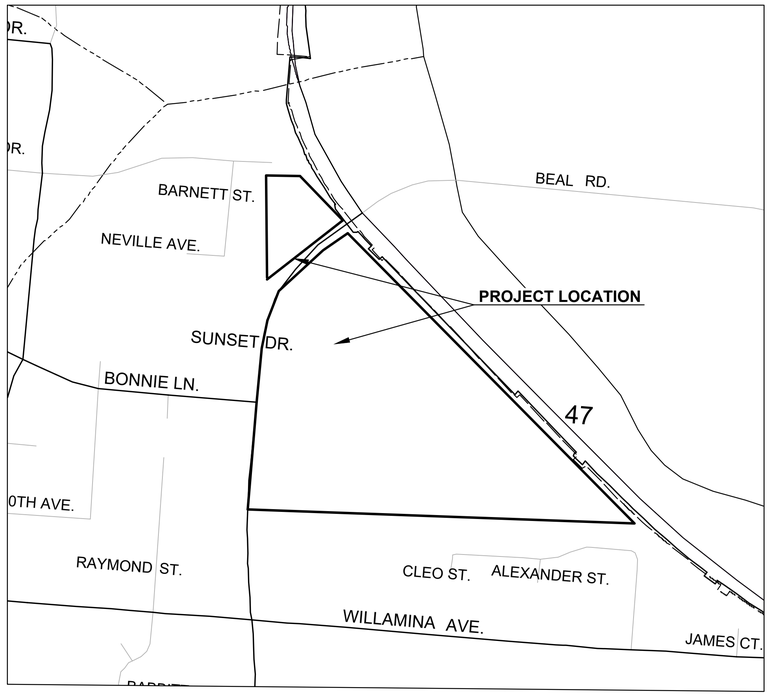
# *LAND USE SET*

FOR

# *BROWN'S FARM MIXED USE*

PREPARED FOR

JTSC, LLC

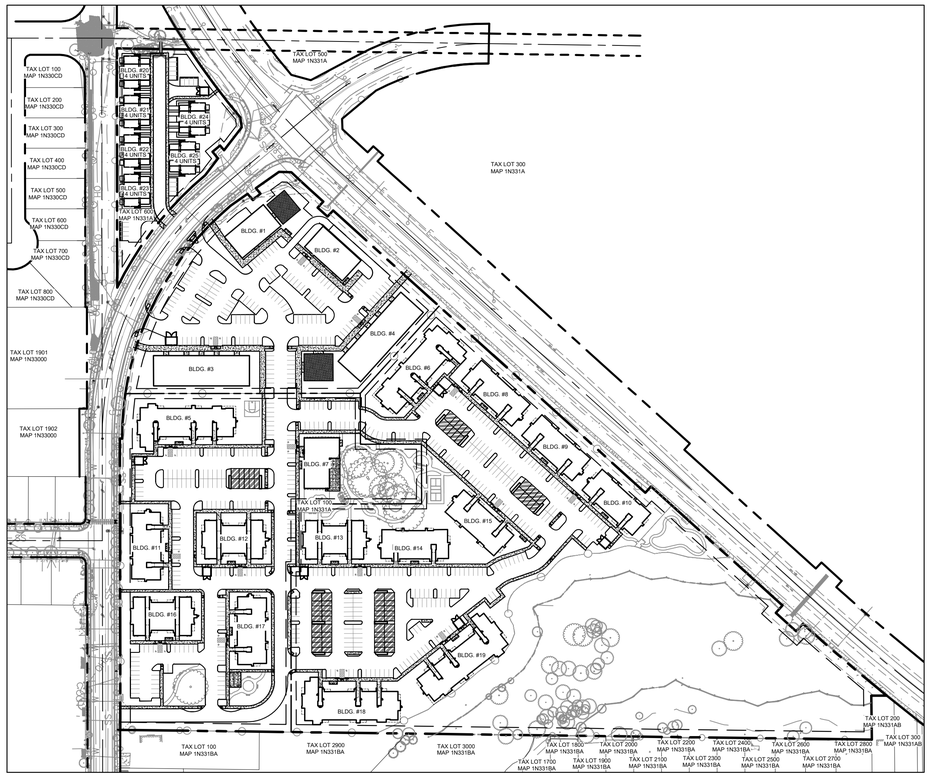



**VICINITY MAP**

**NOT TO SCALE**

N
W E
S

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH




**SITE MAP**

SCALE: 1" = 150'

0 150 300

N
W E
S

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

## Sheet List Table


| Sheet Number | Sheet Title |
|---|---|
| C000 | COVER SHEET |
| C100 | EXISTING CONDITIONS AND DEMOLITION PLAN |
| C150 | TREE PRESERVATION AND REMOVAL PLAN |
| C151 | TREE INVENTORY |
| C152 | TREE INVENTORY |
| C180 | PRELIMINARY PLAT |
| C190 | PHASING PLAN |
| C200 | OVERALL SITE PLAN |
| C201 | SITE PLAN I |
| C202 | SITE PLAN II |
| C203 | SITE PLAN III |
| C210 | GRADING AND EROSION CONTROL PLAN |
| C300 | COMPOSITE UTILITY PLAN |
| C301 | COMPOSITE UTILITY PLAN |
| C302 | COMPOSITE UTILITY PLAN |
| C410 | LIGHTING PLAN |
| C420 | SITE CIRCULATION PLAN |
| C430 | FIRE ACCESS PLAN |


## *PROJECT TEAM*


### OWNER / APPLICANT

JTSC, LLC
5285 MEADOWS ROAD, SUITE 171
LAKE OSWEGO, OR 97035
CONTACT: JESSE NEMEC
PHONE: (503) 730-8620
EMAIL: jnemec@jtsmithco.com

### CIVIL ENGINEER

3J CONSULTING, INC.
9600 SW NIMBUS AVENUE SUITE 100
BEAVERTON, OR 97008
CONTACT: LAURA OXSEN, PE
PHONE: (503) 946-9365
EMAIL: laura.oxsen@3j-consulting.com

### PLANNING CONSULTANT

3J CONSULTING, INC.
9600 SW NIMBUS AVE SUITE 100
BEAVERTON, OR 97008
CONTACT: MERCEDES SERRA
PHONE: (503) 946-9365
EMAIL: mercedes.serra@3j-consulting.com

### LAND SURVEYOR

CES NW
13190 SW 68TH PKWY
TIGARD, OR 97223
CONTACT: PAUL KOHN
PHONE: (503) 968-6655
EMAIL: pkohn@cesnw.com


## *SITE INFORMATION*

### SITE ADDRESS

LOTS NEAR
HIGHWAY 47 AND SUNSET DRIVE
FOREST GROVE, OR 97116

### TAX LOT(S)

1N331A LOTS 100, 600

### JURISDICTION

CITY OF FOREST GROVE

### FLOOD HAZARD

MAP NUMBER: 41067C0311E
ZONE 'X' (UNSHADED)

### ZONING

MIXED USE

### LOCATION

NE 1/4 SECTION 31, T.1N., R.3W., W.M., WASHINGTON COUNTY, OREGON

### GROSS ACREAGE

TAXLOT 1N331A000600: (NORTH): 1.54 AC
TAXLOT 1N331A000100: (SOUTH): 23.37 AC

## *UTILITIES & SERVICES*

### STORM

CLEAN WATER SERVICES
2550 SW HILLSBORO HIGHWAY
HILLSBORO, OR 97123
PHONE: (503)-681-3600

### SANITARY SEWER

CLEAN WATER SERVICES
2550 SW HILLSBORO HIGHWAY
HILLSBORO, OR 97123
PHONE: (503)-681-3600

### WATER

FOREST GROVE PUBLIC WORKS DEPARTMENT
2551-A 23RD AVENUE, PO BOX 326
FOREST GROVE, OR 97116
PHONE: (503) 992-3258

### ROAD

FOREST GROVE PUBLIC WORKS DEPARTMENT
2551-A 23RD AVENUE, PO BOX 326
FOREST GROVE, OR 97116
PHONE: (503) 992-3258

### PARKS

FOREST GROVE PARKS AND RECREATION
2300 SUNSET DRIVE
FOREST GROVE, OR 97116
PHONE: (503) 992-3237

### SCHOOLS

FOREST GROVE SCHOOL DISTRICT
1728 MAIN ST
FOREST GROVE, OR 97116
PHONE: (503) 357-6171

### POLICE

FOREST GROVE POLICE DEPARTMENT
2102 PACIFIC AVENUE, PO BOX 326
FOREST GROVE, OR 97116-0326
PHONE (BUSINESS): (503) 992-3260
PHONE (NON-EMERGENCY): (503) 629-0111
PHONE (EMERGENCY): 911

### FIRE

FOREST GROVE FIRE & RESCUE
1919 ASH STREET
FOREST GROVE, OR 97116-0326
PHONE (BUSINESS): (503) 992-3240
PHONE (NON-EMERGENCY): (503) 629-0111
PHONE (EMERGENCY): 911

### POWER

FOREST GROVE LIGHT & POWER
1818 B STREET
FOREST GROVE, OR 97116
PHONE: (503) 992-3250

### GAS

NORTHWEST NATURAL GAS

### CABLE

COMCAST

### PHONE

CENTURYLINK

## *BENCHMARK*

THE BASIS OF BEARINGS IS NAD 83 (2011) EPOCH 2010.00 OREGON NORTH 3601, INTERNATIONAL FEET. GPS OBSERVATIONS UTILIZING THE OREGON REAL TIME NETWORK (ORGN) WERE HELD AT CMONUMENT NUMBER [100] AND [103]. THE DRAWING COORDINATES ARE AT GROUND DISTANCES AND ARE ON A LOCAL DATUM PLANE. THE TERRESTRIAL GROUND MEASUREMENTS WERE TAKEN BETWEEN ALL INTERVISIBLE CONTROL POINTS. TRIMBLE BUSINESS CENTER VERSION 5.60 WAS USED TO ADJUST THE CONTROL NETWORKS. THE VERTICAL DATUM IS NAVD 88. A GPS DERIVED ELEVATION OF 171.36' FEET WAS HELD AT CONTROL POINT NUMBER 11. DIGITAL DIFFERENTIAL LEVELS WERE RUN THROUGH THE ON-SITE CONTROL.

Know what's below. Call before you dig.

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
PRELIMINARY
EXPIRES: 12/31/24

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

*COVER SHEET*

***BROWN'S FARM***

JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100, BEAVERTON, OR 97008

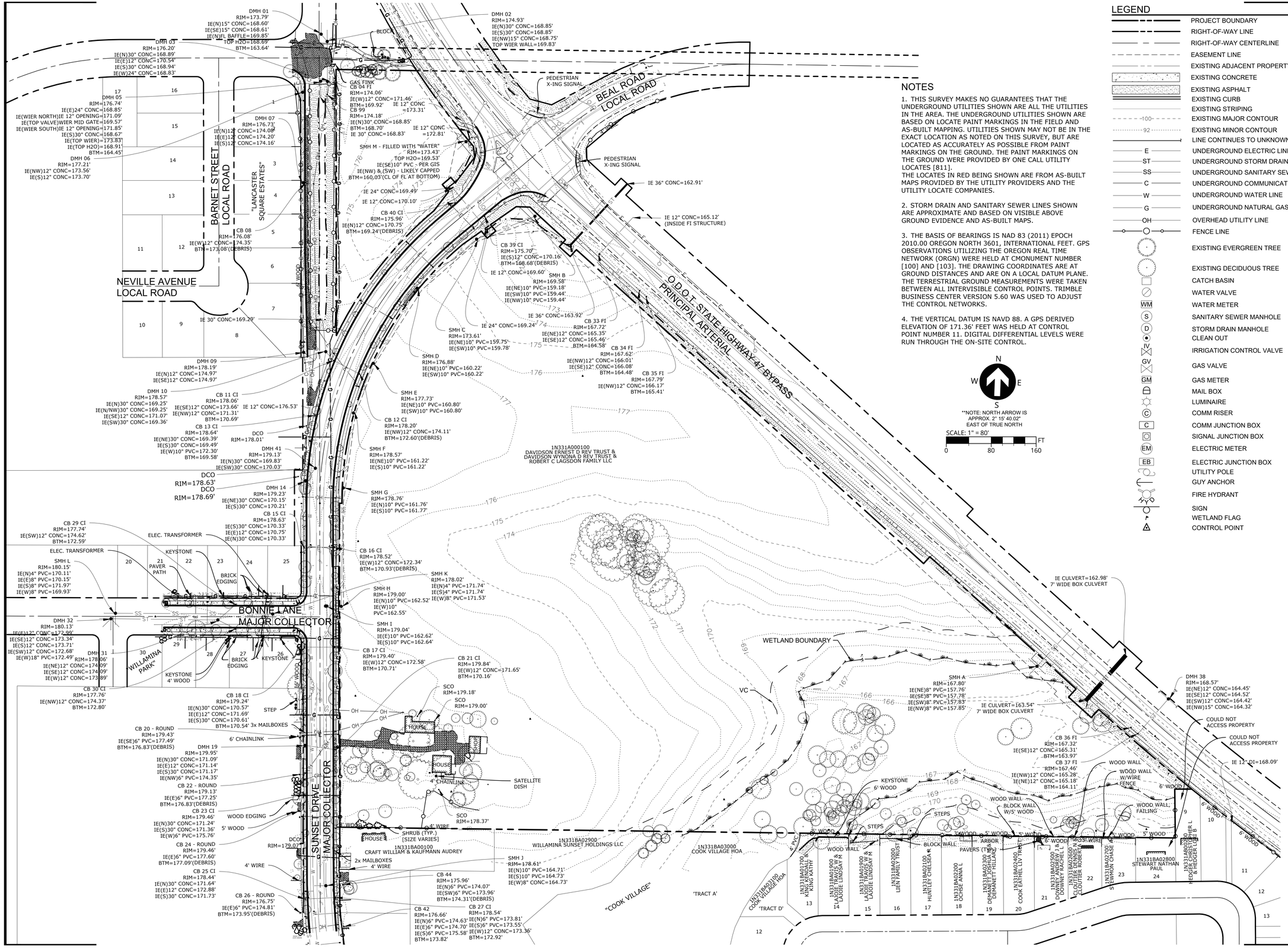

PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER

**C000**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\COVER SHEET-22807.DWG




## NOTES

1. THIS SURVEY MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN ARE ALL THE UTILITIES IN THE AREA. THE UNDERGROUND UTILITIES SHOWN ARE BASED ON LOCATE PAINT MARKINGS IN THE FIELD AND AS-BUILT MAPPING. UTILITIES SHOWN MAY NOT BE IN THE EXACT LOCATION AS NOTED ON THIS SURVEY, BUT ARE LOCATED AS ACCURATELY AS POSSIBLE FROM PAINT MARKINGS ON THE GROUND. THE PAINT MARKINGS ON THE GROUND WERE PROVIDED BY ONE CALL UTILITY LOCATES [811].
THE LOCATES IN RED BEING SHOWN ARE FROM AS-BUILT MAPS PROVIDED BY THE UTILITY PROVIDERS AND THE UTILITY LOCATE COMPANIES.

2. STORM DRAIN AND SANITARY SEWER LINES SHOWN ARE APPROXIMATE AND BASED ON VISIBLE ABOVE GROUND EVIDENCE AND AS-BUILT MAPS.

3. THE BASIS OF BEARINGS IS NAD 83 (2011) EPOCH 2010.00 OREGON NORTH 3601, INTERNATIONAL FEET. GPS OBSERVATIONS UTILIZING THE OREGON REAL TIME NETWORK (ORGN) WERE HELD AT CMONUMENT NUMBER [100] AND [103]. THE DRAWING COORDINATES ARE AT GROUND DISTANCES AND ARE ON A LOCAL DATUM PLANE. THE TERRESTRIAL GROUND MEASUREMENTS WERE TAKEN BETWEEN ALL INTERVISIBLE CONTROL POINTS. TRIMBLE BUSINESS CENTER VERSION 5.60 WAS USED TO ADJUST THE CONTROL NETWORKS.

4. THE VERTICAL DATUM IS NAVD 88. A GPS DERIVED ELEVATION OF 171.36' FEET WAS HELD AT CONTROL POINT NUMBER 11. DIGITAL DIFFERENTIAL LEVELS WERE RUN THROUGH THE ON-SITE CONTROL.

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'

0 80 160 FT

## LEGEND

- PROJECT BOUNDARY
- RIGHT-OF-WAY LINE
- RIGHT-OF-WAY CENTERLINE
- EASEMENT LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING CONCRETE
- EXISTING ASPHALT
- EXISTING CURB
- EXISTING STRIPING
- 100 EXISTING MAJOR CONTOUR
- 92 EXISTING MINOR CONTOUR
- LINE CONTINUES TO UNKNOWN LOCATION
- E UNDERGROUND ELECTRIC LINE
- ST UNDERGROUND STORM DRAIN LINE
- SS UNDERGROUND SANITARY SEWER LINE
- C UNDERGROUND COMMUNICATION LINE
- W UNDERGROUND WATER LINE
- G UNDERGROUND NATURAL GAS LINE
- OH OVERHEAD UTILITY LINE
- FENCE LINE
- EXISTING EVERGREEN TREE
- EXISTING DECIDUOUS TREE
- CATCH BASIN
- WATER VALVE
- WM WATER METER
- S SANITARY SEWER MANHOLE
- D STORM DRAIN MANHOLE
- CLEAN OUT
- IV IRRIGATION CONTROL VALVE
- GV GAS VALVE
- GM GAS METER
- MAIL BOX
- LUMINAIRE
- C COMM RISER
- C COMM JUNCTION BOX
- SIGNAL JUNCTION BOX
- EM ELECTRIC METER
- EB ELECTRIC JUNCTION BOX
- UTILITY POLE
- GUY ANCHOR
- FIRE HYDRANT
- SIGN
- WETLAND FLAG
- CONTROL POINT

REGISTERED PROFESSIONAL ENGINEER
89569
OREGON
JULY 8, 2015
ELIZABETH O'SEN
EXPIRES: 12/31/24

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# EXISTING CONDITIONS AND DEMOLITION PLAN
# BROWN'S FARM

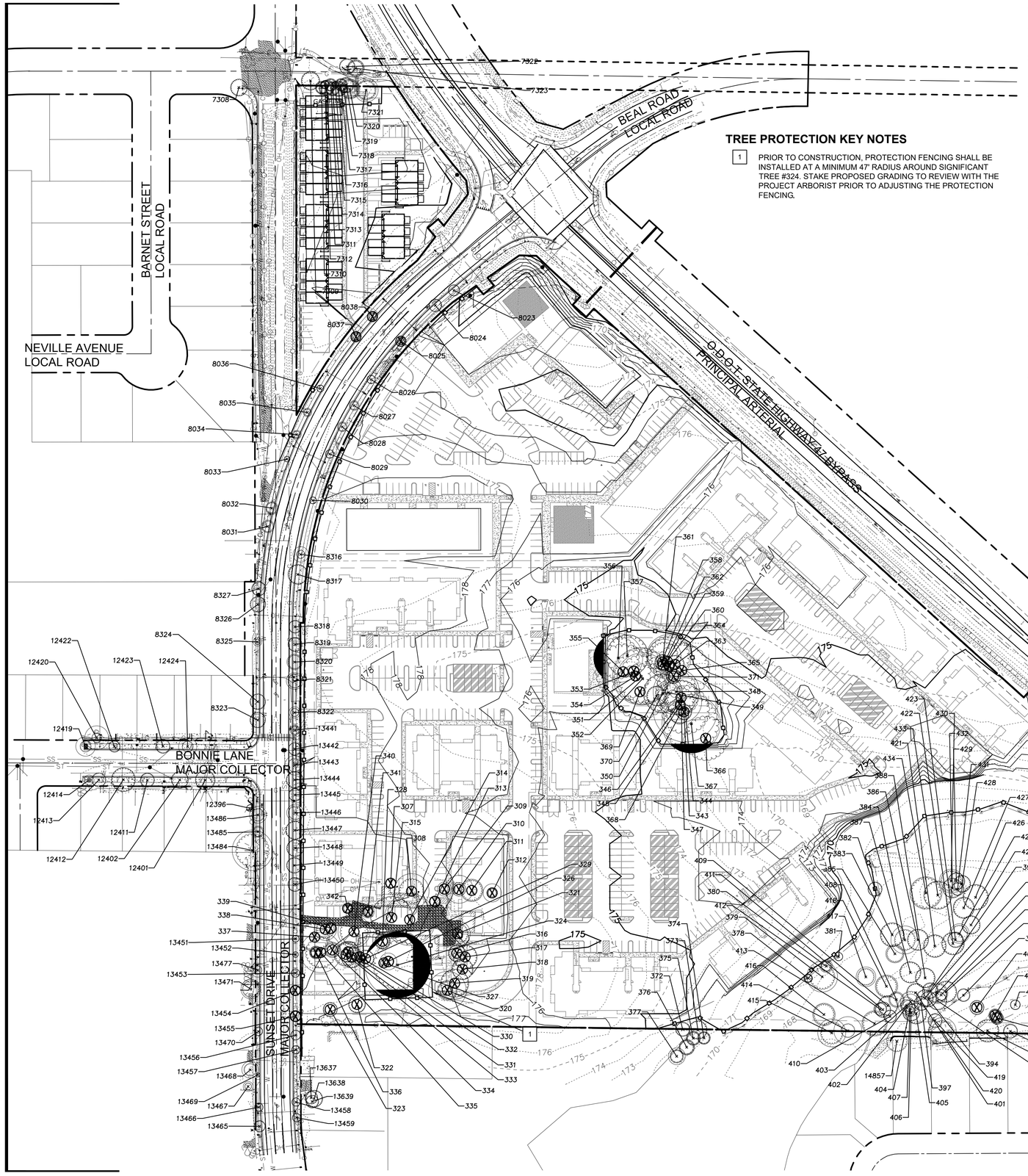
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C100**




## TREE PROTECTION KEY NOTES

1 PRIOR TO CONSTRUCTION, PROTECTION FENCING SHALL BE INSTALLED AT A MINIMUM 47' RADIUS AROUND SIGNIFICANT TREE #324. STAKE PROPOSED GRADING TO REVIEW WITH THE PROJECT ARBORIST PRIOR TO ADJUSTING THE PROTECTION FENCING.

TREE PROTECTION NOTES:

1. PRECONSTRUCTION CONFERENCE. THE DEVELOPER SHALL ARRANGE AN ON SITE MEETING WITH THE PROJECT ARBORIST IN ORDER TO REVIEW THE TREE PRESERVATION AND REMOVAL PLAN AND DISCUSS METHODS OF TREE REMOVAL AND TREE PROTECTION WITH THE CONTRACTOR PRIOR TO ANY GROUND DISTURBING ACTIVITY.
2. CRITICAL ROOT ZONE. THE CRITICAL ROOT ZONE (CRZ) IS DEFINED BY THE CITY OF FOREST GROVE AS ONE FOOT RADIUS PER INCH OF TRUNK DIAMETER. CRZS ARE DEPICTED ON THE TREE PRESERVATION AND REMOVAL PLAN. WORK THAT IS PERFORMED WITHIN PROPOSED AREAS OF CRZ ENCROACHMENT SHALL BE MONITORED AND DOCUMENTED BY THE PROJECT ARBORIST. THE CONTRACTOR SHALL COORDINATE WITH THE PROJECT ARBORIST IN A TIMELY MANNER PRIOR TO WORKING IN THESE AREAS.
3. PROTECTION FENCING. TREES TO BE PRESERVED SHALL BE PROTECTED BY INSTALLATION OF TREE PROTECTION FENCING AS DEPICTED ON THE TREE PRESERVATION AND REMOVAL SITE PLAN TO PREVENT INJURY TO TREE TRUNKS OR ROOTS, OR SOIL COMPACTION. PROTECTION FENCING SHALL BE CHAIN LINK OR STURDY GAUGE GALVANIZED WELDED WIRE ON METAL STAKES, INSTALLED PRIOR TO ANY GROUND DISTURBING ACTIVITY AND MAINTAINED IN GOOD REPAIR THROUGHOUT CONSTRUCTION. THE PROTECTION FENCING SHALL NOT BE MOVED, REMOVED OR ENTERED BY EQUIPMENT WITHOUT PRIOR APPROVAL OF THE PROJECT ARBORIST; ADJUSTMENTS TO THE LOCATION OF PROTECTION FENCING SHALL BE DOCUMENTED BY THE PROJECT ARBORIST. TREES LOCATED MORE THAN 30 FEET FROM CONSTRUCTION ACTIVITY SHOULD NOT REQUIRE FENCING.
4. PROHIBITIONS. NO SOIL COMPACTION, MATERIALS OR SPOILS STORAGE SHALL BE ALLOWED WITHIN CRZS. WITHOUT AUTHORIZATION FROM THE PROJECT ARBORIST, NONE OF THE FOLLOWING SHALL OCCUR WITHIN THE CRZ OF ANY PROTECTED TREE:
   a. GRADE CHANGE OR CUT AND FILL;
   b. NEW IMPERVIOUS SURFACES;
   c. UTILITY OR DRAINAGE FIELD PLACEMENT; OR
   d. VEHICLE MANEUVERING.

   ROOT PROTECTION ZONES MAY BE ENTERED FOR TASKS LIKE SURVEYING, MEASURING, AND, SAMPLING. FENCES MUST BE CLOSED UPON COMPLETION OF THESE TASKS. CONSTRUCTION THAT IS NECESSARY BENEATH PROTECTED TREE DRIPLINES SHALL BE PERFORMED UNDER ARBORIST SUPERVISION.
5. EROSION CONTROL. SILT FENCING REQUIRED TO BE INSTALLED WITHIN TPZS SHALL NOT BE TRENCHED IN PER MANUFACTURER SPECIFICATIONS TO AVOID ROOT DAMAGE. INSTEAD, ROLL THE BASE OF THE SILT FENCE AROUND A STRAW WATTLE AND STAKE THE WATTLE SECURELY INTO THE GROUND OR USE COMPOST SOCKS OR OTHER TECHNIQUES THAT AVOID TREE ROOT IMPACTS.
6. TREE REMOVAL. TREES TO BE REMOVED SHALL BE CLEARLY IDENTIFIED WITH TREE MARKING PAINT OR OTHER METHODS APPROVED IN ADVANCED BY THE PROJECT ARBORIST. TREE REMOVAL SHALL BE PERFORMED BY A QUALIFIED TREE SERVICE. WHERE TREES ARE PLANNED FOR REMOVAL WITHIN A TREE PROTECTION ZONE, PROTECTION FENCING MAY BE TEMPORARILY OPENED FOR TREE REMOVAL DIRECTIONALLY FELL OR SURGICALLY REMOVE TREES TO AVOID CONTACT OR OTHERWISE PREVENT DAMAGE TO THE TRUNKS AND BRANCHES OF TREES TO BE PRESERVED. NO VEHICLES OR HEAVY EQUIPMENT SHALL BE PERMITTED WITHIN CRZS DURING TREE REMOVAL OPERATIONS. WHERE FEASIBLE, A MACHINE OPERATING OUTSIDE OF THE CRZ MAY REACH INTO THE CRZ TO RELOCATE FELLED TREES OUTSIDE THE CRZ. WHERE A MACHINE IS UNABLE TO REACH A FELLED TREE WITHIN A CRZ, THE TREE SHALL BE BUCKED INTO MANAGEABLE LENGTHS AND HAULED OUTSIDE OF THE CRZ BYHAND OR WITH WHEEL BARROWS OR OTHER SIMILAR LIGHT WEIGHT, HAND PROPELLED MACHINE. WITHIN CRZS, THE STUMPS OF REMOVED TREES SHALL REMAIN IN THE GROUND OR BE REMOVED BY GRINDING THE STUMP FACE UP TO SIX INCHES BELOW GRADE.
7. CROWN PRUNING. TREES TO BE PRESERVED MAY REQUIRE PRUNING FOR OVERHEAD CLEARANCE AND TO REMOVE DEAD AND DEFECTIVE BRANCHES FOR SAFETY. THE PROJECT ARBORIST CAN HELP IDENTIFY WHETHER PRUNING IS NECESSARY ONCE TREES PLANNED FOR REMOVAL HAVE BEEN REMOVED AND THE SITE IS STAKED AND PREPARED FOR CONSTRUCTION. TREE REMOVAL AND PRUNING SHALL BE PERFORMED BY A QUALIFIED TREE SERVICE.
8. EXCAVATION AND ROOT PRUNING. EXCAVATION WITHIN THE CRZ OF A PROTECTED TREE SHALL BE AVOIDED IF ALTERNATIVES ARE AVAILABLE. IF EXCAVATION IS UNAVOIDABLE, THE DEVELOPER SHALL COORDINATE WITH THE PROJECT ARBORIST TO EVALUATE THE PROPOSED EXCAVATION TO DETERMINE METHODS TO MINIMIZE IMPACTS TO TREES. THIS CAN INCLUDE TUNNELING, HAND DIGGING, USING A MODIFIED PROFILE OR OTHER APPROACHES. ROOTS SMALLER THAN 2 INCHES IN DIAMETER MAY BE PRUNED CLEAN TO SOUND WOOD USING A SHARP SAW AS DIGGING PROGRESSES TO AVOID PULLING AND TEARING ROOTS. EXCAVATION IMMEDIATELY ADJACENT TO ROOTS 2 INCHES IN DIAMETER AND LARGER SHALL BE BY HAND OR OTHER NON INVASIVE TECHNIQUES TO ENSURE THAT ROOTS ARE NOT DAMAGED. THE PROJECT ARBORIST SHALL ASSESS AND DOCUMENT ROOTS 2 INCHES AND LARGER IN DIAMETER PRIOR TO IMPACTS. WHERE FEASIBLE, THESE SHALL BE PROTECTED BY TUNNELING OR OTHER MEANS TO AVOID DESTRUCTION OR DAMAGE. EXCEPTIONS CAN BE MADE IF, IN THE OPINION OF THE PROJECT, UNACCEPTABLE DAMAGE WILL NOT OCCUR TO THE TREE.
9. LANDSCAPING AND PATH CONSTRUCTION. COORDINATE WITH THE PROJECT ARBORIST PRIOR TO REMOVING TREE PROTECTION FENCING FOR FINAL LANDSCAPING.
   a. PROPOSED PATHS SHALL BE BUILT UP FROM NATIVE GRADE, AS FEASIBLE. UNDER ARBORIST SUPERVISION, A SMALL RUBBER TRACKED EXCAVATOR WITH A FLAT BLADE BUCKET MAY BE USED TO CLEAR THE UPPERMOST ORGANIC MATTER ALONG PATH ALIGNMENTS. IF GRADING IS REQUIRED, PATH EXCAVATION SHALL BE PERFORMED IN ACCORDANCE WITH TREE PROTECTION NOTE #8.
   b. FINAL LANDSCAPING SHALL INCLUDE APPROXIMATELY 3 INCHES OF MULCH BENEATH THE DRIPLINE OF PROTECTED TREES, BUT NOT DIRECTLY AGAINST TREE TRUNKS.
   c. SHRUBS AND GROUND COVER PLANTS MAY BE INSTALLED BY HAND AND WITH HAND TOOLS ALONG THE OUTER EDGES OF PROTECTED TREE DRIPLINES. FIELD FIT PLANTS TO AVOID TREE ROOT IMPACTS. IF IRRIGATION IS USED, USE DRIP IRRIGATION ONLY BENEATH THE DRIPLINES OF PROTECTED TREES. INSTALL DRIP IRRIGATION LINES ON THE GROUND SURFACE AND COVER WITH MULCH (NO TRENCHING TO INSTALL IRRIGATION LINES BENEATH PROTECTED TREE DRIPLINES).
10. QUALITY ASSURANCE. THE PROJECT ARBORIST WILL BE AVAILABLE ON CALL DURING CONSTRUCTION TO SUPERVISE PROPER EXECUTION OF THIS PLAN; IT IS THE DEVELOPER'S RESPONSIBILITY TO COORDINATE WITH THE PROJECT ARBORIST IN A TIMELY MANNER AS NEEDED.
11. FINAL REPORT. AFTER THE PROJECT HAS BEEN COMPLETED, THE PROJECT ARBORIST SHOULD PROVIDE A FINAL REPORT THAT DESCRIBES THE MEASURES NEEDED TO MAINTAIN AND PROTECT THE REMAINING TREES.

## LEGEND

- PROJECT BOUNDARY
- RIGHT-OF-WAY LINE
- RIGHT-OF-WAY CENTERLINE
- EASEMENT LINE
- EXISTING ADJACENT PROPERTY LINE
- 100 EXISTING MAJOR CONTOUR
- 92 EXISTING MINOR CONTOUR
- 110 PROPOSED MAJOR CONTOUR
- 108 PROPOSED MINOR CONTOUR
- PROPOSED TREE PROTECTING FENCING
- EXISTING CONCRETE
- TREE TO BE REMOVED
- EXISTING CONIFEROUS TREE — CRZ (CRITICAL ROOT ZONE)
- EXISTING DECIDUOUS TREE — CRZ (CRITICAL ROOT ZONE)
- AREA OF CRZ ENCROACHMENT: THE CONTRACTOR SHALL COORDINATE WITH THE PROJECT ARBORIST IN A TIMELY MANNER PRIOR TO GRADING IN THESE AREAS; SEE TREE PROTECTION NOTES 2 AND 8.

N W E S

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'
0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89560PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24
PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# TREE PRESERVATION AND REMOVAL PLAN
# BROWN'S FARM

JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C150**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\TREE PRESERVATION AND REMOVAL PLAN-22807.DWG

| NO. | COMMON NAME | SPECIES NAME | DBH[1] | C–RAD[2] | CRZ[3] | COND[4] | COMMENTS | SIG[5] | LOCATION[6] | TREATMENT | MAINTENANCE RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 307 | MAPLE | ACER SPP. | 7 | 11 | 7 | F | | NO | ON–SITE | REMOVE | |
| 308 | ENGLISH LAUREL | PRUNUS LAUROCERASUS | 25 | 20 | 25 | F | | NO | ON–SITE | REMOVE | |
| 309 | APPLE | MALUS SPP. | 10 | 11 | 10 | F | | NO | ON–SITE | REMOVE | |
| 310 | APPLE | MALUS SPP. | 20 | 13 | 20 | F | TRUNK DECAY | NO | ON–SITE | REMOVE | |
| 311 | APPLE | MALUS SPP. | 16 | 14 | 16 | P | TRUNK DECAY WITH LARGE HOLLOW | NO | ON–SITE | REMOVE | |
| 312 | APPLE | MALUS SPP. | 13 | 5 | 13 | P | MOSTLY DEAD, ADVANCED DECAY, SPROUTS | NO | ON–SITE | REMOVE | |
| 313 | PEAR | PYRUS SPP. | 8 | 9 | 8 | F | | NO | ON–SITE | REMOVE | |
| 314 | NORWAY MAPLE | ACER PLATANOIDES | 37 | 35 | 37 | G | HISTORY OF BRANCH FAILURE | NO | ON–SITE | REMOVE | |
| 315 | TULIPTREE | LIRIODENDRON TULIPIFERA | 30 | 27 | 30 | G | | NO | ON–SITE | REMOVE | |
| 316 | SWEET CHERRY | PRUNUS AVIUM | 12 | 14 | 12 | F | | NO | ON–SITE | REMOVE | |
| 317 | SWEET CHERRY | PRUNUS AVIUM | 17 | 21 | 17 | F | BROKEN TOP | NO | ON–SITE | REMOVE | |
| 318 | CHERRY | PRUNUS SPP. | 9,12 | 17 | 15 | F | | NO | ON–SITE | REMOVE | |
| 319 | OREGON WHITE OAK | QUERCUS GARRYANA | 20 | 21 | 20 | G | | NO | ON–SITE | REMOVE | |
| 320 | PORT–ORFORD–CEDAR | CHAMAECYPARIS LAWSONIANA | 27 | 14 | 27 | G | | NO | ON–SITE | REMOVE | |
| 321 | ENGLISH LAUREL | PRUNUS LAUROCERASUS | 8,10,12 | 12 | 17 | G | | NO | ON–SITE | REMOVE | |
| 322 | BLACK COTTONWOOD | POPULUS TRICHOCARPA | 8,9 | 12 | 12 | F | | NO | ON–SITE | REMOVE | |
| 323 | BLACK LOCUST | ROBINIA PSEUDOACACIA | 6,8 | 16 | 10 | F | | NO | ON–SITE | REMOVE | |
| 324 | OREGON WHITE OAK | QUERCUS GARRYANA | 47 | 39 | 47 | G | CROWN DECAY | YES | ON–SITE | RETAIN | PRUNE |
| 326 | ENGLISH HOLLY | ILEX AQUIFOLIUM | 5,7,9 | 9 | 12 | F | | NO | ON–SITE | REMOVE | |
| 327 | ENGLISH HOLLY | ILEX AQUIFOLIUM | 7 | 8 | 7 | P | | NO | ON–SITE | REMOVE | |
| 328 | JUNIPER | JUNIPERUS OCCIDENTALIS | 11 | 12 | 11 | G | | NO | ON–SITE | REMOVE | |
| 329 | ENGLISH HAWTHORN | CRATAEGUS MONOGYNA | 2x6,9 | 17 | 12 | P | POOR STRUCTURE | NO | ON–SITE | REMOVE | |
| 330 | ENGLISH HOLLY | ILEX AQUIFOLIUM | 7 | 9 | 7 | P | | NO | ON–SITE | REMOVE | |
| 331 | SWEET CHERRY | PRUNUS AVIUM | 15 | 20 | 15 | F | | NO | ON–SITE | REMOVE | |
| 332 | SWEET CHERRY | PRUNUS AVIUM | 15 | 21 | 15 | F | | NO | ON–SITE | REMOVE | |
| 333 | OREGON WHITE OAK | QUERCUS GARRYANA | 17 | 22 | 17 | F | | NO | ON–SITE | REMOVE | |
| 334 | BLACK WALNUT | JUGLANS NIGRA | 11 | 10 | 11 | P | | NO | ON–SITE | REMOVE | |
| 335 | BLACK WALNUT | JUGLANS NIGRA | 6,2x9,13,2x15 | 26 | 28 | F | BROKEN BRANCHES, CROWN DECAY | NO | ON–SITE | REMOVE | |
| 336 | BLACK WALNUT | JUGLANS NIGRA | 9 | 19 | 9 | P | | NO | ON–SITE | REMOVE | |
| 337 | ENGLISH WALNUT | JUGLANS REGIA | 21 | 20 | 21 | P | MOSTLY DEAD, ADVANCED BASAL DECAY | NO | ON–SITE | REMOVE | |
| 338 | MIMOSA | ALBIZIA JULIBRISSIN | 2x6,7,11 | 18 | 15 | F | | NO | ON–SITE | REMOVE | |
| 339 | SWEET CHERRY | PRUNUS AVIUM | 8 | 15 | 8 | F | | NO | ON–SITE | REMOVE | |
| 340 | SAUCER MAGNOLIA | MAGNOLIA × SOULANGEANA | 2x7,8,9,10,13 | 22 | 22 | G | | NO | ON–SITE | REMOVE | |
| 341 | ENGLISH HOLLY | ILEX AQUIFOLIUM | 9 | 8 | 9 | G | | NO | ON–SITE | REMOVE | |
| 342 | DOGWOOD | CORNUS SPP. | 7 | 9 | 7 | G | | NO | ON–SITE | REMOVE | |
| 343 | SWEET CHERRY | PRUNUS AVIUM | 11 | 15 | 11 | P | | NO | ON–SITE | REMOVE | |
| 344 | OREGON WHITE OAK | QUERCUS GARRYANA | 47 | 49 | 47 | F | LARGE CONK NEAR BASE ON SOUTH SIDE, HISTORY OF LARGE BRANCH FAILURE, CROWN DECAY, EPICORMICS | NO | ON–SITE | RETAIN | PRUNE |
| 345 | SWEET CHERRY | PRUNUS AVIUM | 6 | 17 | 6 | P | | NO | ON–SITE | REMOVE | |
| 346 | OREGON WHITE OAK | QUERCUS GARRYANA | 31 | 20 | 31 | G | DEAD AND BROKEN BRANCHES, ONE–SIDED TO WEST, IVY | NO | ON–SITE | RETAIN | REMOVE IVY |
| 347 | OREGON WHITE OAK | QUERCUS GARRYANA | 27 | 47 | 27 | F | DEAD AND BROKEN BRANCHES, ONE–SIDED WITH LEAN EAST | NO | ON–SITE | REMOVE | |
| 348 | OREGON WHITE OAK | QUERCUS GARRYANA | 33 | 26 | 33 | F | OLD CODOMINANT LEADER FAILURE WITH LARGE DECAYING WOUND | NO | ON–SITE | RETAIN | |
| 349 | OREGON WHITE OAK | QUERCUS GARRYANA | 15 | 14 | 15 | P | VERY SMALL AND HIGH LIVE CROWN, MOSTLY DEAD EXCEPT FOR EPICORMICS | NO | ON–SITE | RETAIN | |
| 350 | OREGON WHITE OAK | QUERCUS GARRYANA | 28 | 32 | 28 | F | DEAD AND BROKEN BRANCHES, ONE SIDED WITH LEAN WEST | NO | ON–SITE | RETAIN | INSTALL CABLE |
| 351 | OREGON WHITE OAK | QUERCUS GARRYANA | 42 | 28 | 42 | G | RELATIVELY ONE OF BEST TREES IN GROUP, CROWN IS HIGH WITH JUST ONE LATERAL BRANCH DUE TO STAND GROWN NATURE | NO | ON–SITE | RETAIN | |
| 352 | OREGON WHITE OAK | QUERCUS GARRYANA | 38 | 25 | 38 | F | CROWN ASYMMETRY, CROWN DECAY | NO | ON–SITE | RETAIN | PRESCRIPTION FERTILIZE |
| 353 | SWEET CHERRY | PRUNUS AVIUM | 8 | 9 | 8 | P | | NO | ON–SITE | REMOVE | |
| 354 | SWEET CHERRY | PRUNUS AVIUM | 7 | 10 | 7 | P | | NO | ON–SITE | REMOVE | |
| 355 | OREGON WHITE OAK | QUERCUS GARRYANA | 57 | 55 | 57 | F | ONE SIDED CROWN WITH LEAN WEST, HISTORY OF LARGE BRANCH FAILURE, TRUNK AND CROWN DECAY | NO | ON–SITE | REMOVE | |
| 356 | OREGON WHITE OAK | QUERCUS GARRYANA | 36 | 44 | 36 | G | RELATIVELY ONE OF BEST TREES IN GROUP, ONE SIDED TO NORTHWEST, CROWN DECAY | NO | ON–SITE | RETAIN | PRUNE, INSTALL CABLE |
| 357 | OREGON WHITE OAK | QUERCUS GARRYANA | 30 | 42 | 30 | G | MOSTLY ONE SIDED TO NORTH, DEAD AND BROKEN BRANCHES, CROWN DECAY | NO | ON–SITE | RETAIN | PRUNE |
| 358 | OREGON WHITE OAK | QUERCUS GARRYANA | 24 | 27 | 24 | F | CODOMINANT LEADERS, HIGH LIVE CROWN ONE SIDED TO NORTH | NO | ON–SITE | RETAIN | PRUNE, INSTALL CABLE |
| 359 | OREGON WHITE OAK | QUERCUS GARRYANA | 31 | 27 | 31 | F | BASAL/LOWER TRUNK DECAY WITH HOLLOW ON EAST FACE, IVY, DEAD AND BROKEN BRANCHES, CROWN DECAY | NO | ON–SITE | RETAIN | REMOVE IVY, PRUNE |
| 360 | SWEET CHERRY | PRUNUS AVIUM | 7 | 8 | 7 | P | | NO | ON–SITE | REMOVE | |
| 361 | SWEET CHERRY | PRUNUS AVIUM | 11 | 12 | 11 | P | | NO | ON–SITE | REMOVE | |
| 362 | SWEET CHERRY | PRUNUS AVIUM | 9 | 8 | 9 | P | | NO | ON–SITE | REMOVE | |
| 363 | SWEET CHERRY | PRUNUS AVIUM | 13 | 14 | 13 | P | | NO | ON–SITE | REMOVE | |
| 364 | SWEET CHERRY | PRUNUS AVIUM | 7 | 7 | 7 | P | | NO | ON–SITE | REMOVE | |
| 365 | OREGON WHITE OAK | QUERCUS GARRYANA | 43 | 45 | 43 | F | HUGE CONK NEAR BASE ON WEST FACE, DENSE IVY, MULTIPLE UPRIGHT LEADERS, ONE SIDED CROWN EAST, DECAY HOLLOWS IN UPPER TRUNK, DEAD AND BROKEN BRANCHES | NO | ON–SITE | REMOVE | |
| 366 | OREGON WHITE OAK | QUERCUS GARRYANA | 32 | 39 | 32 | F | PREVIOUS FAILURE OF CODOMINANT STEM, REMAINING STEM IS VERY ONE SIDED WITH LEAN NE, NUMEROUS EPICORMICS | NO | ON–SITE | REMOVE | |
| 367 | OREGON WHITE OAK | QUERCUS GARRYANA | 43 | 42 | 43 | F | HISTORY OF LARGE BRANCH FAILURE, POOR WOUND WOOD DEVELOPMENT, DECAY HOLLOWS, MAJOR CROWN ASYMMETRY | NO | ON–SITE | RETAIN | PRUNE |
| 368 | OREGON WHITE OAK | QUERCUS GARRYANA | 13 | 15 | 13 | F | SUPPRESSED BENEATH DOMINANT CANOPY, ONE SIDED WITH LEAN WEST, CROWN DECAY | NO | ON–SITE | RETAIN | PRUNE |
| 369 | OREGON WHITE OAK | QUERCUS GARRYANA | 43 | 59 | 43 | P | OLD CODOMINANT LEADER FAILURE WITH LARGE DECAY HOLLOW AT JUNCTURE OF REMAINING LEADER, TREMENDOUS WEIGHT ABOVE DEFECT, VERY ONE SIDED WITH LEAN WEST | NO | ON–SITE | REMOVE | |
| 370 | OREGON WHITE OAK | QUERCUS GARRYANA | 14 | 25 | 14 | F | SUPPRESSED BENEATH DOMINANT CANOPY, ONE SIDED WITH LEAN WEST | NO | ON–SITE | RETAIN | |
| 371 | SWEET CHERRY | PRUNUS AVIUM | 10 | 11 | 10 | P | | NO | ON–SITE | REMOVE | |
| 372 | ENGLISH WALNUT | JUGLANS REGIA | 10 | 15 | 10 | F | TRUNK DAMAGE | NO | BOUNDARY | RETAIN | |
| 373 | ENGLISH WALNUT | JUGLANS REGIA | 13 | 20 | 13 | F | | NO | BOUNDARY | RETAIN | |
| 374 | DOUGLAS–FIR | PSEUDOTSUGA MENZIESII | 9 | 8 | 9 | G | | NO | OFF–SITE | UNAFFECTED | |
| 375 | DOUGLAS–FIR | PSEUDOTSUGA MENZIESII | 10 | 7 | 10 | F | TRUNK DAMAGE | NO | OFF–SITE | UNAFFECTED | |
| 376 | DOUGLAS–FIR | PSEUDOTSUGA MENZIESII | 11 | 9 | 11 | G | | NO | OFF–SITE | UNAFFECTED | |
| 377 | DOUGLAS–FIR | PSEUDOTSUGA MENZIESII | 12 | 10 | 12 | G | | NO | OFF–SITE | UNAFFECTED | |
| 378 | SCOTS PINE | PINUS SYLVESTRIS | 6 | 8 | 6 | F | | NO | ON–SITE | RETAIN | |
| 379 | OREGON ASH | FRAXINUS LATIFOLIA | 2x10,17 | 18 | 22 | F | | NO | ON–SITE | RETAIN | |
| 380 | SCOTS PINE | PINUS SYLVESTRIS | 9 | 12 | 9 | F | | NO | ON–SITE | RETAIN | |
| 381 | OREGON WHITE OAK | QUERCUS GARRYANA | 6 | 6 | 6 | G | | NO | ON–SITE | RETAIN | |
| 382 | RED OAK | QUERCUS RUBRA | 10 | 19 | 10 | G | | NO | ON–SITE | RETAIN | |
| 383 | OREGON ASH | FRAXINUS LATIFOLIA | 10,14 | 15 | 17 | F | | NO | ON–SITE | RETAIN | |
| 384 | OREGON ASH | FRAXINUS LATIFOLIA | 9,2x10,11 | 21 | 20 | F | | NO | ON–SITE | RETAIN | |
| 385 | OREGON ASH | FRAXINUS LATIFOLIA | 2x7,8 | 14 | 12 | F | TRUNK DECAY | NO | ON–SITE | RETAIN | |
| 386 | OREGON ASH | FRAXINUS LATIFOLIA | 3x6,9 | 15 | 15 | F | | NO | ON–SITE | RETAIN | |
| 387 | OREGON ASH | FRAXINUS LATIFOLIA | 8,2x9 | 16 | 15 | F | | NO | ON–SITE | RETAIN | |
| 388 | OREGON ASH | FRAXINUS LATIFOLIA | 14 | 16 | 14 | F | | NO | ON–SITE | RETAIN | |
| 389 | OREGON ASH | FRAXINUS LATIFOLIA | 9 | 12 | 9 | F | | NO | ON–SITE | RETAIN | |
| 390 | OREGON ASH | FRAXINUS LATIFOLIA | 8,2x9 | 17 | 15 | F | | NO | ON–SITE | RETAIN | |
| 391 | OREGON ASH | FRAXINUS LATIFOLIA | 8 | 10 | 8 | F | | NO | ON–SITE | RETAIN | |
| 392 | OREGON ASH | FRAXINUS LATIFOLIA | 13 | 17 | 13 | F | | NO | ON–SITE | RETAIN | |
| 393 | OREGON ASH | FRAXINUS LATIFOLIA | 7,8 | 14 | 10 | F | | NO | ON–SITE | RETAIN | |
| 394 | OREGON ASH | FRAXINUS LATIFOLIA | 7,8 | 12 | 10 | F | | NO | ON–SITE | RETAIN | |
| 395 | OREGON ASH | FRAXINUS LATIFOLIA | 2x9 | 15 | 12 | F | | NO | ON–SITE | RETAIN | |
| 396 | OREGON ASH | FRAXINUS LATIFOLIA | 12 | 12 | 12 | F | | NO | ON–SITE | RETAIN | |
| 397 | OREGON ASH | FRAXINUS LATIFOLIA | 10 | 16 | 10 | F | | NO | ON–SITE | RETAIN | |
| 401 | OREGON ASH | FRAXINUS LATIFOLIA | 9,10 | 18 | 13 | F | | NO | BOUNDARY | RETAIN | |
| 402 | OREGON ASH | FRAXINUS LATIFOLIA | 2x8 | 14 | 11 | F | | NO | ON–SITE | RETAIN | |
| 403 | OREGON ASH | FRAXINUS LATIFOLIA | 8,9 | 17 | 12 | F | | NO | ON–SITE | RETAIN | |
| 404 | OREGON ASH | FRAXINUS LATIFOLIA | 6,7,8 | 8 | 12 | F | | NO | ON–SITE | RETAIN | |
| 405 | OREGON ASH | FRAXINUS LATIFOLIA | 6,2x7,9 | 20 | 14 | F | | NO | ON–SITE | RETAIN | |
| 406 | OREGON ASH | FRAXINUS LATIFOLIA | 12 | 18 | 12 | F | | NO | ON–SITE | RETAIN | |
| 407 | OREGON ASH | FRAXINUS LATIFOLIA | 7 | 9 | 7 | F | | NO | ON–SITE | RETAIN | |
| 408 | OREGON ASH | FRAXINUS LATIFOLIA | 2x8 | 12 | 11 | F | | NO | ON–SITE | RETAIN | |
| 409 | OREGON ASH | FRAXINUS LATIFOLIA | 2x6,7,9 | 10 | 14 | F | | NO | ON–SITE | RETAIN | |
| 410 | OREGON ASH | FRAXINUS LATIFOLIA | 9 | 12 | 9 | F | | NO | ON–SITE | RETAIN | |
| 411 | OREGON ASH | FRAXINUS LATIFOLIA | 2x8 | 11 | 11 | F | | NO | ON–SITE | RETAIN | |
| 412 | OREGON ASH | FRAXINUS LATIFOLIA | 9 | 13 | 9 | F | | NO | ON–SITE | RETAIN | |
| 413 | OREGON ASH | FRAXINUS LATIFOLIA | 12,14 | 21 | 18 | F | ACTIVE SEPARATION BETWEEN CODOMINANT STEMS | NO | ON–SITE | RETAIN | |
| 414 | OREGON ASH | FRAXINUS LATIFOLIA | 2x6 | 11 | 8 | F | | NO | ON–SITE | RETAIN | |
| 415 | OREGON ASH | FRAXINUS LATIFOLIA | 12,16 | 16 | 20 | F | | NO | ON–SITE | RETAIN | |
| 416 | OREGON ASH | FRAXINUS LATIFOLIA | 2x11 | 15 | 15 | F | | NO | ON–SITE | RETAIN | |
| 417 | OREGON ASH | FRAXINUS LATIFOLIA | 3x6,2x7 | 14 | 14 | F | | NO | ON–SITE | RETAIN | |
| 418 | OREGON ASH | FRAXINUS LATIFOLIA | 16 | 11 | 16 | F | | NO | ON–SITE | RETAIN | |
| 419 | OREGON ASH | FRAXINUS LATIFOLIA | 2x7 | 11 | 9 | F | | NO | ON–SITE | RETAIN | |
| 420 | SWEET CHERRY | PRUNUS AVIUM | 20 | 16 | 20 | F | | NO | ON–SITE | RETAIN | |
| 421 | OREGON ASH | FRAXINUS LATIFOLIA | 10,12 | 16 | 15 | F | COLUMN OF ADVANCED TRUNK DECAY | NO | ON–SITE | RETAIN | |
| 422 | OREGON ASH | FRAXINUS LATIFOLIA | 2x9,10 | 19 | 16 | F | | NO | ON–SITE | RETAIN | |
| 423 | OREGON ASH | FRAXINUS LATIFOLIA | 11 | 15 | 11 | F | | NO | ON–SITE | RETAIN | |
| 424 | OREGON ASH | FRAXINUS LATIFOLIA | 9,11 | 18 | 14 | F | | NO | ON–SITE | RETAIN | |
| 425 | OREGON ASH | FRAXINUS LATIFOLIA | 13 | 16 | 13 | F | | NO | ON–SITE | RETAIN | |
| 426 | OREGON ASH | FRAXINUS LATIFOLIA | 18 | 19 | 18 | F | | NO | ON–SITE | RETAIN | |
| 427 | OREGON ASH | FRAXINUS LATIFOLIA | 9,12 | 14 | 15 | F | | NO | ON–SITE | RETAIN | |
| 428 | OREGON ASH | FRAXINUS LATIFOLIA | 12 | 15 | 12 | F | | NO | ON–SITE | RETAIN | |
| 429 | OREGON ASH | FRAXINUS LATIFOLIA | 12 | 15 | 12 | F | | NO | ON–SITE | RETAIN | |
| 430 | OREGON ASH | FRAXINUS LATIFOLIA | 17 | 18 | 17 | F | | NO | ON–SITE | RETAIN | |
| 431 | OREGON ASH | FRAXINUS LATIFOLIA | 9 | 12 | 9 | F | | NO | ON–SITE | RETAIN | |
| 432 | OREGON ASH | FRAXINUS LATIFOLIA | 8,12 | 21 | 14 | F | | NO | ON–SITE | RETAIN | |
| 433 | OREGON ASH | FRAXINUS LATIFOLIA | 12,16 | 21 | 20 | F | | NO | ON–SITE | RETAIN | |
| 434 | OREGON ASH | FRAXINUS LATIFOLIA | 2x16 | 26 | 22 | F | | NO | ON–SITE | RETAIN | |
| 435 | OREGON ASH | FRAXINUS LATIFOLIA | 14,18 | 17 | 22 | F | | NO | ON–SITE | RETAIN | |

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\TREE PRESERVATION AND REMOVAL PLAN-22807.DWG

PRELIMINARY
REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

*TREE INVENTORY*
***BROWN'S FARM***
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C151**

| NO. | COMMON NAME | SPECIES NAME | DBH[1] | C–RAD[2] | CRZ[3] | COND[4] | COMMENTS | SIG[5] | LOCATION[6] | TREATMENT |
|---|---|---|---|---|---|---|---|---|---|---|
| 436 | OREGON ASH | FRAXINUS LATIFOLIA | 19 | 16 | 19 | F | | NO | ON–SITE | RETAIN |
| 437 | OREGON ASH | FRAXINUS LATIFOLIA | 3x10,2x12 | 17 | 24 | F | | NO | ON–SITE | RETAIN |
| 438 | WILLOW | SALIX SPP. | 8,12 | 18 | 14 | F | | NO | ON–SITE | RETAIN |
| 439 | WILLOW | SALIX SPP. | 3x10 | 14 | 17 | F | | NO | ON–SITE | RETAIN |
| 440 | WILLOW | SALIX SPP. | 2x6,12 | 16 | 14 | F | | NO | ON–SITE | RETAIN |
| 441 | SWEET CHERRY | PRUNUS AVIUM | 8 | 10 | 8 | F | POOR STRUCTURE | NO | ON–SITE | REMOVE |
| 442 | SWEET CHERRY | PRUNUS AVIUM | 15 | 15 | 15 | F | | NO | ON–SITE | REMOVE |
| 443 | ENGLISH HAWTHORN | CRATAEGUS MONOGYNA | 4x7 | 8 | 14 | P | DEAD TOP | NO | ON–SITE | RETAIN |
| 444 | SWEET CHERRY | PRUNUS AVIUM | 12 | 12 | 12 | F | POOR STRUCTURE, LOWER TRUNK DAMAGE | NO | ON–SITE | RETAIN |
| 445 | SWEET CHERRY | PRUNUS AVIUM | 12 | 19 | 12 | F | LOWER TRUNK DAMAGE | NO | ON–SITE | REMOVE |
| 446 | SWEET CHERRY | PRUNUS AVIUM | 2x7 | 10 | 9 | F | | NO | ON–SITE | REMOVE |
| 447 | SWEET CHERRY | PRUNUS AVIUM | 9 | 15 | 9 | F | TRUNK DAMAGE | NO | ON–SITE | REMOVE |
| 448 | SWEET CHERRY | PRUNUS AVIUM | 6,8 | 12 | 10 | F | | NO | ON–SITE | REMOVE |
| 449 | SWEET CHERRY | PRUNUS AVIUM | 7 | 7 | 7 | F | | NO | ON–SITE | REMOVE |
| 450 | SWEET CHERRY | PRUNUS AVIUM | 7 | 10 | 7 | F | | NO | ON–SITE | REMOVE |
| 451 | SWEET CHERRY | PRUNUS AVIUM | 6 | 12 | 6 | F | | NO | ON–SITE | REMOVE |
| 452 | SWEET CHERRY | PRUNUS AVIUM | 10 | 10 | 10 | F | | NO | ON–SITE | RETAIN |
| 453 | OREGON WHITE OAK | QUERCUS GARRYANA | 7 | 7 | 7 | G | | NO | ON–SITE | RETAIN |
| 454 | OREGON WHITE OAK | QUERCUS GARRYANA | 11 | 12 | 11 | G | | NO | ON–SITE | RETAIN |
| 455 | SWEET CHERRY | PRUNUS AVIUM | 10 | 11 | 10 | F | | NO | ON–SITE | RETAIN |
| 456 | SWEET CHERRY | PRUNUS AVIUM | 12 | 15 | 12 | F | | NO | ON–SITE | REMOVE |
| 457 | SWEET CHERRY | PRUNUS AVIUM | 6,7 | 10 | 9 | F | | NO | ON–SITE | REMOVE |
| 458 | PLUM | PRUNUS SPP. | 2x6 | 9 | 8 | F | POOR STRUCTURE | NO | ON–SITE | RETAIN |
| 459 | PLUM | PRUNUS SPP. | 7 | 11 | 7 | F | POOR STRUCTURE | NO | ON–SITE | RETAIN |
| 460 | SWEET CHERRY | PRUNUS AVIUM | 10 | 12 | 10 | F | | NO | BOUNDARY | RETAIN |
| 461 | SWEET CHERRY | PRUNUS AVIUM | 16 | 15 | 16 | F | LOWER TRUNK DAMAGE | NO | BOUNDARY | RETAIN |
| 462 | SWEET CHERRY | PRUNUS AVIUM | 9 | 15 | 9 | F | | NO | ON–SITE | REMOVE |
| 463 | SWEET CHERRY | PRUNUS AVIUM | 9 | 14 | 9 | F | | NO | ON–SITE | REMOVE |
| 464 | SWEET CHERRY | PRUNUS AVIUM | 10 | 11 | 10 | G | | NO | ON–SITE | REMOVE |
| 7308 | NORWAY MAPLE | ACER PLATANOIDES | 12 | 15 | 12 | F | | NO | ROW | UNAFFECTED |
| 7309 | RED MAPLE | ACER RUBRUM | 13 | 15 | 13 | F | | NO | ROW | RETAIN |
| 7310 | AUSTRIAN PINE | PINUS NIGRA | 9 | 14 | 9 | F | CODOMINANT LEADERS WITH INCLUDED BARK, SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7311 | AUSTRIAN PINE | PINUS NIGRA | 11 | 13 | 11 | F | | NO | ON–SITE | RETAIN |
| 7312 | AUSTRIAN PINE | PINUS NIGRA | 6 | 9 | 6 | F | LOWER TRUNK DAMAGE | NO | ON–SITE | RETAIN |
| 7313 | AUSTRIAN PINE | PINUS NIGRA | 9 | 14 | 9 | F | CODOMINANT LEADERS, SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7314 | AUSTRIAN PINE | PINUS NIGRA | 10 | 13 | 10 | F | CODOMINANT LEADERS WITH INCLUDED BARK, SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7315 | AUSTRIAN PINE | PINUS NIGRA | 5 | 7 | 5 | F | | NO | ON–SITE | RETAIN |
| 7316 | AUSTRIAN PINE | PINUS NIGRA | 11 | 13 | 11 | F | CODOMINANT LEADERS WITH INCLUDED BARK, SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7317 | AUSTRIAN PINE | PINUS NIGRA | 9 | 13 | 9 | F | | NO | ON–SITE | RETAIN |
| 7318 | AUSTRIAN PINE | PINUS NIGRA | 6 | 10 | 6 | F | SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7319 | AUSTRIAN PINE | PINUS NIGRA | 11 | 12 | 11 | F | CODOMINANT LEADERS, SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7320 | AUSTRIAN PINE | PINUS NIGRA | 14 | 14 | 14 | F | MULTIPLE STEMS, SEQUOIA PITCH MOTH | NO | ON–SITE | RETAIN |
| 7321 | REDWOOD | SEQUOIA SEMPERVIRENS | 17 | 12 | 17 | G | CODOMINANT STEMS | NO | ON–SITE | RETAIN |
| 7322 | MAPLE | ACER SPP. | 11 | 15 | 11 | G | | NO | ROW | UNAFFECTED |
| 7323 | AUSTRIAN PINE | PINUS NIGRA | 12 | 14 | 12 | G | | NO | ROW | UNAFFECTED |
| 8023 | GINKGO | GINKGO BILOBA | 8 | 8 | 8 | G | | NO | ROW | RETAIN |
| 8024 | GINKGO | GINKGO BILOBA | 9 | 8 | 9 | F | | NO | ROW | RETAIN |
| 8025 | GINKGO | GINKGO BILOBA | 5 | 6 | 5 | G | | NO | ROW | REMOVE |
| 8026 | GINKGO | GINKGO BILOBA | 6 | 6 | 6 | G | | NO | ROW | RETAIN |
| 8027 | GINKGO | GINKGO BILOBA | 7 | 7 | 7 | G | | NO | ROW | RETAIN |
| 8028 | GINKGO | GINKGO BILOBA | 7 | 7 | 7 | G | | NO | ROW | RETAIN |
| 8029 | GINKGO | GINKGO BILOBA | 6 | 6 | 6 | G | | NO | ROW | RETAIN |
| 8030 | GINKGO | GINKGO BILOBA | 5 | 5 | 5 | F | | NO | ROW | RETAIN |
| 8031 | RED MAPLE | ACER RUBRUM | 9 | 9 | 9 | F | TOPPED | NO | ROW | UNAFFECTED |
| 8032 | RED MAPLE | ACER RUBRUM | 9 | 8 | 9 | F | TOPPED | NO | ROW | UNAFFECTED |
| 8033 | GINKGO | GINKGO BILOBA | 4 | 4 | 4 | F | | NO | ROW | UNAFFECTED |
| 8034 | GINKGO | GINKGO BILOBA | 6 | 6 | 6 | F | | NO | ROW | RETAIN |
| 8035 | GINKGO | GINKGO BILOBA | 6 | 7 | 6 | F | | NO | ROW | RETAIN |
| 8036 | GINKGO | GINKGO BILOBA | 5 | 5 | 5 | F | | NO | ROW | RETAIN |
| 8037 | GINKGO | GINKGO BILOBA | 6 | 6 | 6 | F | | NO | ROW | REMOVE |
| 8038 | GINKGO | GINKGO BILOBA | 6 | 6 | 6 | F | | NO | ROW | REMOVE |
| 8316 | CHERRY | PRUNUS SPP. | 11 | 7 | 11 | F | | NO | ROW | RETAIN |
| 8317 | CHERRY | PRUNUS SPP. | 14 | 13 | 14 | F | | NO | ROW | RETAIN |
| 8318 | WHITE ASH | FRAXINUS AMERICANA | 9 | 10 | 9 | G | | NO | ROW | RETAIN |
| 8319 | WHITE ASH | FRAXINUS AMERICANA | 10 | 9 | 10 | G | | NO | ROW | RETAIN |
| 8320 | CHERRY | PRUNUS SPP. | 11 | 11 | 11 | F | | NO | ROW | RETAIN |
| 8321 | CHERRY | PRUNUS SPP. | 12 | 12 | 12 | F | | NO | ROW | RETAIN |
| 8322 | CHERRY | PRUNUS SPP. | 8 | 6 | 8 | P | TRUNK DECAY | NO | ROW | RETAIN |
| 8323 | RED MAPLE | ACER RUBRUM | 11 | 11 | 11 | G | | NO | ROW | UNAFFECTED |
| 8324 | RED MAPLE | ACER RUBRUM | 11 | 11 | 11 | G | | NO | ROW | UNAFFECTED |
| 8325 | RED MAPLE | ACER RUBRUM | 6 | 5 | 6 | G | | NO | ROW | UNAFFECTED |
| 8326 | RED MAPLE | ACER RUBRUM | 11 | 11 | 11 | F | TOPPED | NO | ROW | UNAFFECTED |
| 8327 | RED MAPLE | ACER RUBRUM | 10 | 8 | 10 | F | TOPPED | NO | ROW | UNAFFECTED |
| 12396 | JAPANESE MAPLE | ACER PALMATUM | 5 | 6 | 5 | G | | NO | OFF–SITE | UNAFFECTED |
| 12401 | RED MAPLE | ACER RUBRUM | 14 | 15 | 14 | F | | NO | ROW | UNAFFECTED |
| 12402 | RED MAPLE | ACER RUBRUM | 12 | 14 | 12 | F | | NO | ROW | UNAFFECTED |
| 12411 | RED MAPLE | ACER RUBRUM | 10 | 10 | 10 | F | | NO | ROW | UNAFFECTED |
| 12412 | RED MAPLE | ACER RUBRUM | 17 | 17 | 17 | F | | NO | ROW | UNAFFECTED |
| 12413 | RED MAPLE | ACER RUBRUM | 10 | 10 | 10 | F | | NO | ROW | UNAFFECTED |
| 12414 | DWARF WHITE PINE | PINUS STROBUS 'NANA' | 7 | 6 | 7 | G | | NO | ROW | UNAFFECTED |
| 12419 | RED MAPLE | ACER RUBRUM | 14 | 12 | 14 | F | | NO | ROW | UNAFFECTED |
| 12420 | SAUCER MAGNOLIA | MAGNOLIA × SOULANGEANA | 10x3 | 7 | 17 | F | POORLY PRUNED | NO | OFF–SITE | UNAFFECTED |
| 12422 | RED MAPLE | ACER RUBRUM | 8 | 10 | 8 | F | | NO | ROW | UNAFFECTED |
| 12423 | RED MAPLE | ACER RUBRUM | 10 | 11 | 10 | F | | NO | ROW | UNAFFECTED |
| 12424 | RED MAPLE | ACER RUBRUM | 13 | 11 | 13 | F | | NO | ROW | UNAFFECTED |
| 13441 | CHERRY | PRUNUS SPP. | 7 | 7 | 7 | P | TRUNK DECAY | NO | ROW | RETAIN |
| 13442 | CHERRY | PRUNUS SPP. | 9 | 7 | 9 | P | TRUNK DECAY | NO | ROW | RETAIN |
| 13443 | CHERRY | PRUNUS SPP. | 14 | 13 | 14 | F | | NO | ROW | RETAIN |
| 13444 | CHERRY | PRUNUS SPP. | 12 | 12 | 12 | F | | NO | ROW | RETAIN |
| 13445 | CHERRY | PRUNUS SPP. | 9 | 8 | 9 | P | TRUNK DECAY | NO | ROW | RETAIN |
| 13446 | CHERRY | PRUNUS SPP. | 12 | 9 | 12 | P | TRUNK DECAY | NO | ROW | RETAIN |
| 13447 | CHERRY | PRUNUS SPP. | 13 | 14 | 13 | F | TRUNK DAMAGE | NO | ROW | RETAIN |
| 13448 | CHERRY | PRUNUS SPP. | 12 | 12 | 12 | P | TRUNK DAMAGE | NO | ROW | RETAIN |
| 13449 | CHERRY | PRUNUS SPP. | 11 | 15 | 11 | F | | NO | ROW | RETAIN |
| 13450 | CHERRY | PRUNUS SPP. | 10 | 11 | 10 | P | TRUNK DECAY | NO | ROW | RETAIN |
| 13451 | WHITE ASH | FRAXINUS AMERICANA | 5 | 6 | 5 | G | | NO | ROW | RETAIN |
| 13452 | WHITE ASH | FRAXINUS AMERICANA | 4 | 6 | 4 | G | | NO | ROW | RETAIN |
| 13453 | WHITE ASH | FRAXINUS AMERICANA | 6 | 8 | 6 | G | | NO | ROW | RETAIN |
| 13454 | WHITE ASH | FRAXINUS AMERICANA | 7 | 8 | 7 | G | | NO | ROW | REMOVE |
| 13455 | WHITE ASH | FRAXINUS AMERICANA | 8 | 10 | 8 | G | | NO | ROW | REMOVE |
| 13456 | PERSIAN IRONWOOD | PARROTIA PERSICA | 7 | 8 | 7 | G | | NO | ROW | UNAFFECTED |
| 13457 | WHITE ASH | FRAXINUS AMERICANA | 6 | 8 | 6 | G | | NO | ROW | UNAFFECTED |
| 13458 | WHITE ASH | FRAXINUS AMERICANA | 6 | 8 | 6 | F | | NO | ROW | UNAFFECTED |
| 13459 | WHITE ASH | FRAXINUS AMERICANA | 6 | 7 | 6 | F | | NO | ROW | UNAFFECTED |
| 13465 | ZELKOVA | ZELKOVA SERRATA | 8 | 10 | 8 | P | | NO | ROW | UNAFFECTED |
| 13466 | RED MAPLE | ACER RUBRUM | 6 | 6 | 6 | F | | NO | ROW | UNAFFECTED |
| 13467 | EUROPEAN WHITE BIRCH | BETULA PENDULA | 7 | 7 | 7 | P | MOSTLY DEAD | NO | OFF–SITE | UNAFFECTED |
| 13468 | JAPANESE MAPLE | ACER PALMATUM | 2x6,8 | 10 | 11 | G | | NO | OFF–SITE | UNAFFECTED |
| 13469 | ZELKOVA | ZELKOVA SERRATA | 3x2 | 5 | 2 | P | ORIGINAL TREE DEAD, NUMEROUS SPROUTS | NO | ROW | UNAFFECTED |
| 13470 | ZELKOVA | ZELKOVA SERRATA | 6 | 11 | 6 | P | | NO | ROW | UNAFFECTED |
| 13471 | CHERRY | PRUNUS SPP. | 14 | 8 | 14 | F | POORLY PRUNED | NO | OFF–SITE | UNAFFECTED |
| 13477 | ZELKOVA | ZELKOVA SERRATA | 10 | 6 | 10 | F | POOR STRUCTURE | NO | ROW | UNAFFECTED |
| 13484 | BLACK WALNUT | JUGLANS NIGRA | 29 | 29 | 29 | F | | NO | OFF–SITE | UNAFFECTED |
| 13485 | RED MAPLE | ACER RUBRUM | 8 | 6 | 8 | G | | NO | ROW | UNAFFECTED |
| 13486 | RED MAPLE | ACER RUBRUM | 12 | 10 | 12 | G | | NO | ROW | UNAFFECTED |
| 13637 | DECIDUOUS | UNKNOWN | 20x2 | 10 | 8 | F | LIMITED VTA | NO | OFF–SITE | UNAFFECTED |
| 13638 | OREGON WHITE OAK | QUERCUS GARRYANA | 12 | 14 | 12 | G | LIMITED VTA | NO | OFF–SITE | UNAFFECTED |
| 13639 | DECIDUOUS | UNKNOWN | 3,2x6 | 12 | 9 | F | LIMITED VTA | NO | OFF–SITE | UNAFFECTED |
| 14857 | SWAMP WHITE OAK | QUERCUS BICOLOR | 12 | 15 | 12 | G | | NO | OFF–SITE | UNAFFECTED |

1DBH is tree diameter measured at breast height, 4.5–feet above the ground level (inches); codominant trunks splitting below DBH are measured individually and stem diameters are separated by a comma or recorded as quantity x size.

2C–Rad is the average crown radius measured in feet.

3CRZ identifies the Critical Root Zone as defined by Forest Grove Development Code, Section 10.12.210.T4(d): Circular area surrounding the tree trunk a distance of 1–foot per one 1–inch of tree diameter. For multi–stemmed trees, the CRZ is derived by taking the square root of the sum of the squares for individual stem diameters; for example, a tree with two 10" stems has a CRZ of 14–feet [=SQRT((10x10)+(10x10))].

4Cond is an arborist assigned rating to generally describe the condition of individual trees as follows– Dead; Poor; Fair; or Good condition.

5Sig identifies trees listed on the Forest Grove Register of Significant Trees.

6Location identifies trees as being located on the project site (On–site), on adjacent private properties (Off–site) or within public rights–of–way (ROW), based on the survey.

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24
PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

# TREE INVENTORY
# BROWN'S FARM

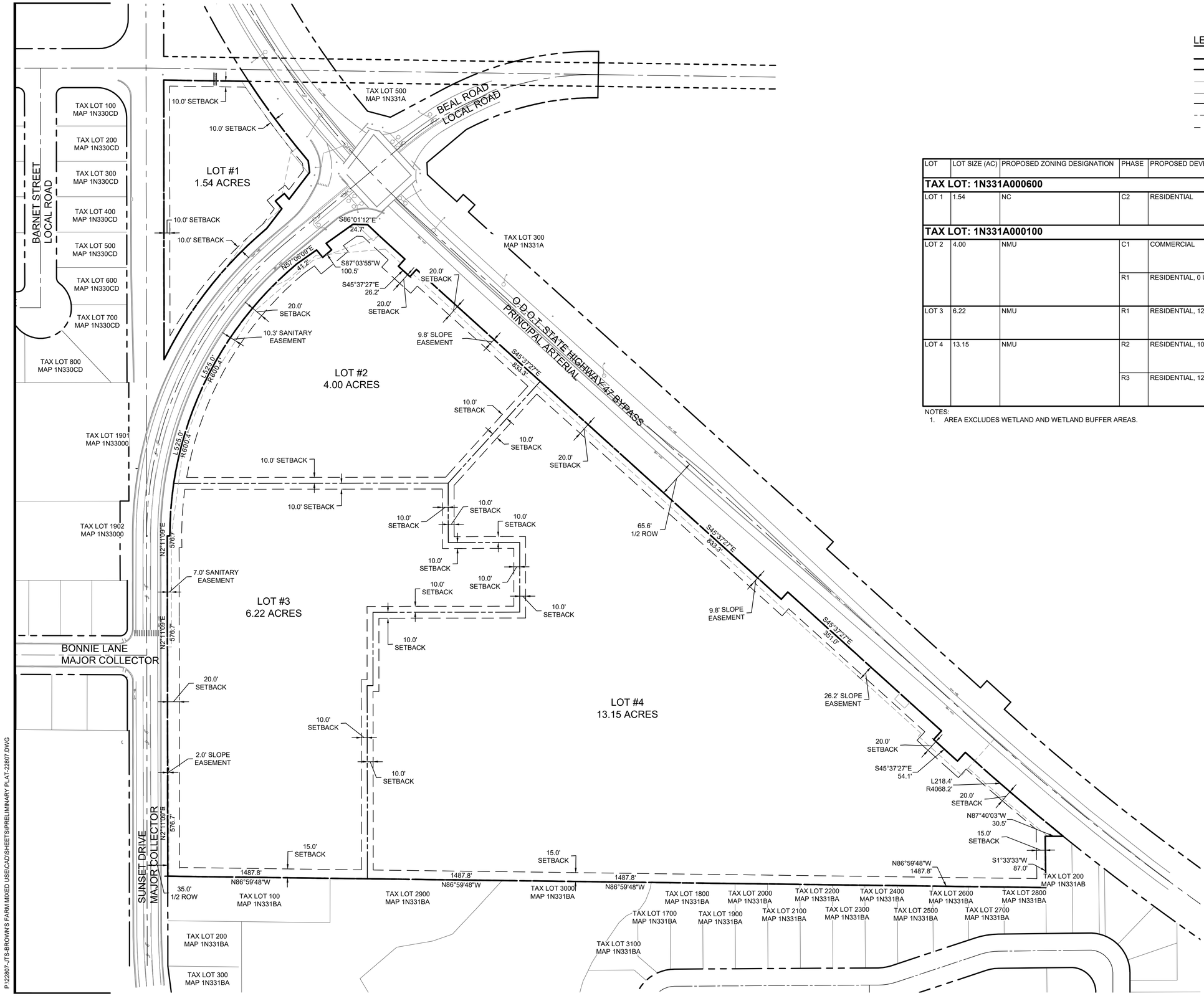
JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
C152

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\TREE PRESERVATION AND REMOVAL PLAN-22807.DWG




LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED LOT LINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE

| LOT | LOT SIZE (AC) | PROPOSED ZONING DESIGNATION | PHASE | PROPOSED DEVELOPMENT | PHASE AREA (AC) | NUMBER OF PARKING SPACES |
|---|---|---|---|---|---|---|
| **TAX LOT: 1N331A000600** | | | | | | |
| LOT 1 | 1.54 | NC | C2 | RESIDENTIAL | 1.54 | 20 SPACES<br>24 GARAGES<br>4 DRIVEWAYS |
| **TAX LOT: 1N331A000100** | | | | | | |
| LOT 2 | 4.00 | NMU | C1 | COMMERCIAL | 3.77 | **TOTAL: 152**<br>STANDARD: 146<br>COMPACT: 0<br>ADA: 6 |
| | | | R1 | RESIDENTIAL, 0 UNITS | 0.23 | **TOTAL: 0**<br>STANDARD: 0<br>COMPACT: 0<br>ADA: 0 |
| LOT 3 | 6.22 | NMU | R1 | RESIDENTIAL, 126 UNITS | 6.22 | **TOTAL: 206**<br>STANDARD: 194<br>COMPACT: 0<br>ADA: 12 |
| LOT 4 | 13.15 | NMU | R2 | RESIDENTIAL, 108 UNITS | 3.76[2] | **TOTAL: 161**<br>STANDARD: 155<br>COMPACT: 0<br>ADA: 6 |
| | | | R3 | RESIDENTIAL, 126 UNITS | 3.96[1] | **TOTAL: 149**<br>STANDARD: 143<br>COMPACT: 0<br>ADA: 6 |

NOTES:
1. AREA EXCLUDES WETLAND AND WETLAND BUFFER AREAS.

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'
0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24
PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

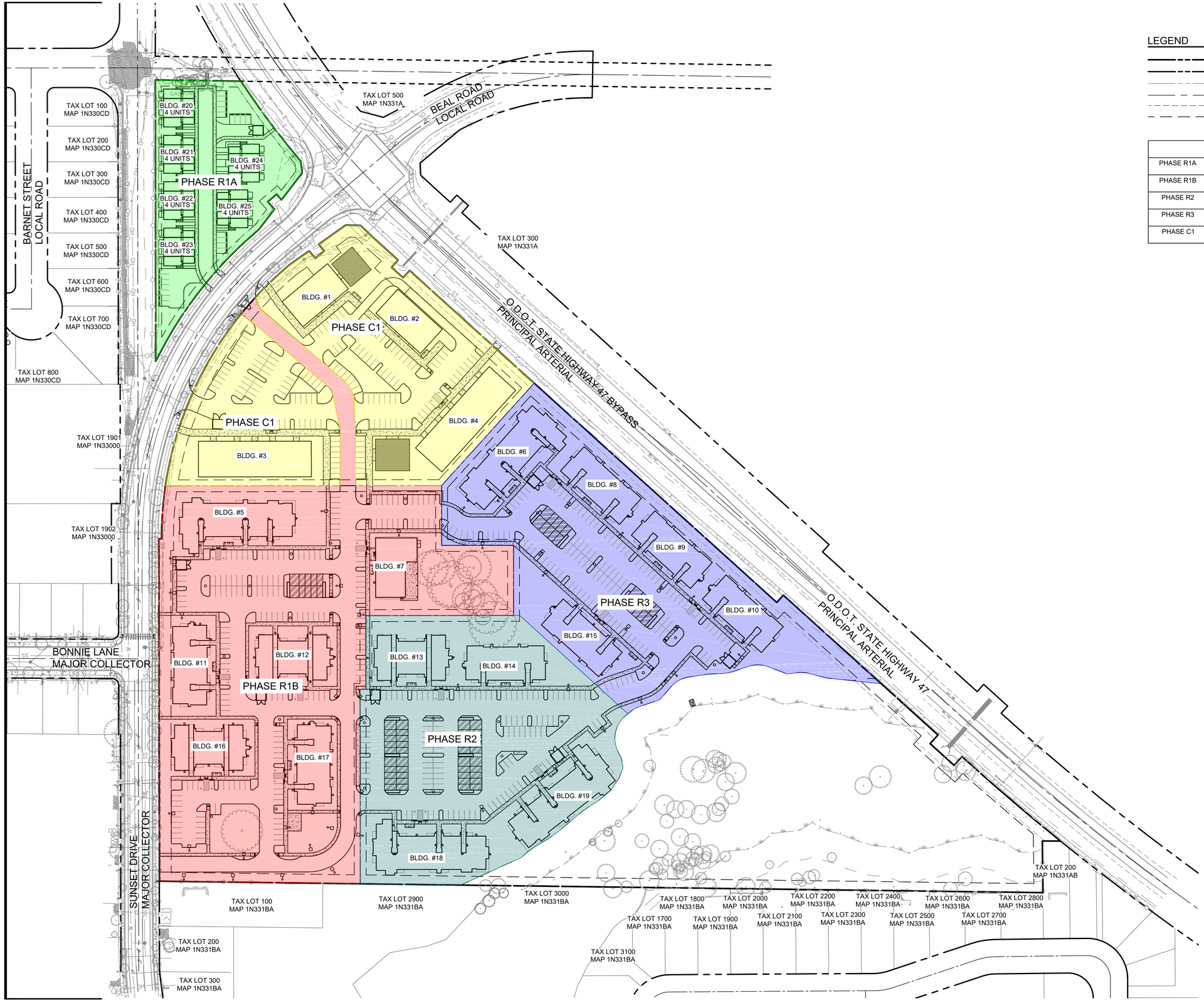
*PRELIMINARY PLAT*
***BROWN'S FARM***
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C180**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEET\PRELIMINARY PLAT-22807.DWG




**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'

0 80 160 FT

## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE

| | | TOTAL ACRES |
|---|---|---|
| PHASE R1A | | 1.54 |
| PHASE R1B | | 6.45 |
| PHASE R2 | | 3.76 |
| PHASE R3 | | 3.96 |
| PHASE C1 | | 3.77 |

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# PHASING PLAN
# BROWN'S FARM

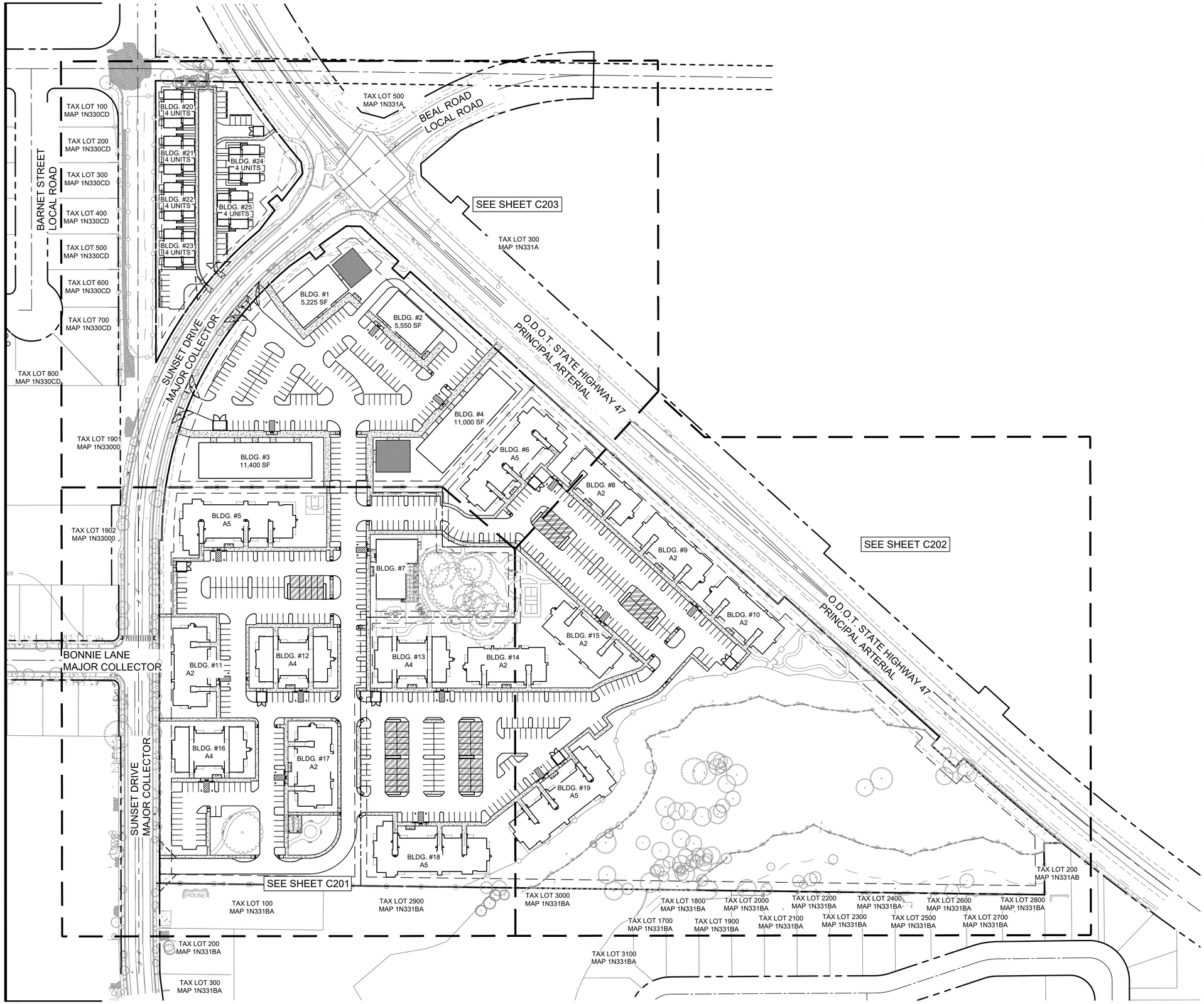
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C190**

P:\22807-JTS-BROWN'S FARM\MIXED USE\CAD\SHEETS\PHASING PLAN-22807.DWG




## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- EXISTING EDGE OF ASPHALT
- PROPOSED EASEMENT LINE
- PROPOSED LOT LINE
- PROPOSED SETBACK LINE
- PROPOSED CURB FACE/BACK
- PROPOSED CONCRETE
- PROPOSED CONCRETE SCORING
- PROPOSED BUILDING LINE
- VISION CLEARANCE TRIANGLE
- PROPOSED GARAGE
- PROPOSED BICYCLE RACKS
- PROPOSED LIGHTING
- ADA PARKING SYMBOL
- C COMPACT PARKING SYMBOL

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'
0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89569
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

*OVERALL SITE PLAN*

# BROWN'S FARM

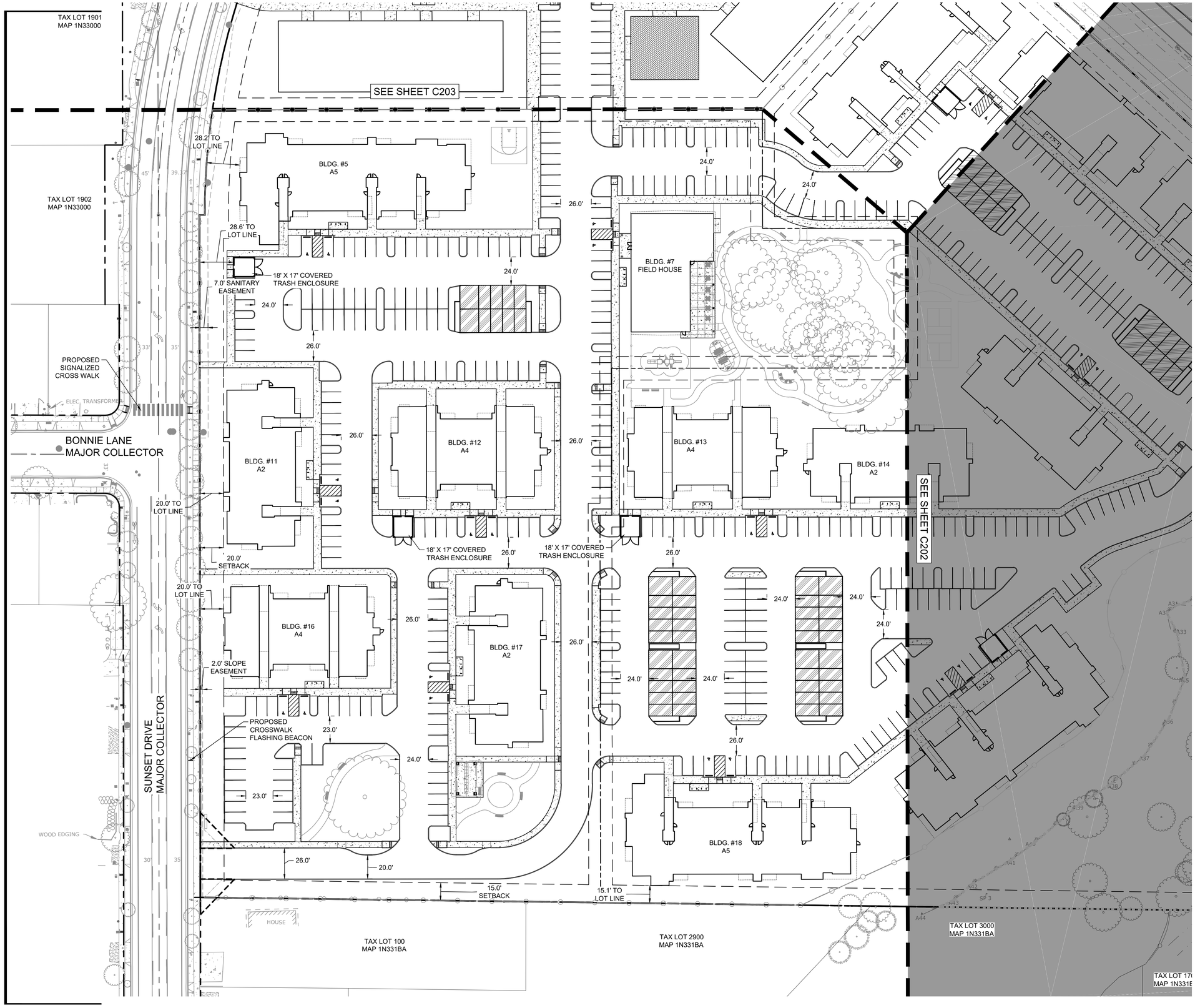
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C200**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\SITE PLAN-22807.DWG




## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- EXISTING EDGE OF ASPHALT
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE
- PROPOSED CURB FACE/BACK
- PROPOSED CONCRETE
- PROPOSED CONCRETE SCORING
- PROPOSED BUILDING LINE
- VISION CLEARANCE TRIANGLE
- PROPOSED GARAGE
- PROPOSED BICYCLE RACKS
- PROPOSED LIGHTING
- ADA PARKING SYMBOL
- C COMPACT PARKING SYMBOL

N
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S

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 40'
0 40 80 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH O'SEAN
EXPIRES: 12/31/24
PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

# *SITE PLAN I* ***BROWN'S FARM***

JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C201**

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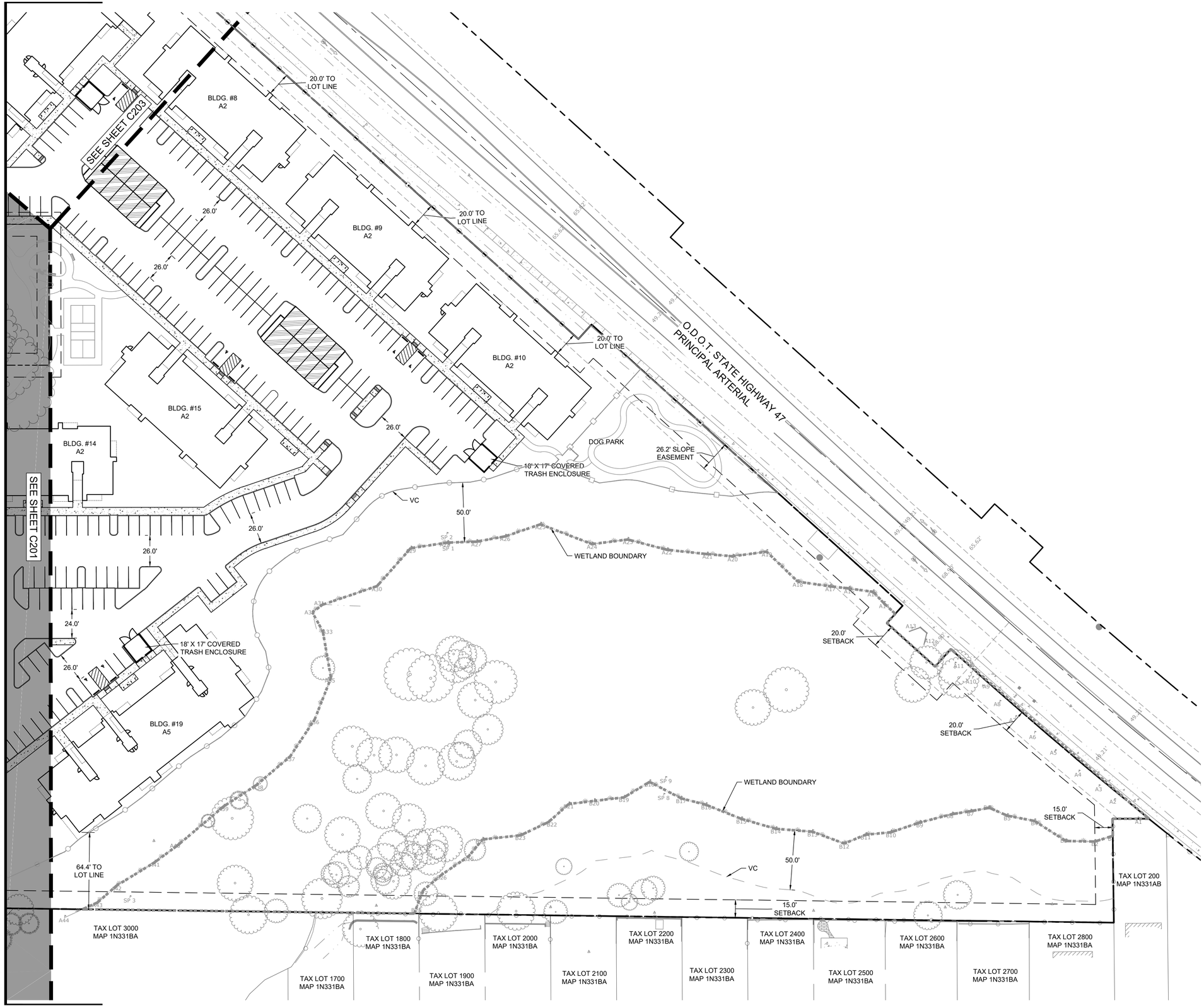


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## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- EXISTING EDGE OF ASPHALT
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE
- PROPOSED CURB FACE/BACK
- PROPOSED CONCRETE
- PROPOSED CONCRETE SCORING
- PROPOSED BUILDING LINE
- PROPOSED GARAGE
- PROPOSED BICYCLE RACKS
- PROPOSED LIGHTING
- ADA PARKING SYMBOL

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 40'
0 40 80 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24
PRELIMINARY

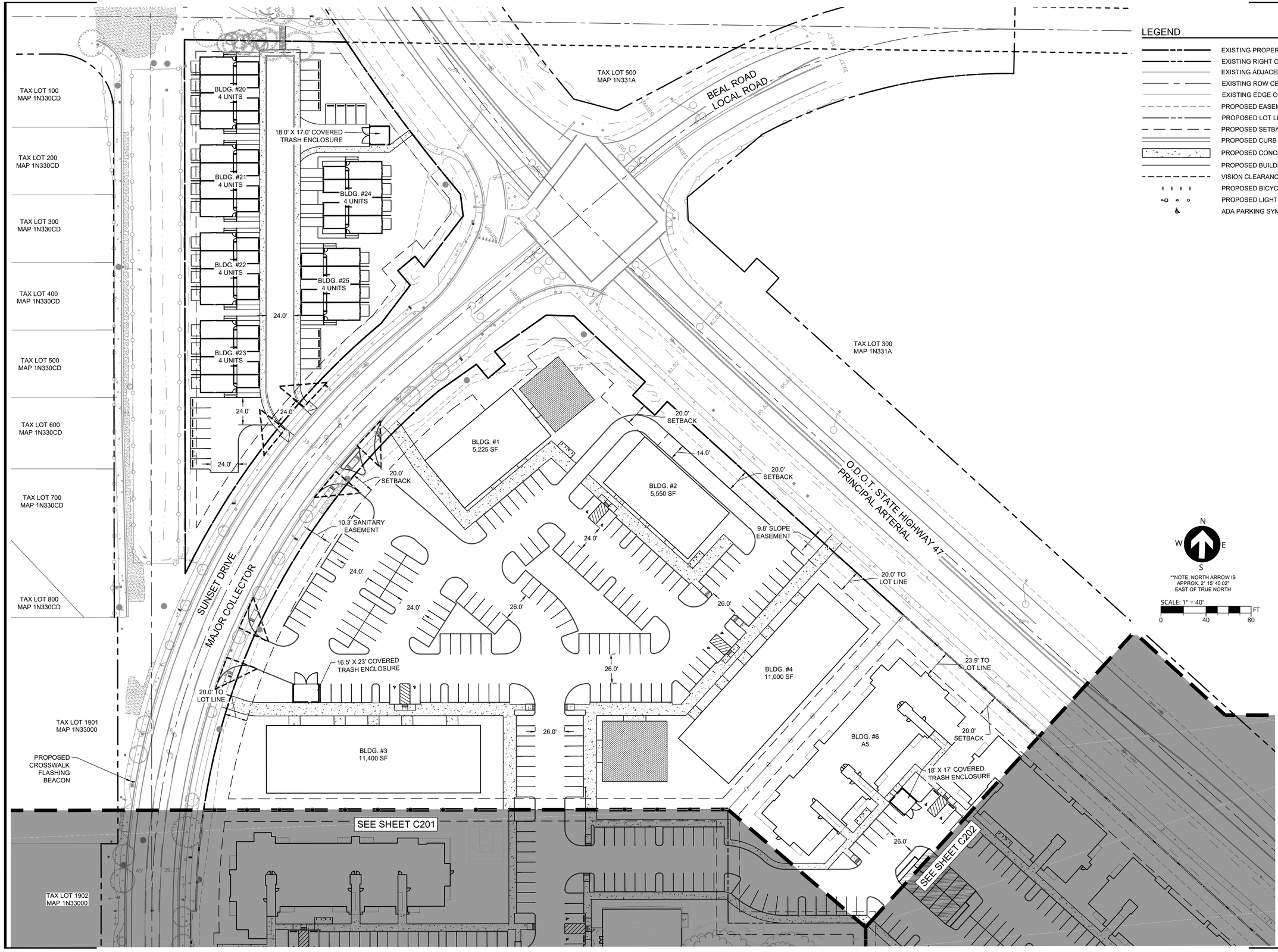
PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

*SITE PLAN II*
***BROWN'S FARM***
JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
C202




## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- EXISTING EDGE OF ASPHALT
- PROPOSED EASEMENT LINE
- PROPOSED LOT LINE
- PROPOSED SETBACK LINE
- PROPOSED CURB FACE/BACK
- PROPOSED CONCRETE
- PROPOSED BUILDING LINE
- VISION CLEARANCE TRIANGLE
- PROPOSED BICYCLE RACKS
- PROPOSED LIGHTING
- ADA PARKING SYMBOL

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 40'
0 40 80 FT

REGISTERED PROFESSIONAL ENGINEER
89569
OREGON
JULY 8, 2015
ELIZABETH A. OLSEN
EXPIRES: 12/31/24
PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

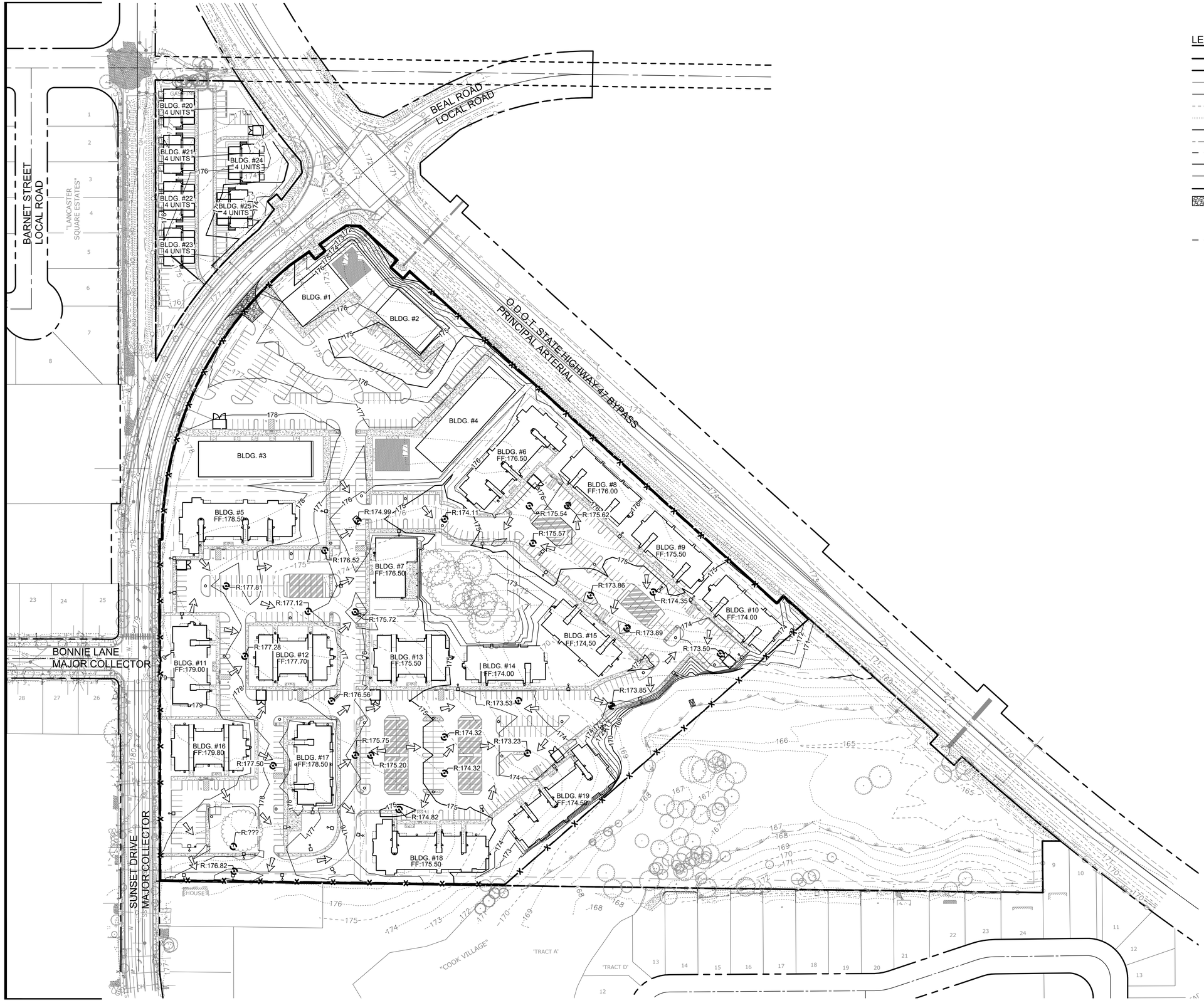
# SITE PLAN III
# BROWN'S FARM
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C203**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\SITE PLAN-22807.DWG

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## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- 110 EXISTING MAJOR CONTOUR
- 108 EXISTING MINOR CONTOUR
- PROPOSED LOT LINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE
- 110 PROPOSED MAJOR CONTOUR
- 108 PROPOSED MINOR CONTOUR
- PROPOSED SILT FENCING
- PROPOSED CONSTRUCTION ENTRANCE
- PROPOSED INLET PROTECTION
- SURFACE RUN-OFF FLOW ARROW
- PROPOSED LIMITS OF DISTURBANCE
- TRAPPED CATCH BASIN
- FILTERED CATCH BASIN

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'
0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89568PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# GRADING AND EROSION CONTROL PLAN
# BROWN'S FARM

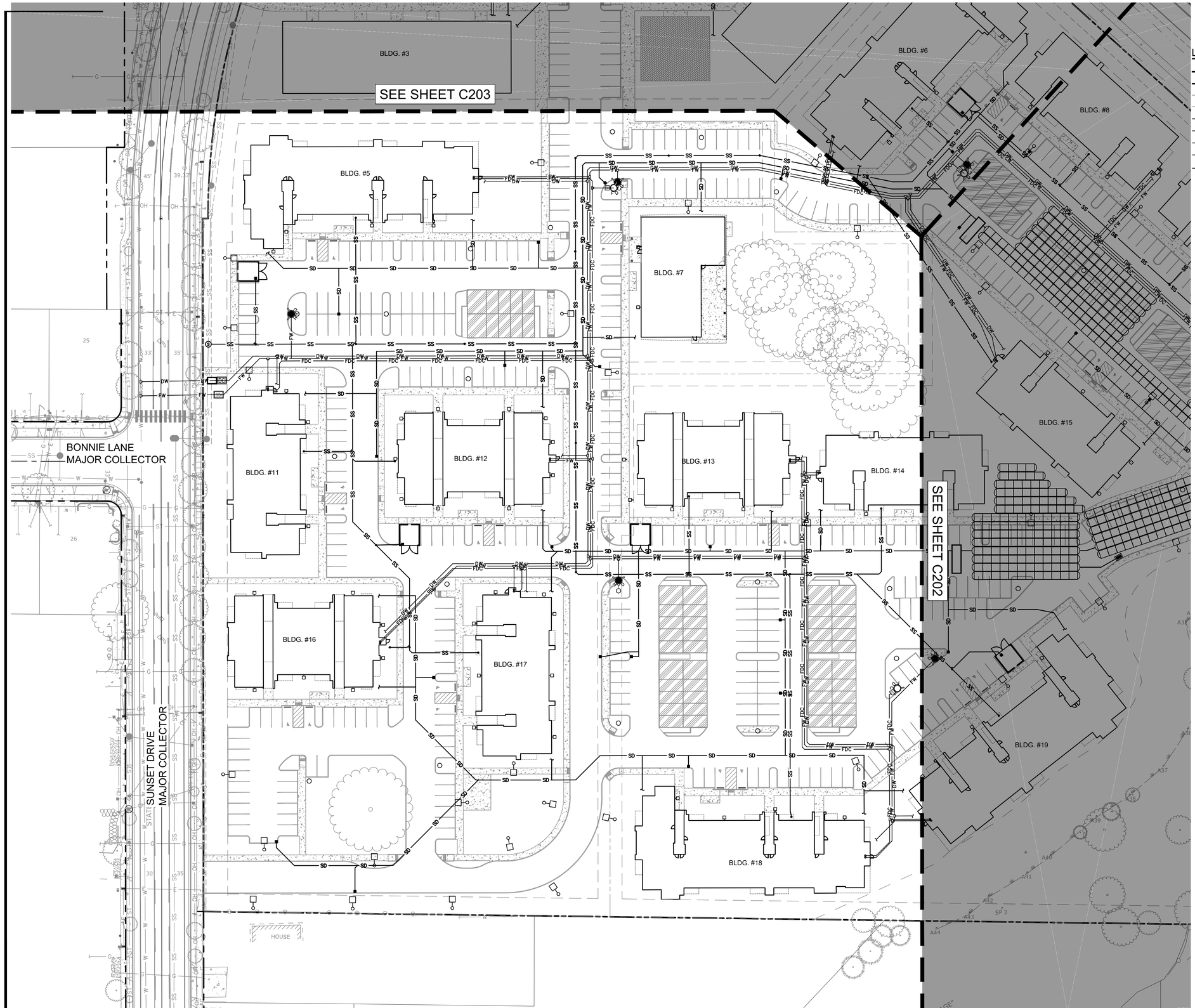
JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C210**




## LEGEND

- PROJECT BOUNDARY
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- PROPOSED EASEMENT LINE
- SD — PROPOSED STORM PIPE
- SS — PROPOSED SANITARY PIPE
- FW — PROPOSED FIRE WATER SERVICE
- DW — PROPOSED DOMESTIC WATER SERVICE
- FDC — PROPOSED FIRE DEPARTMENT CONNECTION
- PROPOSED TRAPPED CATCH BASIN
- PROPOSED DCDA
- PROPOSED DC
- PROPOSED FDC VAULT
- PROPOSED WATER METER
- PROPOSED HYDRANT
- FIRE DPT. CONNECTION
- PROPOSED MANHOLE
- PROPOSED CLEANOUT
- PROPOSED LIGHTING

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 40'
0 40 80 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# COMPOSITE UTILITY PLAN
# BROWN'S FARM
JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C300**

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BLDG. #6

BLDG. #8

BLDG. #9

BLDG. #10

BLDG. #15

BLDG. #14

BLDG. #19

SEE SHEET C203

SEE SHEET C201

O.D.O.T. STATE HIGHWAY 47
PRINCIPAL ARTERIAL

## LEGEND

- PROJECT BOUNDARY
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- PROPOSED EASEMENT LINE
- PROPOSED STORM PIPE
- PROPOSED SANITARY PIPE
- PROPOSED FIRE WATER SERVICE
- PROPOSED DOMESTIC WATER SERVICE
- PROPOSED FIRE DEPARTMENT CONNECTION
- PROPOSED TRAPPED CATCH BASIN
- PROPOSED TREATMENT CATCH BASIN
- PROPOSED UNDERGROUND DETENTION
- PROPOSED FDC VAULT
- PROPOSED HYDRANT
- FIRE DPT. CONNECTION
- PROPOSED CLEANOUT
- PROPOSED LIGHTING

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 40'
0 40 80 FT

REGISTERED PROFESSIONAL ENGINEER
89565PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24
PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

*COMPOSITE UTILITY PLAN*
***BROWN'S FARM***
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**C301**

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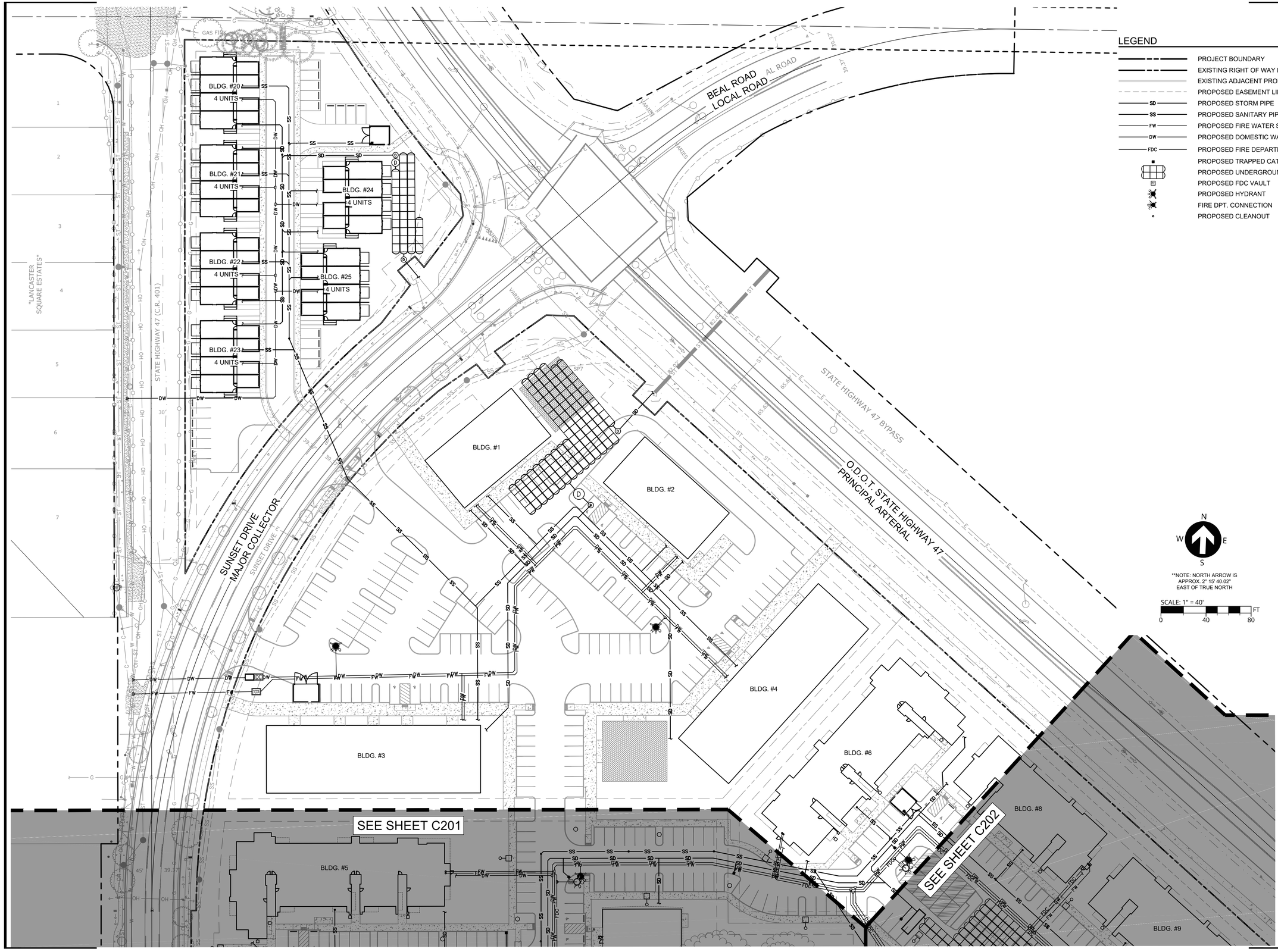



## LEGEND

- PROJECT BOUNDARY
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- PROPOSED EASEMENT LINE
- SD — PROPOSED STORM PIPE
- SS — PROPOSED SANITARY PIPE
- FW — PROPOSED FIRE WATER SERVICE
- DW — PROPOSED DOMESTIC WATER SERVICE
- FDC — PROPOSED FIRE DEPARTMENT CONNECTION
- PROPOSED TRAPPED CATCH BASIN
- PROPOSED UNDERGROUND DETENTION
- PROPOSED FDC VAULT
- PROPOSED HYDRANT
- FIRE DPT. CONNECTION
- PROPOSED CLEANOUT

N

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 40'

0 40 80 FT

REGISTERED PROFESSIONAL ENGINEER
89568PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# *COMPOSITE UTILITY PLAN*
# ***BROWN'S FARM***

JTSC, LLC
FOREST GROVE, OREGON

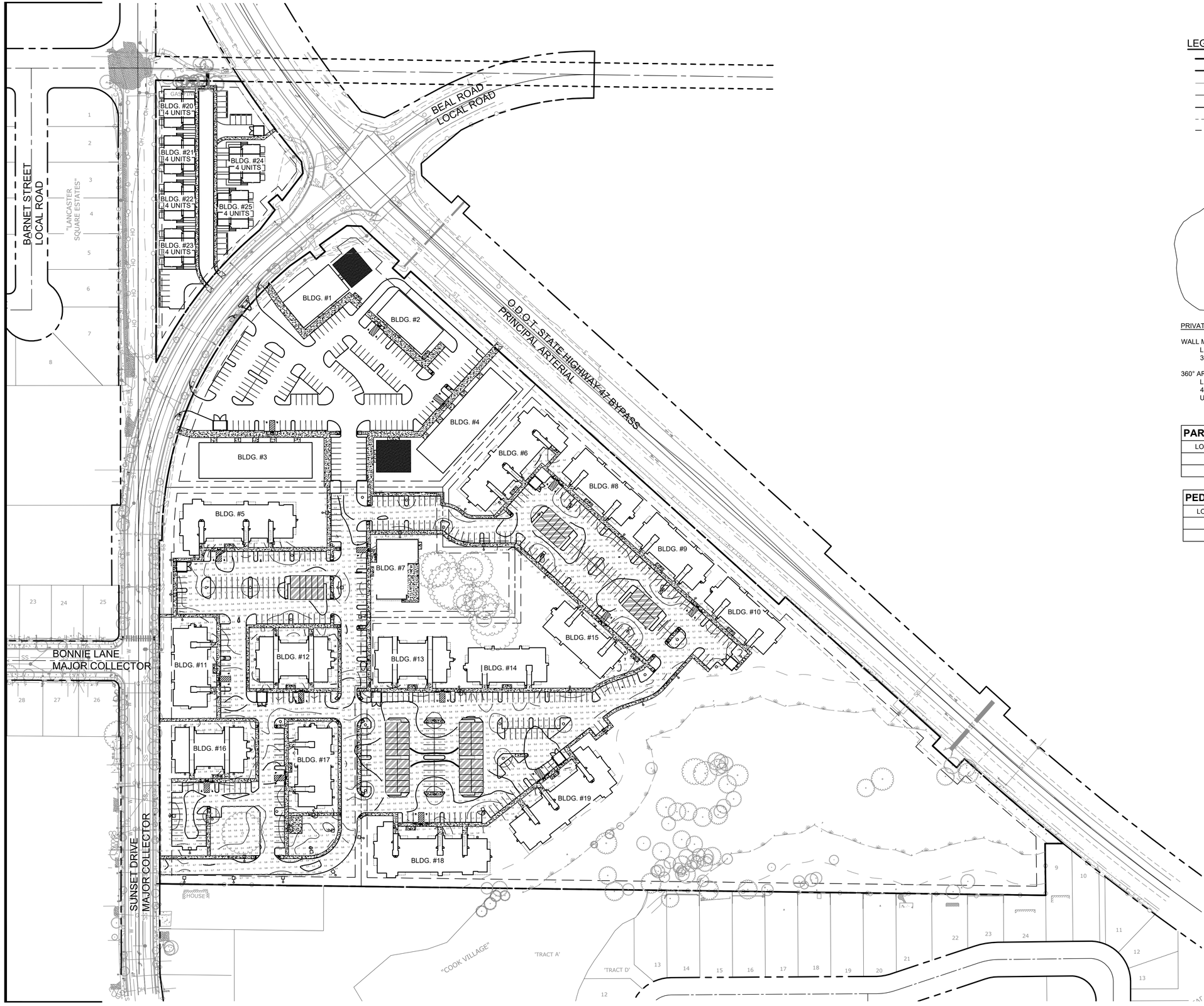

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C302**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\COMPOSITE UTILITY PLAN-22807.DWG

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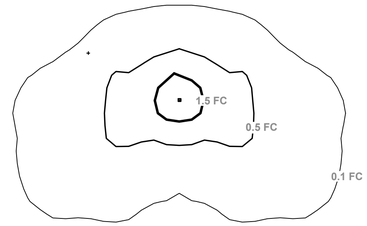
## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED LOT LINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE
- PROPOSED LIGHTING
- 0.7 - ILLUMINATION ANALYSIS POINT (FC)
- FC - FOOT CANDLE UNIT




PRIVATE SITE LIGHTING LUMINAIRES

WALL MOUNTED AND COBRAHEAD LIGHTS:
LEOTEK GCJ2-30J-MV-30K-2R-XX-055
37W LED (5550 LUMENS) AT 18' MOUNTING HEIGHT

360° AREA LIGHTS:
LEOTEK GCJ2-30J-MV-30K-5-XX-065
44W LED (6425 LUMENS) AT 18' MOUNTING HEIGHT
UNLESS NOTED OTHERWISE

| PARKING AREA | |
|---|---|
| LOW PEDESTRIAN CONFLICT AREA | CALCULATED |
| AVERAGE ILLUMINANCE (fc) | 0.5 |
| UNIFORMITY (max / min) | 0.14 |

| PEDESTRIAN ROUTE | |
|---|---|
| LOW PEDESTRIAN CONFLICT AREA | CALCULATED |
| AVERAGE ILLUMINANCE (fc) | 1.5 |
| UNIFORMITY (max / min) | 0.10 |

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'

0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

*LIGHTING PLAN*

***BROWN'S FARM***

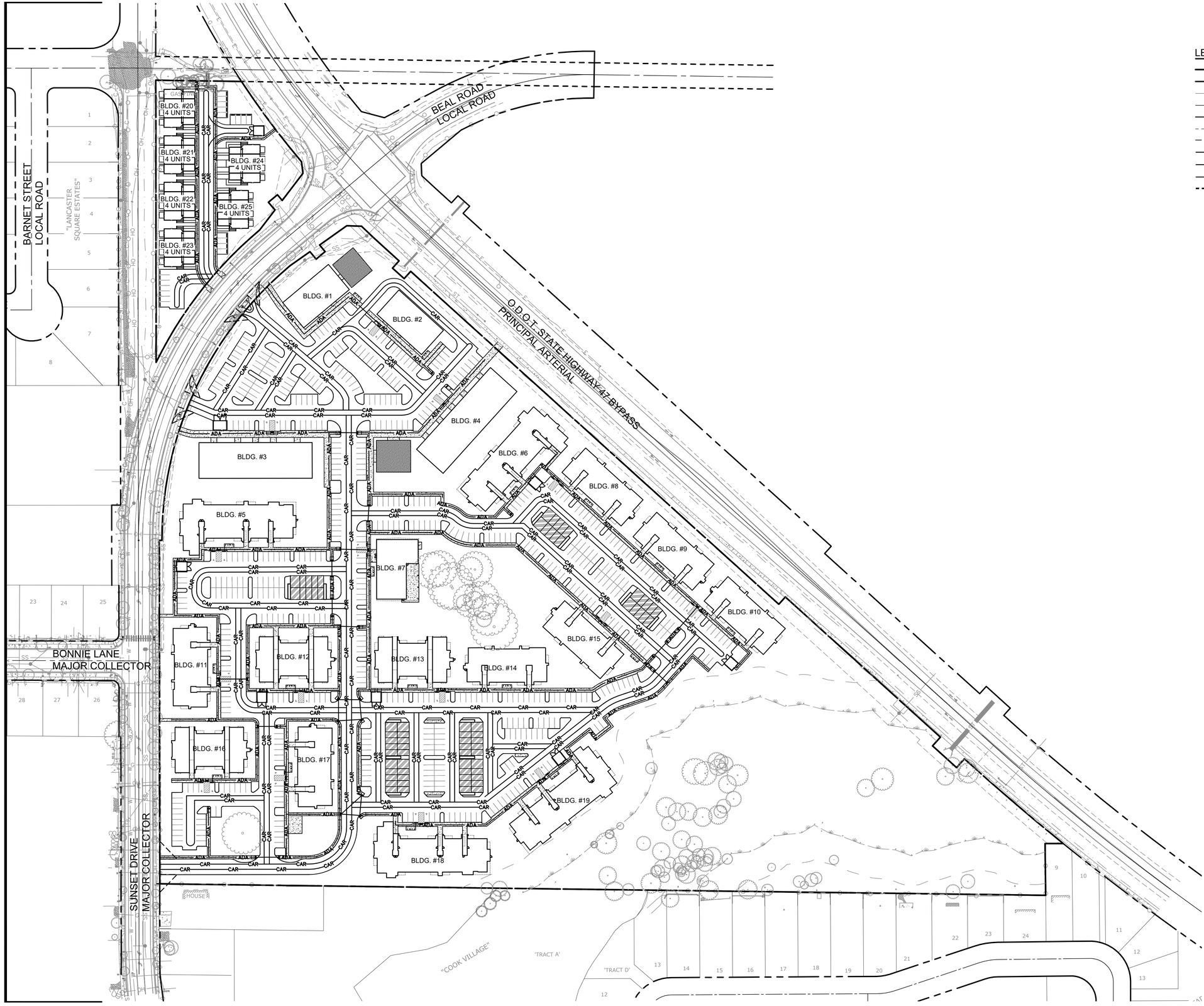
JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C410**

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## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED LOT LINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE
- PED — PEDESTRIAN PATHWAY
- ADA — ADA PATHWAY
- CAR — VEHICLE PATHWAY
- VISION CLEARANCE TRIANGLE

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**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'
0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# SITE CIRCULATION PLAN
# BROWN'S FARM

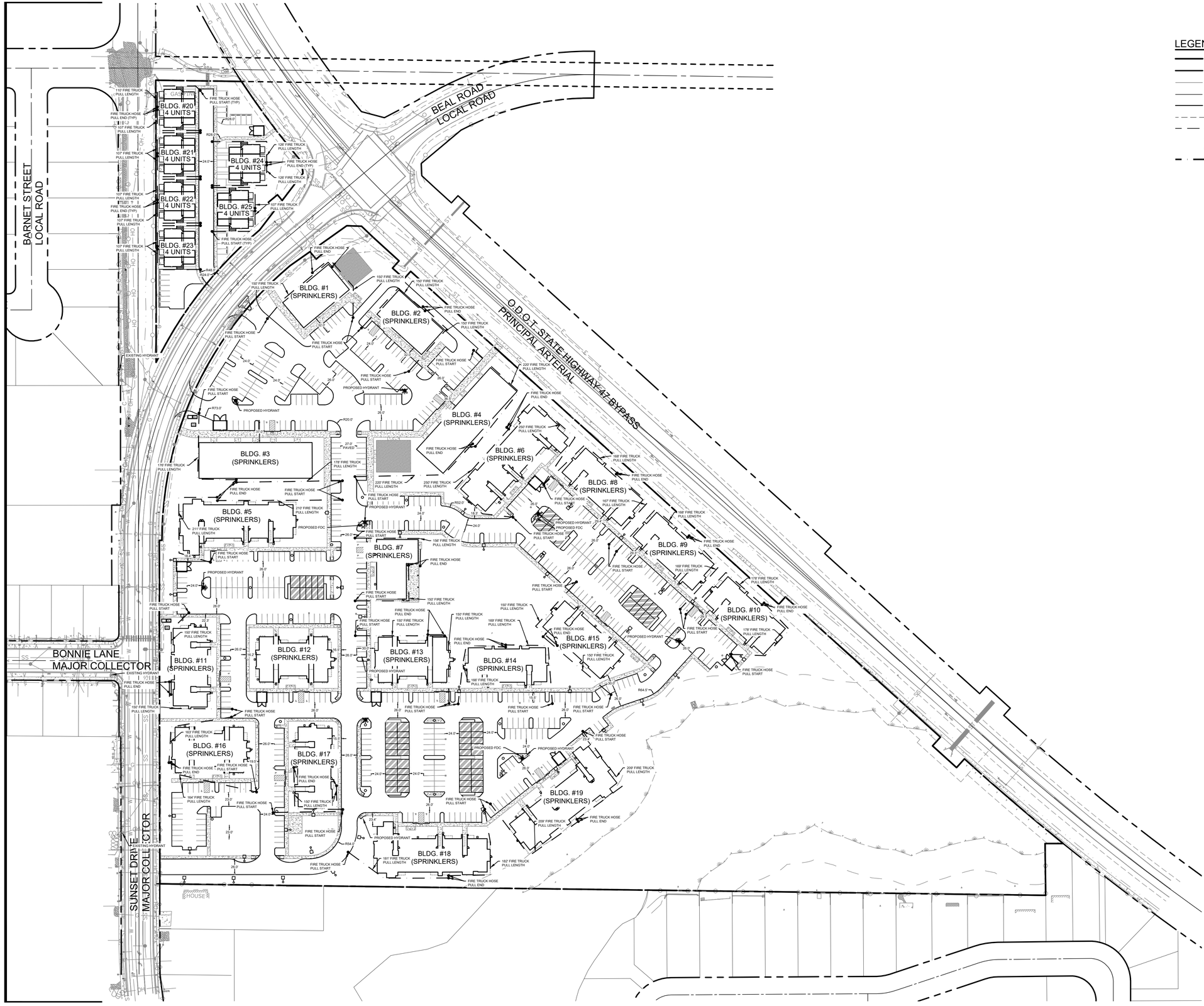
JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C420**




## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED LOT LINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE
- PROPOSED HYDRANT
- FIRE DPT. CONNECTION
- FIRE TRUCK HOSE PULL
- FIRE HOSE PULL START/STOP

N
W E
S

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'

0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
**OCTOBER 20, 2023**

ISSUED FOR
**LAND USE**

REVISIONS

# *FIRE ACCESS PLAN*
# ***BROWN'S FARM***

JTSC, LLC
FOREST GROVE, OREGON

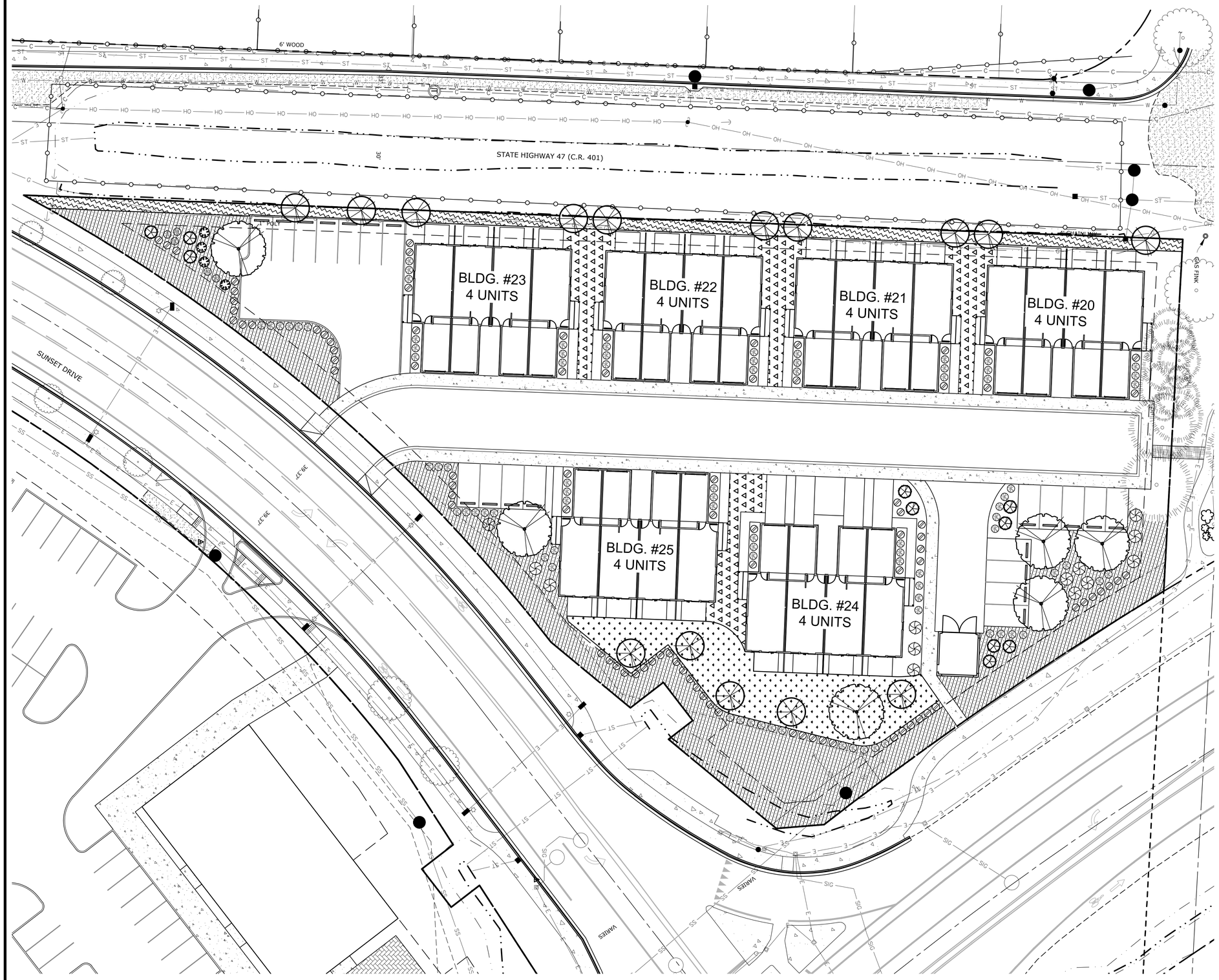

3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION

| | |
|---|---|
| 3J PROJECT # | 22807 |
| TAX LOT(S) | 100, 600 |
| LAND USE # | - |
| DESIGNED BY | LEO, KDO, SMT |
| CHECKED BY | AJM, JJS |

SHEET NUMBER
**C430**

P:\22807-JTS-BROWN'S FARM MIXED USE\CAD\SHEETS\FIRE ACCESS PLAN-22807.DWG




## LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED TYPE C BUFFER AREA MIN. 20 ONE GALLON SHRUBS PER 1,000 SF OF AREA
- PROPOSED GROUND COVER AREA LIPSTICK STRAWBERRY OR EQUAL
- PROPOSED BARK MULCH AREA 3" DEPTH OR GREATER
- PROPOSED LAWN AREA
- PROPOSED DECIDUOUS TREE BOWHALL MAPLE OR EQUAL
- PROPOSED EVERGREEN TREE LELAND CYPRESS OR EQUAL
- PROPOSED LARGE SHRUBS GOLD SPOT EUONYMUS OR TINY TOWER CYPRESS OR DAVID VIBURNUM OR EQUAL
- PROPOSED SMALL SHRUBS HELMOND PILLAR BARBERRY OR FOERSTER'S FEATHER REED GRASS OR EQUAL

SCALE: 1" = 20'
0 20 40 FT

REGISTERED PROFESSIONAL ENGINEER
89569PE
OREGON
JULY 8, 2015
ELIZABETH OLSEN
EXPIRES: 12/31/24

PRELIMINARY

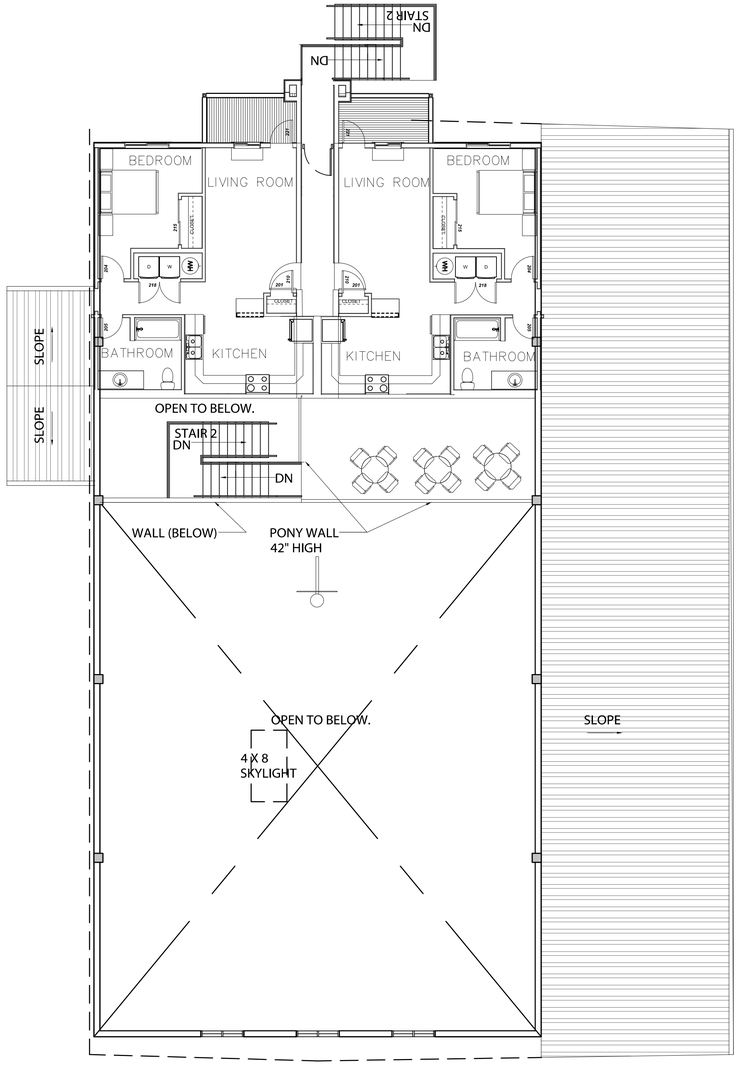
PUBLISH DATE
**OCTOBER 20, 2023**
ISSUED FOR
**LAND USE**
REVISIONS

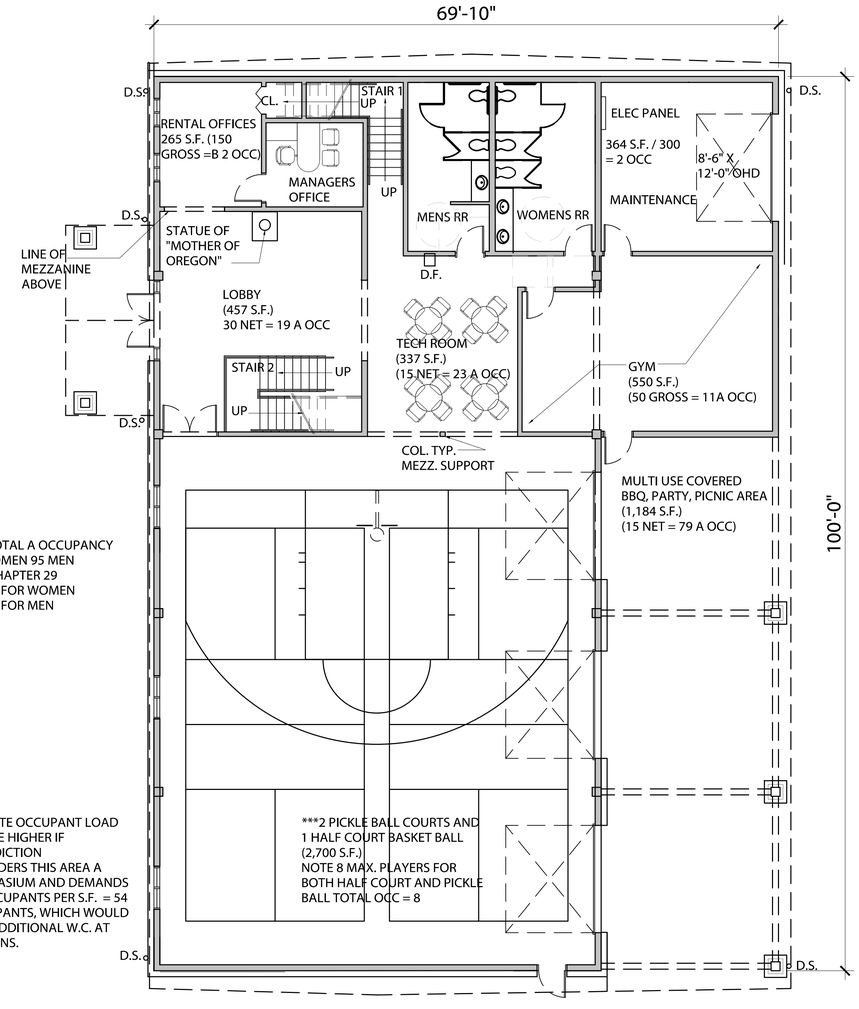
# *PRELIMINARY TOWNHOME LANDSCAPE PLAN*
# ***BROWN'S FARM***
JTSC, LLC
FOREST GROVE, OREGON


3J CONSULTING
CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008


PROJECT INFORMATION
3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
**L001**




**CONSTRUCTION TYPE OPTIONS**

1) TYPE VB CONSTRUCTION FIRE SPRINKLERS REQUIRED 1 HOUR OCCUPANCY SEPARATION REQUIRED

**AT THE ENTRY AIR CURTAIN AND SELF CLOSING DOORS REQ. OTHERWISE A VESTIBULE WILL BE REQUIRED.**

AIR CURTAIN UNITS SHALL BE TESTED IN ACCORDANCE WITH ANSI/AMCA 220 OR ISO 27327-1 AND INSTALLED AND COMMISSIONED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ENSURE PROPER OPERATION AND SHALL HAVE A JET VELOCITY OF NOT LESS THAN 6.6 FT/S AT 6.0 IN. ABOVE THE FLOOR AND DIRECTION NOT LESS THAN 20 DEGREES TOWARDS THE OPENING. AUTOMATIC CONTROLS SHALL BE PROVIDED THAT WILL OPERATE THE AIR CURTAIN WITH THE OPENING AND CLOSING OF THE DOOR.

**SKYLIGHT WILL BE REQUIRED.**

MIN. 1/4 TOTAL AREA UNDER 15'-0" HIGH ROOF STRUCTURE (OVER MIN. 2,500 S.F.) MUST HAVE SKYLIGHTING.

4,100 S.F. / 2 = 2,050 MIN. PROVIDED MEETS THIS MIN.

1 MEZZANINE FLOOR PLAN
SCALE: 1/8" = 1'-0"

PLAN NORTH

2 1ST FLOOR PLAN
SCALE: 1/8" = 1'-0"

PLAN NORTH

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AXIS DESIGNGROUP
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11104 S.E. STARK STREET
PORTLAND, OR 97216
T: 503.284.0988 | F: 503.546.9276

# BROWN'S FARM
FOREST GROVE, OREGON

REVISIONS

| No. | Description | Date |
|---|---|---|
| | | |

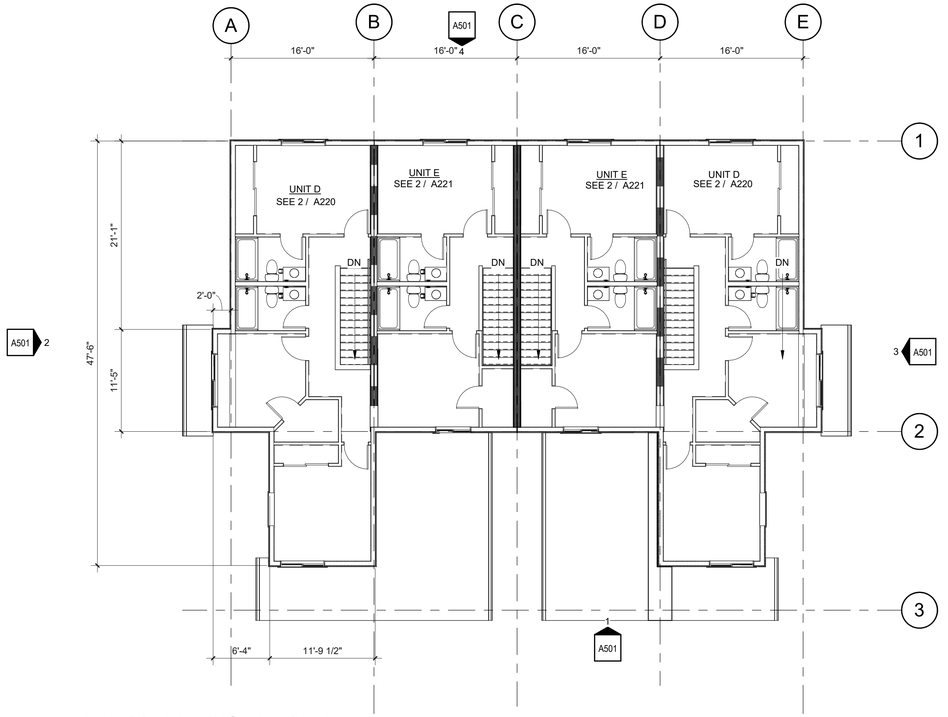
DRAWN BY:
CHECKED BY:
JOB NO: 22-040

DATE: 00/00/0000
ISSUED FOR: CHECK

SHEET TITLE

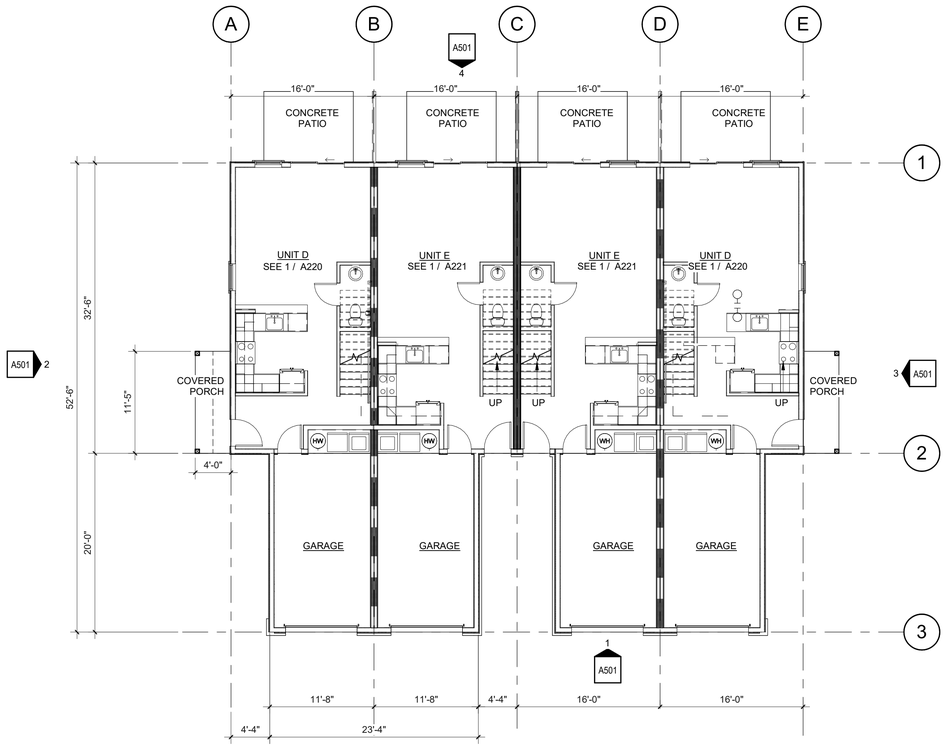
SHEET NO.

S:\Projects\2023 Projects\23-003_Brown's Farm Multi-Family - Forest Grove\F_Drawings\F2_Current\CAD\A-121 - 23-003 - Floor Plan - Field House Apt.dwg @ Plot Date: Oct 20 23 @ Time: 4:13 PM




## 2 4-PLEX BUILDING - LEVEL 2

SCALE: 1/8" = 1'-0"




## 1 4-PLEX BUILDING - LEVEL 1

SCALE: 1/8" = 1'-0"

C:\300 Revit Local Files\223XXX_JTSC BROWNS FARM_ARCH_R23_dmasukawa@lrsarchitects.com.rvt
10/18/2023 10:57:21 AM

## GENERAL NOTES:

A. ALL PLAN WALLS SHOW FRAMING ONLY UON. NO FINISHES ARE DRAWN. ALL DIMENSIONS ARE TO FACE OF FRAMING UON OR CENTER OF WINDOW OPENING, COLUMN, OR GRID. EXTERIOR DIMENSIONS ARE TO FACE OF FOUNDATION/ FACE OF FRAMING. DIMENSIONS INDICATED AS "CLEAR MINIMUM" ARE TO FACE OF FINISH.

B. ALL DOOR OPENINGS PERPENDICULAR TO A WALL ARE 5" TO THE WALL UON.

C. SEE SITE PLAN FOR BUILDING ORIENTATION

D. SQUARE CORNERS AT ALL GYPSUM BOARD CORNERS

E. SEE ENLARGED UNIT PLANS FOR INTERIOR WALL DIMENSIONS .

## KEYNOTES

LRS ARCHITECTS
720 NW Davis 503.221.1121
Suite 300 503 221.2077
Portland OR 97209 www.lrsarchitects.com

CONSULTANT:

PROJECT NUMBER: 223263

**JTSC Browns Farm**

Forest Grove, OR

KEY PLAN:

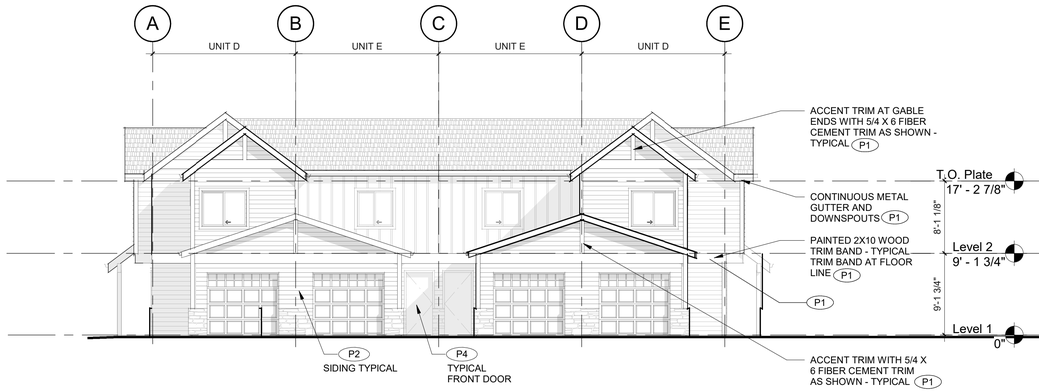
N
True North

SHEET TITLE:
**4 PLEX FLOOR PLANS**

DRAWN BY: DM
DATE CREATED: 04/03/18

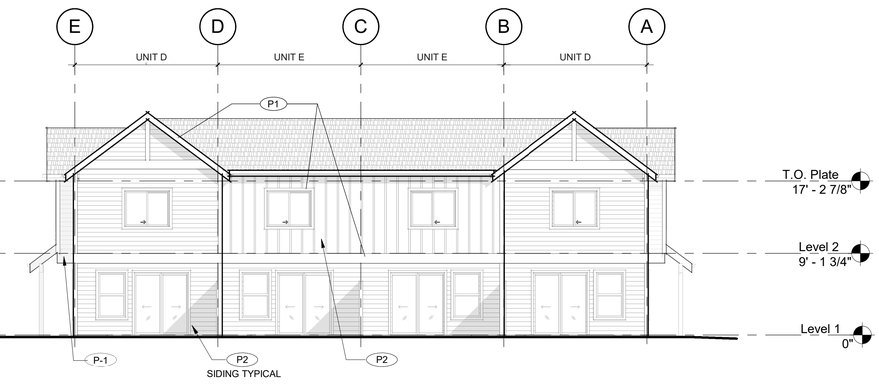
SHEET:
**A201**
LAND USE SUBMITTAL
10/18/23

LRS Architects, Inc. ©2023



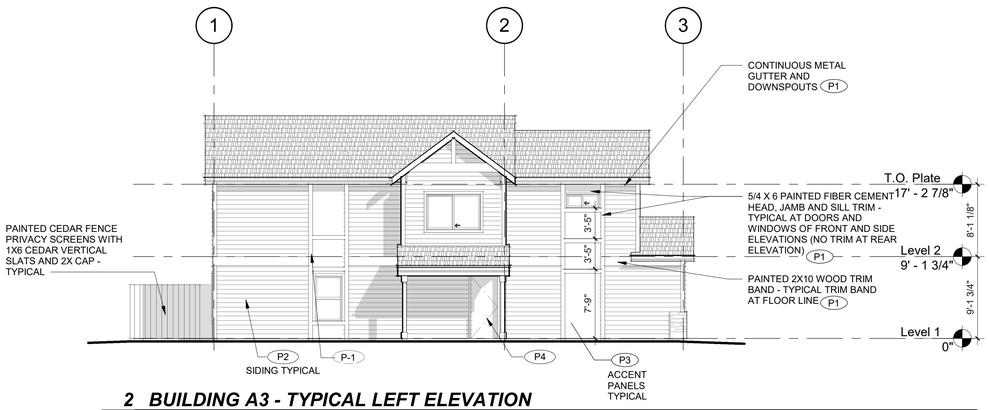

## 1 BUILDING A3 - TYPICAL FRONT ELEVATION

SCALE: 1/8" = 1'-0"



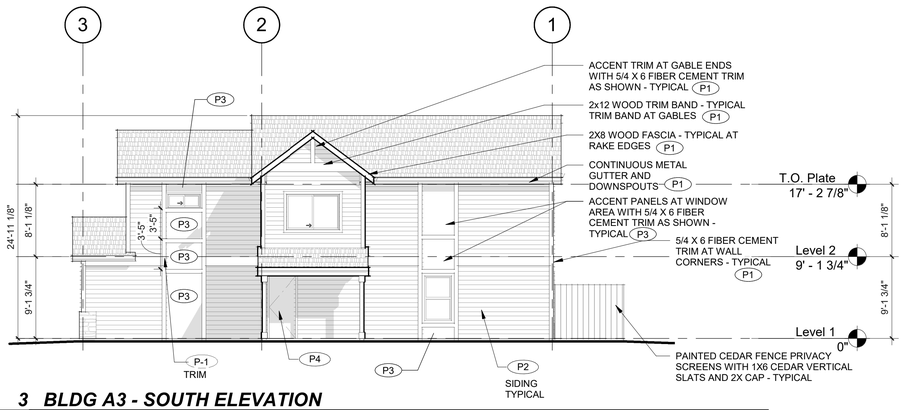

## 4 BLDG A3 - TYPICAL REAR ELEVATION

SCALE: 1/8" = 1'-0"




## 2 BUILDING A3 - TYPICAL LEFT ELEVATION

SCALE: 1/8" = 1'-0"




## 3 BLDG A3 - SOUTH ELEVATION

SCALE: 1/8" = 1'-0"

## GENERAL NOTES:

A. PAINT ALL NON-NOTED MISCELLANEOUS ITEMS TO MATCH ADJACENT REFERENCED FINISH, UON.
B. SEE WALL SECTIONS FOR PARTIAL ELEVATIONS NOT SHOWN.
C. SEE DOOR AND WINDOW SCHEDULES AND ELEVATIONS FOR ADDITIONAL INFORMATION.
D. WINDOWS TO ALIGN VERTICALLY, TYPICAL, UON.

## LEGEND

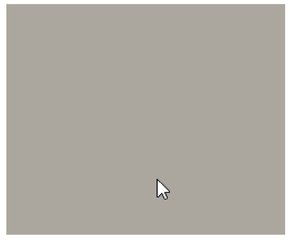
- FIBER CEMENT LAP SIDING (7" REVEAL HORIZONTAL)
- ASPHALT SHINGLE ROOFING, BASIS OF DESIGN: GAF TIMBERLINE NATURAL SHADOW, COLOR BARKWOOD
- SIMULATED STONE
- BATTEN & BOARD
- FIBER CEMENT PANEL ACCENT PANEL

## EXTERIOR FINISH

- P-1 FIBER CEMENT PANEL ACCENT PANELS WITH 5/4 X 6 FIBER CEMENT TRIM. COLOR TO MATCH: SHERWIN WILLIAMS SW 7017 DORIAN GRAY
- P-2 SIDING, ASSOCIATED TRIM, LIVING UNIT VENTS AND PREPAINTED METAL FLASHING COLOR TO MATCH SHERWIN WILLIAMS SW 7015 REPOSE GRAY
- P-3 ACCENT SIDING, ASSOCIATED TRIM, LIVING UNIT VENTS AND PREPAINTED METAL FLASHING COLOR TO MATCH SHERWIN WILLIAMS SW 7075 WEB GRAY
- P-4 FRONT DOORS COLOR TO MATCH SHERWIN WILLIAMS SW 7075 WEB GRAY

BUILDERS VINYL WINDOWS - COLOR: WHITE

ROUGH CUT MOONLIT CULTURED STONE



P-1

P-2

P-3 /P-4

ROOFING GAF TIMBERLINE NATURAL SHADOW, COLOR BARKWOOD


LRS ARCHITECTS
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Suite 300 503.221.2077
Portland OR 97209 www.lrsarchitects.com


CONSULTANT:

PROJECT NUMBER: 223263

**JTSC Browns Farm**

*Forest Grove, OR*

KEY PLAN:

True North

SHEET TITLE:

**EXTERIOR ELEVATIONS**

DRAWN BY: RI
DATE CREATED: 10/18/23

SHEET:

**A501**

LAND USE SUBMITTAL
10/18/23

LRS Architects, Inc. ©2023

**EXECUTIVE ORDER NO. 23-04**

**ESTABLISHING A STATEWIDE HOUSING PRODUCTION GOAL AND HOUSING PRODUCTION ADVISORY COUNCIL**

**WHEREAS,** Oregon is experiencing a severe housing shortage, which increases housing costs and reduces housing affordability, is the primary cause of the homelessness crisis in the state of Oregon, hinders the State's economic prosperity, and prevents too many Oregonians from maintaining housing stability, which is the foundation to every family's health, well-being, and economic stability;

**WHEREAS,** the greatest shortage of housing is housing that is affordable to households earning below the median income;

**WHEREAS,** the Oregon Housing Needs Analysis (OHNA) estimated that there is a current shortage of almost 140,000 homes across the state;

**WHEREAS,** the OHNA also estimated that, in addition to addressing the current shortage of housing, the state needs to produce 443,566 homes over the next twenty years to keep pace with demand;

**WHEREAS,** addressing the current shortage and keeping pace with current need over the next ten years would require the production of 361,781 homes over the next ten years, or approximately 36,000 homes each year for the next ten years;

**WHEREAS,** over the past five years, the State has produced an average of 20,000 units per year;

**WHEREAS,** the state would need to approximately double its annual housing production each year to address the current shortage and keep pace with demand;

**WHEREAS,** more than fifty percent of the annual statewide production target of 36,000 homes must be affordable to households making less than 80 percent of Area Median Income (AMI) to meet the need;

**WHEREAS,** experts have determined that the production of housing affordable to people making less than 80 percent of AMI requires public subsidy;

**WHEREAS,** insufficient investment in affordable housing at all levels of government, and especially the federal level, has resulted in the severe shortage of affordable housing in the State of Oregon;

**WHEREAS,** all levels of government, especially the federal government, must significantly increase investment in affordable housing to meet the need;

Contains Recycled Materials

**WHEREAS,** workforce challenges may slow the development of all needed housing;

**WHEREAS,** the shortage of housing across Oregon is a matter of vital statewide importance;

**WHEREAS,** expanding housing opportunities and solving the affordable housing crisis will require a new level of innovation and cooperation between the public, private, and non-profit sectors; and

**WHEREAS,** addressing the housing shortage and building enough housing to meet future demand will improve housing affordability in the State of Oregon and decrease the risk of and actual homelessness in the State of Oregon;

**NOW, THEREFORE, I, TINA KOTEK,** Governor of the State of Oregon, by virtue of the power and authority vested in me by the Constitution and statutes of the State of Oregon, do hereby issue this order to become effective immediately:

**IT IS HEREBY ORDERED THAT:**

1. The State of Oregon establishes an annual housing production target of 36,000 homes;
2. The Governor's Housing Production Advisory Council (the "Council") is established. The Council shall recommend an action plan to meet the State's annual housing production target of 36,000 homes per year for the next ten years. The recommended action plan shall include concrete executive actions, policies, and investments needed to meet this production target.
3. The Council shall consist of no more than twenty-five (25) members. All members of the Council must have a commitment to meeting the state's housing production targets at all levels of affordability. The members shall be selected as follows:
    a. The Governor or her designee shall be a member;
    b. The President of the Senate shall appoint two members of the Oregon State Senate, one from the majority party and one from the minority party, in consultation with each party's leadership;

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c. The Speaker of the House shall appoint two members of the Oregon Housing of Representatives, one from the majority party and one from the minority party, in consultation with each party's leadership;

d. The Director of Oregon Housing and Community Services or their designee shall be a member;

e. The Director of the Department of Land Conservation and Development or their designee shall be a member;

f. An Oregon tribal member shall be a member, appointed by the Governor;

g. The Governor shall appoint up to 17 additional members. These members may, at the discretion of the Governor, include representatives with expertise in the development and operations of housing, including affordable housing, permanent supportive housing, and market rate housing; representatives of rural and coastal communities, communities of color, and local governments; and representatives with expertise in land use, fair housing, permitting, workforce development, and construction.

4. The Governor shall designate two members of the Council as Co-Chairs. One co-chair must reside or work in an urban area. One co-chair must reside or work in a rural or coastal area.

5. A quorum for the Council meetings shall consist of a majority of the appointed members. The Council shall strive to operate by consensus; however the Council may approve measures and recommendations based on an affirmative vote of a majority of the quorum.

6. The Council shall provide a recommended plan framework to the Governor's Office no later than April 1, 2023, and a final recommended action plan no later than December 31, 2023. The report shall include the findings and recommendations of the Council.

7. The Council shall be staffed by the Governor's Office. In addition, the following state offices and agencies shall provide necessary support to the Council:

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a. Oregon Housing and Community Services

b. Department of Land Conservation and Development

c. Higher Education Coordinating Committee

d. Building Codes Division of the Department of Consumer and Business Services

8. The Directors of these agencies and divisions shall cooperate by providing information as needed and available, and by meeting with and reporting to the Council as needed.

9. The Council shall make specific recommendations for policy changes and investments for consideration by the Governor, in order that:

   a. The State meets its annual housing production target to meet the housing needs of Oregonians;

   b. Housing affordability levels are prioritized by the scale of the deficit of each type; and;

   c. Housing is produced spatially in a way that is equitable and affirmatively furthers fair housing.

Done at Salem, Oregon, this 10th day of January, 2023.

Tina Kotek
GOVERNOR

ATTEST:

Shemia Fagan
SECRETARY OF STATE

# EXHIBIT C – DEVELOPMENT CODE STANDARDS AND SPECIFICATIONS

GENERAL

1. The applicant is bound to the project description and all representations made by the applicant during the application and decision-making proceeding.
2. The applicant must comply with all applicable City, and CWS building and development standards, including all dimensional standards and public works specifications [DC §17.8.000 and §17.8.005(A)&(C)].
3. Preliminary plan approval – including all phases - is valid for three (3) years and may not be extended. Within the three (3) year time period, the applicant must submit a final development plan for the entire site [DC §17.4.320(D)].
4. Tentative subdivision plat approval shall be valid for a period of two years from the effective approval date. If the applicant has not submitted a final subdivision plat within two years (with appropriate assurances for improvements, if applicable), the approval shall expire. Upon satisfactory completion, a Mylar copy of the recorded plat shall be provided to the Community Development Department [DC §17.6.115].
5. For all trees proposed to be preserved, the applicant shall comply with the submitted protection plan consistent with the provisions of DC §17.5.120. Protected trees shall be identified on final landscape plans [DC §17.5.130(C)(3)].
6. Prior to the demolition or relocation, in whole or in part, of any landmark, an application and plans shall be submitted to the Community Development Department for review and action by the HLB under Type III procedures.

    A. In considering a proposal for demolition or relocation of a landmark, the HLB shall have the authority to allow the demolition or relocation, or to allow partial demolition or relocation, or to delay approval of the demolition or relocation. If the HLB acts to approve the request, in whole or in part, issuance of a permit and the commencement of work shall be delayed until appeal periods have expired. The Board shall base its action on the following criteria, and shall delay approval of the demolition or relocation if it finds that:
        1. The landmark is of such architectural, historic or scenic interest that its demolition or relocation would be detrimental to the public interest;
        2. The landmark is of such interest or significance that it is or could be included in the National Register of Historic Places or is on the Oregon State Inventory of Historic Places;
        3. The landmark has such unusual design, texture, or materials characteristics that it could not be reproduced or could be reproduced only with great difficulty or expense; or
        4. Retention of the landmark would aid substantially in the preservation of another designated landmark or in preservation of the character of the adjacent area.

    B. If the Board acts to delay approval of the proposal, the demolition or relocation may be delayed for up to a maximum of 180 days from the Board's initial consideration of the proposal. The decision of the HLB may be appealed to the City Council in accordance with the appeal procedures for a Type III decision.

    C. If, at the end of the extended delay period, the owner of the landmark or his or her authorized agent has not withdrawn the application for demolition or relocation,

the application shall be deemed approved, and any city permits required for such demolition or relocation shall be issued [DC §17.5.225 (A),(B) & (C)].

GENERAL DEVELOPMENT STANDARDS

ACCESS AND CIRCULATION:

7. GENERAL PROVISIONS §17.8.110
   A. Continuing obligation of property owner. The provision and maintenance of access and egress stipulated in this section are continuing requirements for the use of any structure or parcel of real property in the city [17.8.110(A)]
   B. Access plan requirements. No building or other permit shall be issued until a scaled site plan is submitted that shows how access, egress and circulation requirements are to be fulfilled [17.8.110(B)].
   C. Joint access. Owners of two or more uses, structures or parcels of land may agree to jointly use the same access and egress when the combined access and egress of both uses, structures or parcels of land satisfies their requirements as designated in this article, provided:
      1. Satisfactory legal evidence shall be presented in the form of deeds, easements, leases or contracts to establish the joint use; and
      2. Copies of the deeds, easements, leases or contracts are placed on permanent file with the city [17.8.110(C)].
   D. Public street access. All vehicular access and egress shall connect directly with a public or private street approved by the city for public use, except where joint access is provided through adjacent or other property which is connected to a street. Vehicular access to a residential use shall be provided within the same lot for single-family and two-family dwellings, and within the same lot or development for multi-family dwellings. Access to multi-family units shall avoid being located through single-family residential areas before being connected to a collector or arterial as designated by the city's Transportation Plan [17.8.110(D)].

8. ON-SITE PEDESTRIAN WALKWAYS § 17.8.115
   A. Required walkways. On-site pedestrian walkways are required as follows:
      1. Walkways shall extend from the ground floor entrances or from the ground floor landing of stairs, ramps or elevators of all commercial, institutional and industrial uses, to the public sidewalk or curb of the public street or streets which provide the required access and egress. Walkways shall provide convenient connections between buildings in multi-building commercial, institutional and industrial complexes. Walkways shall be constructed between a new development and neighboring developments. If connections aren't currently available, then planned connections shall be designed to provide an opportunity to connect adjoining developments.
      2. The maximum distance between a parking space and a walkway shall not exceed 45 feet. All walkways constructed within parking lots shall be raised to standard sidewalk height. All surface treatment of walkways shall be firm, stable and slip resistant.
      3. Required walkways shall be paved with hard-surfaced materials such as concrete, asphalt, stone, brick, etc. Walkways may be required to be lighted and/or signed as

needed for safety purposes. Lighting and or signs may be required for walkways for safety purposes.

4. Whenever required walkways cross vehicle access driveways or parking lots, such crossings shall be designed and located for pedestrian safety. Required walkways shall be physically separated from motor vehicle traffic and parking by either a minimum six-inch vertical separation (curbed) or a minimum three-foot horizontal separation, except that pedestrian crossings of traffic aisles are permitted for distances no greater than 36 feet if appropriate landscaping, pavement markings or contrasting pavement materials are used. Walkways shall be a minimum of four feet in width, exclusive of vehicle overhangs and obstructions such as mailboxes, benches, bicycle racks and signposts, and shall be in compliance with ADA standards.

5. Where required for pedestrian access, interior landscape areas in combination with pedestrian walkways between rows of parking shall be at least ten feet in width to accommodate walkways, shrubbery and trees 20 to 30 feet on-center. This ten-foot width may be reduced between tree areas depending on the characteristics of the vegetation. Angled or perpendicular parking spaces shall provide bumper stops or widened curbs to prevent bumper overhang into interior landscaped areas or walkways[17.8.115(A)].

9. MINIMUM ACCESS REQUIREMENTS FOR RESIDENTIAL USES §17.8.120

A. Direct access to arterial streets from a residential dwelling established after the effective date of this Code is prohibited. The city may permit direct access to an arterial for lots of subdivisions approved prior to the effective date of this Code, and for multi-family residential complexes if the access is designed to local residential street standards.

C. Service drives for multi-family dwellings shall be fully improved with hard surface pavement with a minimum width of:

1. Twelve feet when accommodating one-way traffic; or

2. Twenty feet when accommodating two-way traffic.

*In no case shall the design of said service drive or drives require or facilitate the backward movement or other maneuvering of a vehicle within a street* [§17.8.120(A) & (C)]

10. MINIMUM ACCESS REQUIREMENTS FOR NON-RESIDENTIAL USES §17.8.125

A. Service drives for non-residential uses shall be fully improved with hard surface pavement with a minimum width of:

1. Fifteen feet when accommodating one-way traffic; or

2. Twenty-four feet when accommodating two-way traffic.

B. All non-residential uses shall be served by one or more service drives as determined necessary to provide convenient and safe access to the property. In no case shall the design of said service drive or drives require or facilitate the backward movement or other maneuvering of a vehicle within a street, other than an alley [§17.8.125(A) & (B)].

11. WIDTHS AND LOCATIONS OF DRIVEWAYS AND CURB CUTS §17.8.130

A. Minimum driveway widths at the street right-of-way line shall be 15 feet for institutional, commercial, industrial and ***multi-family residential*** *projects with at least five units*, and

ten feet for single-unit detached and townhomes, duplex, triplex, fourplex and cottage clusters.

B. Maximum driveway widths at the street right-of-way line shall be as follows.

2. Thirty-six feet in institutional, town center or **commercial** zones.

C. Location of curb cut. No portion of a curb cut shall be located closer to an intersecting street right-of-way line than:

1. One hundred feet on an arterial street with four or more travel lanes;
2. Fifty feet on an arterial street with two or three travel lanes;
3. Fifty feet on a collector street; or
4. Twenty feet on a local street.

D. Minimum distance between curb cuts. On arterial and collector streets, minimum distances shall be maintained as follows between adjacent curb cuts on the same side of any such street:

1. Eighty-five feet where the speed limit is 20 mph or less;
2. One hundred five feet where the speed limit is 25 mph;
3. One hundred twenty-five feet where the speed limit is 30 mph;
4. One hundred fifty feet where the speed limit is 35 mph;
5. One hundred eighty-five feet where the speed limit is 40 mph;
6. Two hundred thirty feet where the speed limit is 45 mph; and
7. Two hundred seventy-five feet where the speed limit is 50 mph or greater.

E. In measuring the distance between curb cuts on arterial and collector streets, existing curb cuts, or accesses serving single-family and two-family dwellings shall not be considered.

F. City Engineer ’s authority to restrict driveway widths and locations. To ensure that driveways do not conflict with public infrastructure, the City Engineer has the authority to restrict the width and location of any driveway [§17.8.130(A)-(F)].

12. SPECIFIC SITE ACCESS AND CIRCULATION STANDARDS §17.8.140

A. Multi-unit development. A functional and safe environment for vehicles and pedestrians is important within residential areas. Multi-unit development should be visually appealing from the adjacent street right-of-way and be functionally and aesthetically tied to adjacent residential neighborhoods.

1. Circulation.

a. A continuous pedestrian connection shall be provided from the front door of all residential buildings to the public sidewalk.

b. Separate pathways from dwellings a minimum distance of ten feet. The separation is measured from the pathway edge closest to any dwelling unit.

c. On-site pedestrian walkways are required to be a minimum width of five feet connecting dwelling units to parking/open space /recreation areas.

2. Parking areas.

a. Separate physically and visually parking areas greater than 10,000 square feet in area with landscape planter bays at least 18 feet in width. Individual parking areas may be connected by a driveway.

b. The sidewalk system shall connect the front door of all residential buildings to parking area(s).

3. Pedestrian environment.

a. Residential doors which face a public right-of-way shall be setback a minimum of three feet plus any additional width needed to meet the minimum sidewalk requirements (where applicable) from a public sidewalk.

b. The following types of doors shall not provide the primary entrance into a dwelling unit: sliding glass or solid metal doors without glazing.

c. Residential stoops, porches or terraces shall be raised a maximum of three feet above grade at the adjacent right-of-way.

d. Residences with entry porches or terraces shall have a minimum area of 40 square feet.

e. Residential entries shall be lowered a maximum of four feet below grade measured at adjacent right-of-way.

4. Screening/service areas.

a. All mechanical equipment shall be screened from view by an opaque fence or solid landscape screen eight feet high.

b. Service/refuse collection areas shall not be located within 20 feet of public rights-of-way.

c. All development of two or more stories in height shall be required to provide screening of garbage collection and storage areas from above.

d. All roof mounted mechanical equipment other than vents shall be screened from ground level view. The screening shall be as high as the height of the equipment and shall be integrated with the exterior building facade.

5. Landscaping.

a. At least 75% of required landscaped area shall be planted with any suitable combination of trees, shrubs or evergreen ground cover.

b. A maximum of 25% of required landscaped area may include architectural features or artificial ground covers such as sculptures, benches, masonry or stone walls, rock groupings, decorative hard paving and gravel areas interspersed with planting areas.

6. Crime Prevention Through Environmental Design (CPTED).

a. No landscaping, fences, walls or plant materials greater than five feet in height shall be installed which obstruct the visibility of a dwelling entry from a public street.

b. A minimum of 25 square feet of window area shall be provided within each dwelling unit facing a common open space, pedestrian path or car park to allow visual surveillance.

c. A clear line of site between all front building entries and the public sidewalk or car park shall be maintained.

d. Lighting shall be provided at all exterior dwelling unit entrances.

e. Guard or a keyed variation of gated residential development is prohibited.

f. Motion activated security lighting is prohibited along public rights-of-way [17.8.140(A)].

B. Commercial development. Commercial development should accommodate automobiles, mass transit, bicycles and pedestrians in a safe, functional and visually appealing manner.

1. Circulation.

a. Auto/truck access to parking shall be from a local or collector street, an adjacent development, alley or existing driveways along arterial roads.

b. Where buildings are setback from right-of-ways, a continuous and direct sidewalk with a 12-foot minimum width shall be provided between the public sidewalk and the front door to all buildings on site.

c. All roadways or drives shall include sidewalks on both sides of travel lanes with the exception of vehicle facilities that provide access to loading and service areas.

2. Parking.

a. Construct off-street surface parking that does not occupy more than 50% of the street frontage. Where a site has frontage along a side street a surface car park may occupy more than 50% of the side street frontage.

b. Screen parking with a solid perimeter wall, decorative welded metal (wrought iron) fencing and columns, earthen berm or evergreen hedge (or a combination thereof). The maximum height of screening shall be five feet except along the street frontage where the maximum height shall be three feet six inches.

c. Provide a minimum of 15% of the car park as water pervious surface – either paving or landscaped retention areas.

d. Development sites shall not consist of paved parking areas of more than 50% of the entire site area.

3. Pedestrian environment.

a. The sidewalk system shall connect all customer entrances to the public sidewalk.

b. Minimum sidewalk width ten feet. Sidewalks shall meet American with Disabilities Act (ADA) requirements and may include landscaped areas, benches and other pedestrian amenities.

c. Plazas, squares or courts shall be fronted by commercial building facades with 75% or more transparency/window opening of first 15 feet of building.

d. All development shall provide a sheltered entry area at the entrance to each commercial establishment with a minimum area of 50 square feet and a minimum dimension of six feet.

4. Screening of service areas.

a. All loading areas shall be physically separated from customer pedestrian and residential areas with a solid five-foot tall fence, evergreen hedge, arbor, berm or a combination of these elements.

b. All ground level and roof-top mechanical equipment shall be screened from view with landscaping, fencing and or walls. The height of the screen shall equal or exceed the height of the equipment, and include screening from views from above when visible from adjacent inhabited buildings.

5. Landscaping.

a. Landscaping standards vary depending on zoning, use, adjacent zoning and existing site conditions.

b. A landscaped strip at least ten feet in width shall be provided abutting any property line facing a street. The landscape strip shall be appropriately landscaped with ground cover, planted berm, shrubbery and/or trees.

c. At least 75% of required landscaped area shall be planted with any suitable combination of trees, shrubs or evergreen ground cover.

d. A maximum of 25% of required landscaped area may include architectural features or artificial ground covers such as sculptures, benches, masonry or stone walls, rock groupings, decorative hard paving and gravel areas interspersed with planting areas [17.8.140(B)]

13. CLEAR VISION AREA - STANDARDS §17.8.155

Except in the Town Center zones, a clear vision area shall be maintained on the corners of all property adjacent to the intersection of two streets, a street and a railroad, or a driveway providing vehicular access to a public street, excluding alleys.

A. On corner lots, no vehicle, fence, wall, hedge or other planting or structure shall be parked, erected, planted, placed, located or maintained, except for occasional tree trunks or poles, so as to impede visibility within the greater of the two clear vision areas defined below (see Figure 8-5):

1. The triangular area formed by the curb lines along such lots and a straight line joining said curb lines at points which are 30 feet distant from the intersection of the curb lines and measured along such lines; or

2. The triangular area formed by the property lines of such lots and a straight line joining said property lines at points which are ten feet distant from the intersection of the property lines and measured along such lines.

B. A private access shall be treated as a public street for the purpose of this section. The edge of the paved surface area of the private access, be it roadway, curb or sidewalk, shall be treated as the curb line in determining the vision clearance area.

C. The vision clearance area for all commercial, industrial, institutional and multi-family uses shall be determined in the manner set forth in subsectionA.1. above.

E. Any obstruction maintained in violation of this section shall be deemed in violation of the Development Code and shall be abated pursuant to § 17.1.400 enforcement procedures. [§17.8.155(A),(B),(C) & (E)].

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14. OPEN SPACE, RECREATIONAL FACILITIES AND COMMON AREAS – STANDARDS §17.8.205

A. Open space areas may be required to avoid placing structures or other improvements either in identified hazard or resource areas as required by §§ 17.5.005 et seq. and 17.8.300 et seq.

B. Areas retained to comply with Clean Water Services (CWS) water quality sensitive area and vegetative corridor requirements of the Design and Construction Standards or surface water quality or quantity facilities requiring over 100 square feet of area shall be considered open space but not be considered a recreational area unless so designed as to be integrated with a development 's site design and available for access for residents in the development.

C. Except for developments in TCC or TCT zones, any development not involved in a division of land, open space and recreation areas shall be held in common for residential condominiums or by the primary land owner for apartment complexes or non-residential. The area shall be placed within an easement unless waived by the Director for minor recreation facilities or recreation facilities that are integrated with the developed portion of the project.

2. All condominium, two-family dwellings and multi-family dwellings of 20 units or more, residential care facilities, residential care institutions and nursing or convalescent homes shall improve one-half of the required open space as recreation space. Recreation space shall be planted in grass and/or improved for recreational use, and have a minimum area of 870 square feet and a minimum dimension of 20 feet. For two-family and multi-family dwellings, the recreational area shall include a children's play area. A fence shall be installed that is a minimum of 30 inches in height to separate a parking lot, street or driveway from any children's play area.

3. For the development of condominiums, two-family and multi-family dwellings of 20 units or more, residential care facilities and residential care institutions, individual private open space (patio or balcony) shall be provided for each dwelling unit. All private open space shall be directly accessible from the dwelling unit through a doorway. Patios and balconies shall be at least 48 square feet in size with a minimum width dimension of four feet.

4. Floor area of ground floor patios and all balconies for individual units can be used to meet no more than one-half of the recreational land area requirement. Private open space shall be separated from common open space through the use of perimeter landscaping, fencing or a change in vertical grade (e.g., second floor balconies).

5. Where a proposed condominium, multi-family development, residential care facility, residential care institution, or nursing or convalescent home will abut an existing or proposed public park or open space, the development shall integrate into its design the adjoining park or open space to maximize its benefits to development residents.

6. No less than 75% of all open space areas excluding recreational space shall be landscaped with living ground cover, shrubs or trees.

D. Areas and tracts of land to be held in common, shall meet the following requirements.

1. Common areas shall be held in ownership by either a homeowners association or operator of a multi-family development, residential care facility, residential care institution or nursing or convalescent home.

2. To ensure adequate maintenance of common areas within the land division, the applicant shall provide maintenance provisions in Covenants, Conditions and

Requirements (CC & Rs) when to be maintained by a homeowners association or another method an operator of a multi-family development, residential care facility, residential care institution or nursing or convalescent home [§17.8.205(A)-(D)].

15. RESOURCE AREAS §17.8.305

A. Wetlands, Wetland Buffer Areas, Wildlife Conservation Areas and Vegetated Corridors subject to the provisions of § 17.5.005 shall be left undisturbed unless:

1. Division of State Lands has issued a permit to allow fill in a wetland; or

2. Enhancements that are required or allowed either by the report approved by the city for Wildlife Conservation Areas pursuant to § 17.5.025 or by the Service Provider Letter issued by Clean Water Service.

B. Wetland buffer areas and vegetated corridors shall be provided consistent with the requirements of Clean Water Service (CWS) Design and Construction Standards. Pursuant to § 17.5.025A., a service provider letter from CWS shall be issued prior to filing for a land use permit with the city.

C. All development with Natural Resource Areas shall attempt to design development through avoidance of the resource area. If that cannot be achieved through standard development requirements, then the requirements of §§ 17.5.005 et seq. shall apply and shall override any conflicting development requirements established by other portions of the Development Code in order to minimize intrusion into the NRA.

D. All wetlands, wetland buffers, vegetated corridors and wildlife habitats shall be established as follows.

1. For divisions of land, the area shall be placed in an open space tract separate from areas intended for development. The open space tract is subject to the requirements of §§ 17.8.200 et seq.

2. For development not involved in a division of land, the area shall be held in common for residential condominiums or by the primary land owner for apartment complexes or non-residential development. The area shall be placed within an easement and adequate maintenance provisions shall be provided consistent with the requirements of § 17.8.200.

E. Historic structures and trees. Any modification of historic structures or the removal of trees shall comply with the requirements of §§ 17.5.200 et seq. and 17.5.100 et seq. respectively [§17.8.305(A)-(E)]

16. LANDSCAPING, SCREENING AND BUFFERING

GENERAL PROVISIONS §17.8.410

A. Obligation to maintain. It shall be the continuing obligation of the property owner to maintain required landscaped areas in an attractive manner free of weeds and noxious vegetation. In addition, the minimum amount of required living landscape materials shall be maintained.

B. Ground preparation. The ground in all required landscaped areas should be properly prepared with suitable soil and fertilizer. Specifications shall be submitted with the landscape plans showing that adequate preparation of the top soil and sub-soil will be undertaken prior to planting to support the plantings over a long period of time.

C. Installation requirements. The installation of all landscaping shall be as follows:

1. All landscaping shall be installed according to accepted planting procedures and the provisions of this article;

2. The plant materials shall be of high grade, and shall meet the size and grading standards of the American Standards for Nursery Stock; and

3. All required landscaped areas must be provided with a piped underground irrigation system unless a licensed landscape architect or certified nurseryman submits written verification that the proposed plant materials do not require irrigation.

D. Pruning required. All plant growth in landscaped areas of developments shall be controlled by pruning or trimming so that it will not:

1. Interfere with the maintenance or repair of any public utility;

2. Restrict pedestrian or vehicular access; and

3. Constitute a traffic hazard because of reduced visibility.

E. Certificate of occupancy. Certificates of occupancy shall not be issued unless the landscaping requirements have been met or other arrangements have been made and approved by the city such as the posting of a performance bond or security equal to 125% of the cost of the landscaping.

F. Care of landscaping along public rights-of-way. Appropriate methods for the care and maintenance of street trees and landscaping materials shall be provided by the owner of the property abutting the rights-of-way unless otherwise required for emergency conditions and the safety of the general public [§17.8.410(A)-(F)].

GENERAL STANDARDS §17.8.415

A. Non-invasive native vegetation is encouraged to be used for all landscaping except within 100 feet of a natural resource area. In such situations, native vegetation is required.

B. Installation of bio-swales or preservation of wetlands should be located where possible in landscaped areas.

C. Required landscaping adjacent to public rights-of-way. A strip of land at least five feet in width located between the abutting right-of-way and the off-street parking area or vehicle use area which is exposed to an abutting right-of-way, except in required vision clearance areas.

D. Perimeter landscaping relating to abutting properties. On the site of a building or structure or open lot use providing an off-street parking area or other vehicular use area, where such areas will not be entirely screened visually by an intervening building or structure from abutting property, a five-foot landscaped strip shall be between the common lot line and the off-street parking area or other vehicular use area exposed to abutting property. Landscaped areas should include where possible water quality features such as bio-swales or wetlands, trees, grass, shrubs and other plant material so as to cover the landscape area.

E. Parking area interior landscaping. Landscaped areas shall be appropriately distributed to break up large expanses of pavement, improve the appearance and climate of the site, improve safety and delineate pedestrian walkways and traffic lanes. Except for industrial development within industrial zones, the following interior landscaping shall be met.

1. Percentage approach. For the purpose of this section, INTERIOR PARKING LOT AREA is defined as the hard surface parking area (parking stalls and aisles). Such area does not include loading and unloading zones or perimeter landscaping around the lot. Where perimeter landscaping intrudes into the parking lot four or more feet, that area is included in both the interior parking lot area and interior parking lot landscaping.
2. A required landscaped area shall have a minimum interior dimension of six feet and be no less than 48 square feet in area.
3. At least 8% of the Interior Parking Lot Area shall be landscaped. Landscaped areas may include water quality features such as bio-swales or wetlands , trees , grass, shrubs and other plant material so as to cover the landscape area.
4. One tree shall be required for every 1,600 square feet of interior parking lot area as defined in subsection 1. above. Trees shall have a minimum two-inch caliper and six-foot branch height at time of planting.
5. Interior parking area landscaping and trees must be dispersed throughout the parking area. Some trees may be grouped, but the groups must be dispersed. Required trees may be planted within five feet of the edges of the parking area.
6. Perimeter landscaping area may not substitute for interior landscaping. However, interior landscaping may join perimeter landscaping as long as it extends four feet or more into the parking area from the perimeter landscape line [§17.8.415(A)-(E)].

BUFFERING AND SCREENING STANDARDS §17.8.425

B. Buffering and screening requirements.

1. A buffer consists of an area within a required setback adjacent to a property line and having a depth equal to the amount specified in the buffering and screening matrix and containing a length equal to the length of the property line of the abutting use or uses.
2. Utilities, screening, sidewalks and bikeways, and landscaping may only occupy a buffer area. No buildings, accessways or parking areas shall be allowed in a buffer area except where an accessway has been approved by the city.
3. The minimum improvements within a buffer area shall consist of combinations for landscaping and screening as specified in Tables 8-2, 8-3 and 8-4. In addition, improvements shall meet the following specifications:

a. At least one row of trees shall be planted. They shall have a minimum caliper of two inches at four feet in height above grade for deciduous trees and a minimum height of five feet high for evergreen trees at the time of planting. Spacing for trees shall be as follows:

    1. Small or narrow-stature trees, less than 25 feet tall or less than 16 feet wide at maturity shall be spaced no further than 20 feet apart;
    2. Medium-sized trees between 25 to 40 feet tall and with 16 to 35 feet wide branching at maturity shall be spaced no greater than 30 feet apart; and
    3. Large trees, over 40 feet tall and with more than 35 feet wide branching at maturity, shall be spaced no greater than 40 feet apart.

b. In addition, at least ten five-gallon shrubs or 20 one-gallon shrubs shall be planted for each 1,000 square feet of required buffer area; and

c. The remaining area shall be planted in lawn or other living ground cover.

4. Where screening is required, the following standards shall apply in addition to those required for buffering:

   a. A hedge of narrow or broad leaf evergreen shrubs shall be planted which will form a four-foot continuous screen of the height specified in Table 8-3 within two years of planting;

   b. An earthen berm planted with evergreen plant materials shall be provided which will form a continuous screen of the height specified in Table 8-3 within two years; or

   c. A fence or wall of the height specified in Table 8-3 shall be constructed to provide a continuous sight-obscuring screen.

5. Buffering and screening provisions shall be superseded by the clear vision area requirements as set forth in § 17.8.150.

6. When the use to be screened is downhill from the adjoining zone or use, the prescribed heights of required fences, walls or landscape screening shall be measured from the actual grade of the adjoining property. In this case, fences and walls may exceed the permitted six-foot height at the discretion of the Director as a condition of approval. When the grades are so steep so as to make the installation of walls, fences or landscaping to the required height impractical, a detailed landscape/screening plan shall be submitted for approval.

7. Fences and walls.

   a. Fences and walls shall be constructed of any materials commonly used in the construction of fences and walls such as wood, stone, rock or brick, or otherwise acceptable by the Director;

   b. Such fence or wall construction shall be in compliance with other city regulations;

   c. Walls shall be a minimum of six inches thick; and

   d. Chain link fences with slats shall qualify for screening. However, chain link fences without slats shall require the planting of a continuous evergreen hedge to be considered screening.

C. Screening: special provisions.

1. Screening and landscaping of parking and loading areas. Screening and landscaping of parking and loading areas is required as provided in this article.

2. Screening of service facilities. Except for one-family and two-family dwellings, any service facilities such as gas meters and air conditioners which would otherwise be visible from a public street, customer or resident parking area, any public facility or any residential area shall be screened from view by placement of a solid wood fence or masonry wall between five and eight feet in height.

3. Screening of refuse containers. Except for one- and two-family dwellings, any refuse container or refuse collection area which would be visible from a public street, parking lot, residential or commercial area, or any public facility such as a school or park shall be screened or enclosed from view by placement of a solid wood fence, masonry wall or evergreen hedge. All refuse shall be contained within the screened area.

4. Screening of swimming pools. All swimming pools shall be enclosed as required by the City of Forest Grove Building Code.

D. Buffer Matrix.

1. The Buffer Matrices contained in Table 8-2 shall be used in calculating widths of buffering/screening and required improvements to be installed between proposed uses and abutting uses or zoning districts [§17.8.425(B),(C)&(D)].

17. DESIGN AND MAINTENANCE STANDARDS FOR OFF-STREET PARKING AND LOADING §17.8.525 *MULTI-FAMILY RESIDENTIAL SPECIFIC*

A. No backing movement. Excluding single-family and duplex residences, groups of more than two parking spaces shall be served by a service drive so that no backing movements or other maneuvering within a street or other public right-of-way would be required.

B. Free flow of traffic. Service drives shall be designed and constructed to facilitate the flow of traffic, provide maximum safety of traffic access and egress, and maximum safety of pedestrians and vehicular traffic on the site.

C. Parking accessible from street. Each parking and/or loading space shall be accessible from a street and the access shall be of a width and location as described in §§ 17.8.100 et seq. for Access and Circulation.

D. Parking space, stall and access aisle dimensions. Parking space configuration, stall and access aisle size shall be of sufficient width for all vehicles turning and maneuvering, based on the standards shown in Figures 8-11 and 8-12.

E. Permanent marking. Except for single-family and duplex residences, any area intended to be used to meet the off-street parking requirements shall have all parking spaces clearly marked using permanent paint. All interior drives and access aisles shall be clearly marked and signed to show direction of traffic flow and maintain vehicular and pedestrian safety.

F. Surfacing.

1. Except for single-family and duplex residences, all areas used for the parking and/or storage and/or maneuvering of any vehicle, boat and/or trailer shall be improved with asphalt or concrete surfaces according to the same standards required for the construction and acceptance of city streets.

3. Where possible, pervious surfacing should be used for off-street parking areas.

G. Wheel stops. Parking spaces along the boundaries of a parking lot or adjacent to interior landscaped areas or sidewalks shall be provided with a wheel stop at least four inches high located one and one-half feet back from the front of the parking stall as defined in Figure 8-7.

H. Drainage. Off-street parking and loading areas shall provide stormwater drainage in accordance with specifications approved by the City Engineer. Off-street parking and loading facilities shall be drained to avoid flow of water across public sidewalks.

I. Lighting. Artificial lighting on all off-street parking facilities shall be designed to deflect all light away from surrounding residences and so as not to create a glare hazard to the public use of any road or street.

J. Maintenance. All parking lots shall be kept clean and in good repair at all times. Breaks in paved surfaces shall be repaired promptly and broken or splintered wheel stops shall be replaced so that their function will not be impaired.

K. Parking lots over three acres in size. Parking lots over three acres in size shall be designed to incorporate curbs and sidewalks along major drive aisles [§17.8.525 (A)-(K)]

18. BICYCLE PARKING §17.8.540

A. When required. Bicycle parking shall be provided on-site in conjunction with the following uses:

1. Multi-family housing;

2. Retail and office development;

B. Required number of spaces. The number of bicycle parking spaces required shall be at least 20% of the required automobile parking for the use, but not less than two spaces.

C. Location and design standards. Bicycle parking facilities shall be:

1. Located within 75 feet of a primary building entrance and dispersed for multiple entrances;

2. Designed to provide direct access to a public right-of-way, but not to obstruct sidewalks or walkways. Public sidewalks may be utilized for bicycle parking when parking can't be reasonably accommodated on-site and the location is convenient to the building 's primary entrance. If a public sidewalk is used for bicycle parking, a minimum of six feet of clear and unobstructed sidewalk must be maintained;

3. In a location visible to building occupants or from the main parking lot;

4. Thoroughly illuminated during working hours. Bicycle parking areas shall be at least as well lit as automobile parking areas;

5. Bicycle parking facilities shall offer security in the form of either a lockable enclosure in which the bicycle can be stored or a stationary rack to which the bicycle can be locked. All bicycle racks, lockers or other facilities shall be securely anchored to the ground or to a structure. Bicycle racks shall be designed so that bicycles may be securely locked to them without undue inconvenience. Such racks shall be designed to hold bicycles securely by means of the frame, with the frame supported so that the bicycle cannot be pushed or fall to one side in a manner that will damage the wheels; and

6. Bicycle parking spaces shall be at least six feet long and two feet wide with an overhead clearance of at least seven feet. An access aisle of at least five feet shall be provided and maintained beside or between each row of bicycle parking. Each required bicycle parking space shall be accessible without moving another bicycle [§17.8.540(A)-(C)]

19. LANDSCAPING AND SCREENING OF PARKING AND LOADING AREAS §17.8.545

C. Required landscaping for parking lots adjacent to public rights-of-way. A minimum five-foot landscaped strip is required between the abutting right-of-way and the off-street parking area or vehicle use area.

D. Perimeter parking lot landscaping. When the off-street parking area or other vehicular use area is not visually screened from an abutting property by an intervening building or structure, a minimum five-foot landscaped strip shall be installed between the common

property line and the off-street parking area or other vehicular use area that is visually exposed.

E. Interior parking lot landscaping. Landscaped areas shall be appropriately distributed to break up large expanses of pavement, improve the appearance and climate of the site, improve safety and delineate pedestrian walkways and traffic lanes. For the purpose of this section, interior parking lot area is defined as the hard surface parking area (parking stalls and aisles). Such area does not include loading and unloading zones or perimeter landscaping around the lot.

1. At least 8% of the interior parking lot area shall be landscaped. Landscaped areas should include water quality features such as bio-swales or wetlands, trees, grass, shrubs and other material when possible, so as to cover the landscape area.
2. A required landscaped area shall have a minimum interior dimension of six feet and be no less than 48 square feet in area. Landscaping shall be protected from vehicular damage by some form of wheel guard or curb.
3. One tree shall be required for every 1,600 square feet of interior parking lot area. Trees shall have a minimum two-inch caliper and six-foot branch height at the time of planting.
4. Interior parking area landscaping and trees must be dispersed throughout the parking area. Some trees may be grouped, but the groups must be dispersed.
5. Perimeter landscaping may not substitute for interior landscaping. However, interior landscaping may join perimeter landscaping as long as it extends four feet or more into the parking area from the perimeter landscape line.

F. Landscaping within clear vision areas. All landscaping of parking lots within clear vision areas shall provide unobstructed cross-visibility at a level between three to ten feet above the curb line. With the exception of grass or groundcover, no landscaping shall be located closer than three feet from the edge of any accessway pavement [§17.8.545(C),(D),(E)&(F)]

PUBLIC IMPROVEMENTS

20. GENERAL PROVISIONS §17.8.605

A. When standards apply. Unless otherwise provided, the standard specifications for construction, reconstruction or repair of streets, sidewalks, curbs and other public improvements within the city shall occur in accordance with the standards of this article. No development may occur unless the public facilities related to development comply with the public facility requirements established in this section.

B. Standard specifications. The City Engineer shall establish standard specifications consistent with the application of engineering principles (SEE EXHIBIT F) [§17.8.605(A)&(B)]

21. EASEMENTS §17.8.615

A. Easements. Easements for sewers, drainage, water mains, electric lines or other public utilities shall be either dedicated or provided for in the deed restrictions, and where a development traversed by a watercourse, or drainageway, there shall be provided a stormwater easement or drainage right-of-way conforming substantially with the lines of the watercourse.

B. Utility easements. A property owner proposing a development shall make arrangements with the city, the applicable district and each utility franchise for the provision and dedication of utility easements necessary to provide full services to the development. The city ’s standard width for public main line utility easements shall be 15 feet unless otherwise specified by the utility company, applicable district, or City Engineer.

C. Where the alignment of a utility easement (other than those required perimeter easements) is such that it would also serve as a suitable easement for originating or continuing a pedestrian/bicycle path, the Community Development Director may require that such easement be designated as serving both functions. The walkway shall be designed and improved consistent with the requirements of § 17.8.100 Access and Circulation [§17.8.615(A)-(C)]

22. SANITARY SEWERS §17.8.625

A. Sewers required. Sanitary sewers shall be installed to serve each new development and to connect developments to existing mains in accordance with the provisions set forth in Design and Construction Standards for Sanitary and Surface Water Management (as adopted by Clean Water Services in 1996 and including any future revisions or amendments) and the adopted policies of the Comprehensive Plan and the City ’s Master Sewer Plan.

B. Sewer plan approval. The City Engineer shall approve all sanitary sewer plans and proposed systems prior to issuance of development permits involving sewer service.

C. Over-sizing. Proposed sewer systems shall include consideration of additional development within the area as projected by the Comprehensive Plan.

D. Permits denied. Development permits may be restricted by the Commission or Hearings Officer where a deficiency exists in the existing sewer system or portion thereof which cannot be rectified within the development and which if not rectified will result in a threat to public health or safety, surcharging of existing mains, or violations of state or federal standards pertaining to operation of the sewage treatment system [§17.8.625(A)-(D)].

23. WATER FACILITIES §17.8.630

A. Water facilities required. Water facilities shall be installed to serve each new development and to connect developments to existing mains in accordance with the provisions set forth in the adopted policies of the Comprehensive Plan and the city ’s Master Water Plan.

B. Water plan approval. The City Engineer shall approve all plans for water facilities and proposed systems prior to issuance of development permits involving water service.

C. Over-sizing. Proposed water facilities shall include consideration of additional development within the area as projected by the Comprehensive Plan.

D. Permits denied. Development permits may be restricted by the Planning Commission or Hearings Officer where a deficiency exists in the existing water system or portion thereof which cannot be rectified within the development and which, if not rectified, will result in a threat to public health or safety or violations of local, state or federal standards pertaining to the operation of the water system [§17.8.630(A)-(D)].

///

24. STORM DRAINAGE §17.8.635

A. General provisions. The Director and City Engineer shall issue a development permit only where adequate provisions for stormwater and flood water runoff have been made, and:

1. The stormwater drainage system shall be separate and independent of any sanitary sewerage system; and

2. Where possible, inlets shall be provided so surface water is not carried across any intersection or allowed to flood any street; and 3. Surface water drainage patterns shall be shown on every development proposal plan.

B. Easements. Where a watercourse, drainageway, channel or stream traverses a development, there shall be provided a stormwater easement or drainage right-of-way conforming substantially to the lines of such watercourse and such further width as will be adequate for conveyance and maintenance.

C. Accommodation of upstream drainage.

1. A culvert or other drainage facility shall be large enough to accommodate runoff from its entire upstream drainage area, whether inside or outside the development; and

2. The City Engineer shall approve the necessary size of the facility, based on the provisions of Design and Construction Standards for Sanitary and Surface Water Management (as adopted and amended by Clean Water Services) and the city 's Master Stormwater Sewer Plan.

D. Effect on downstream drainage. Where it is anticipated by the City Engineer that the additional runoff resulting from the development will overload an existing drainage facility, the Director and Engineer shall withhold approval of the development until provisions have been made for improvement of the potential condition or until provisions have been made for storage of additional runoff caused by the development in accordance with the Design and Construction Standards for Sanitary and Surface Water Management (as adopted by Clean Water Services and including any future revisions or amendments ) [§17.8.635(A)-(D)]

25. UTILITIES §17.8.645

A. Underground utilities. All utility lines in new developments shall be placed underground, and:

1. The developer shall make all necessary arrangements with the serving utility to provide the underground services;

2. The city reserves the right to approve location of all surface mounted facilities;

3. All underground utilities, including sanitary sewers and storm drains installed in streets by the developer, shall be constructed prior to the surfacing of the streets; and

4. Stubs for service connections shall be long enough to avoid disturbing the street improvements when service connections are made.

B. Information on development plans. The applicant for a development shall show on the development plan or in the explanatory information, easements for all underground utility facilities, and:

1. Plans showing the location of all underground facilities as described herein shall be submitted to the City Engineer for review and approval; and
2. Care shall be taken in all cases to ensure that above ground equipment does not obstruct vision clearance areas for vehicular traffic.

C. Exception to under-grounding requirement for infill development. An applicant for infill development, which is served by above ground utilities, may be exempt from the requirement for undergrounding utilities. This exception shall apply only to existing utility lines [§17.8.645(A)-(C)].

BUILDING DESIGN AND DEVELOPMENT STANDARDS

26. STANDARDS §17.8.710

A. Building design standards for multi-unit development except within Town Center zones.
   1. Massing and form.
      a. On lots with an average cross slope of 15% or more, no more than 60% of the site shall be re-graded.
      b. No building shall have a dimension greater than 150 feet without a minimum three feet off-set of the exterior wall.
      c. At a minimum, every two dwelling units shall be offset from the next dwelling unit by at least four feet in depth.
      d. All habitable rooms shall incorporate at least one window when facing parking lots and common areas.
   2. Compatibility.
      a. All buildings shall incorporate a porch or architecturally defined entry space for each ground level dwelling unit with a minimum area of 16 square feet per dwelling unit, with no dimension less than four feet.
      b. Shared porches or entry spaces are permitted. All grade level porches shall include hand-railing, half-walls or shrubs to define their outside perimeter.
   3. Privacy.
      a. Front entryways into dwelling units shall be separated vertically or horizontally a minimum of three feet from sidewalks used by more than one dwelling unit.
      b. Bedroom and bathroom windows shall be offset a minimum of four feet from windows on adjacent buildings (unless window glazing is frosted, diffused or glass block).
   4. Building relationship with adjacent arterials.
      a. Buildings shall be setback at least ten feet from arterials.
      b. Buildings shall be oriented away from arterials and no front or main entries shall be facing the arterials.
      c. The setback area shall be landscaped consistent with the buffering requirements of § 17.8.425, except that chain link fence shall not be allowed.

B. Building design standards for commercial development in Community Commercial and **Mixed-Use** zones.
   1. Building orientation.

a. Design and construct buildings so that at least one facade is within 60 feet of a dedicated public street right-of-way line.

b. Design and construct a minimum of one primary building entrance for each building ground floor use or tenant along a public right-of-way or internal roadway built to city public street engineering standards.

2. Massing and form.

a. Provide changes in the depth of the facade plane in excess of two feet for all building walls more than 75 feet in length.

b. Maximum length of building facades shall be 200 feet.

c. Roofline heights must be varied a minimum of two feet for building facades greater than 75 feet in length.

d. Provide vertical partitioning of facades by using columns, pilasters and other vertical elements a minimum of every 25 feet.

e. Articulation of building fronts through changes in depth or building relief (e.g. windows, doors, cornices, columns, a change in materials) shall occur a minimum of every 15 feet in the horizontal or vertical dimensions.

3. Design elements.

a. Every building elevation adjacent to a street with a horizontal dimension of more than 100 feet shall have a building entrance.

b. Building facades adjacent to sidewalks or pedestrian connections must include weather protection canopies or awnings along at least 75% of the length of the ground floor facade.

c. Incorporate a minimum of 50% transparency/window openings on the ground floor facades of buildings that are 5,000 square feet or less, or 20% transparency/window openings for buildings greater than 5,000 square feet facing the public right-of-way. For a building that faces two streets, the requirement shall apply to the predominant street or as determined by the Director where both streets are considered similar.

d. Windows shall not be reflective, tinted or treated in such a way as to block views into or out of windows unless for energy or security purposes.

e. Windows must be recessed a minimum of four inches from building facades.

f. Materials such as synthetic stucco (EIFS, Dryvit, etc.) are prohibited at ground floor.

g. Vinyl cladding of building facade is prohibited at ground floor.

4. Compatibility.

a. Any building or portion of a building that is less than 50 feet from existing residential dwellings must not be higher than 15 feet above the top of the roofline of the nearest existing dwelling.

b. When adjacent to existing residential development, all commercial structures with floor areas less than 20,000 square feet of total building area must provide a gabled element to the parapet or roof.

5. Safety.

a. Security gates or bars on windows or doors are prohibited along ground floors of commercial buildings, excluding loading and storage areas.

b. Motion activated security lighting is prohibited along building facades that front onto public rights-of-way.

c. Public access shall be provided to all commercial uses that provide plazas, squares or courts intended for food, beverage or entertainment uses.

d. Parking lots or roadways shall not be gated or secured excluding loading and storage areas or residential parking areas.

6. Single-family and duplexes in the NMU zone shall comply with § 17.8.710F [§17.8.710(A)&(B)].

LIGHTING STANDARDS

27. GENERAL PROVISIONS §17.8.755

C. Luminous standards. Light intensity standards shall be as follows:

1. Outdoor lighting shall be provided in a manner that enhances security, is appropriate for the use, and avoids adverse impacts on surrounding properties. Glare shall not cause illumination on other properties in excess of a measurement of 0.5 foot-candles of light.

3. Pedestrian lighting standards:

a. Lighting for on-site pedestrian circulation system shall be lighted to a minimum level of 0.5 foot-candles, a 1.5 foot-candle average, and a maximum to minimum ratio of seven-to-one to enhance pedestrian safety and allow employees , residents, customers or the public to use the walkways at night.

b. Pedestrian walkway lighting through parking lots shall be lighted to a 0.5 foot-candle average and a maximum to minimum ratio of ten-to-one to light the walkway and enhance pedestrian safety. Artificial lighting which may be provided shall enhance security, be appropriate for the use, and avoid adverse impacts on surrounding properties and the night sky through appropriate shielding. The lighting shall not cause a measurement in excess of 0.5 foot-candles of light on other properties.

D. Lighting standards for multi-unit development.

1. All exterior dwelling unit entrances and pedestrian walkways shall be lighted.

2. Poles outside of the public right-of-way shall be a maximum of 14 feet in height if the lot is less than 20,000 square feet and 18 feet for lots larger than 20,000 square feet.

3. Concrete light fixture bases taller than eight inches are prohibited.

4. Area lighting shall be directed downward with no splay of light off the site. Any light source over ten feet high shall incorporate cut-off shield.

5. Plastic signs with internal light source are prohibited.

E. Lighting standards for commercial development.

1. Exterior building lighting. Building lighting shall be directed downward with no splay of light off the site. Any light source over ten feet high shall incorporate cut-off shield.

2. Parking lot lighting.

a. Lights shall not obstruct vehicular or pedestrian traffic.

b. Poles outside of the public right-of-way shall be a maximum of 14 feet in height if the lot is less than 20,000 square feet and 18 feet for lots larger than 20,000 square feet.

c. Concrete light fixture bases taller than eight inches are prohibited.

d. Lights shall be equipped with cut-off fixture to ensure that light does not spill onto adjacent residential property.

3. Sidewalk and landscape lighting.

a. All bollard, wall or stairway lighting shall be directed exclusively downward.

b. All up-lighting fixtures shall be screened by landscaping or concealed within structures or located below or flush with grade.

c. No walkway lighting shall exceed 14 feet in height.

4. Sign lighting.

a. Interior lighted plastic signs are prohibited.

b. Moving or flashing signs are prohibited [§17.8.755(C),(D)&(E)].

28. SIGNS - GENERAL PROVISIONS §17.8.805

A. Compliance with Sign Code. All signs erected, constructed or maintained in the city must comply with this Sign Code (§§ 17.8.800 through 17.8.875). A sign that is erected, constructed or maintained in violation of the Sign Code is declared to be a nuisance and may be abated as such.

B. Oregon Motorist Information Act. The Oregon Motorist Information Act, O.R.S. Chapter 377 (2017), is adopted by reference and incorporated into §§ 17.8.800 through 17.8.875 as if fully set forth herein [§17.8.805(A)&(B)].

29. MINIMUM SETBACKS SHALL BE:

| **Multifamily Setbacks** | |
|---|---|
| **Standard** | **Dimension** |
| Front | 20 feet |
| Corner (street side) | 20 feet |
| Interior | 10 feet |
| Rear | 15 feet |


| **Multifamily Setbacks** | |
|---|---|
| **Standard** | **Dimension** |
| Front | 20 feet |
| Corner (street side) | 20 feet |
| Interior | 10 feet |
| Rear | 15 feet |

# Comments & Conditions

## Brown's Farm Mixed-Use Development
## Permit #311-23-000022-PLNG

1. A CAD file of the Site Plan, which includes all wet utilities, is required to start an electrical design.
2. Additional easements may be needed depending on the final electrical design.
3. Electrical loading & demand will need to be provided by the developer.
4. All lighting within the apartment complex will be customer-owned and must be designed by the developer.
5. The developer will be responsible for all labor, material, and equipment costs associated with the mixed-use development.
6. The developer will be responsible for any costs associated with the relocation of existing FGL&P facilities or the installation of needed infrastructure to provide electricity to the development.
7. The developer will be responsible for providing and installing all vaults & conduits.
8. Developer shall work directly with Jason O'Dell (503)992-3294 regarding details of electrical design, transformer, & meter base locations.
9. Due to long lead times and the instability of material costs, FGL&P requires prepayment for transformers and materials.

Completed By:
Jason O'Dell
08/15/2023

# Project Review Form – PROPOSED CONDITIONS

| |
|---|
| **DATE:** Tuesday September 5, 2023 |
| **YOUR DEADLINE:** Tuesday September 19, 2023 |
| **PERMIT #: 311-23-000022-PLNG – Mixed Use Planned Development**<br>**311-23-000023-PLNG – Variance (building height to 45')**<br>**311-23-000024-PLNG – Partition**<br>**311-23-000025-PLNG – Text Amendment (density)** |
| **LOCATION:** 3081 Sunset Drive – 1N331A000100 & 1N331A000600 |
| **PROJECT NAME:** Browns Farm |
| **TO:** Building, Engineering, Fire, ~~Light and Power~~, Police, Public Works, ODOT, TVID |
| **FROM:** Kate McGuire, Senior Planner kmcguire@forestgrove-or.gov |

Please review the proposal materials and return any ***comments and potential approval conditions***, either on this sheet or on a separate page attached to this sheet. If on a separate sheet, please include the project name "Browns Farm" on the attached document.

*****Your comments / conditions will be incorporated, verbatim, *****
**into the conditions of approval section of my staff report**

PROPOSAL NARRATIVE:

Partition of lot 100 to create 3 new parcels; a mixed use planned development containing commercial development and 360 residential apartment units at final build out (3 phases); a text amendment to allow higher density; and a variance to allow buildings up to 45' outside of the village center (for residential structures).

Your timely attention to this review ensures that the city maintains compliance with state-mandated deadlines. **This form must be returned to the Community Development Department (hard copy or digitally) by "YOUR Deadline."** Thank you.

**Comments / Conditions:**

1. Provide address signs in accordance with fire marshal's office approved size and locations. Address numbers shall be clearly visible from the parking/fire lane areas, minimum of 8 inch street and unit numbers.

2, Install Knox brand key boxes outside all fire sprinkler/alarm control rooms, as well as the front of all commercial/retail buildings. These boxes will be installed in approved locations, to be determined by the Fire Marshal's Office.

3. Label all fire sprinkler/alarm control rooms so they are clearly visible from the exterior (if they have exterior doors).

4. Label all fire department connections (sprinkler FDCs) so they clearly identify which building's are served by each individual FDC.

5. Post no parking fire lane signs in accordance with the Oregon Fire Code, where appropriate and required.

Signature: DaWeman Department: Fire

Date Returned to CD: 9.22.23 Total # of hours for review 1

# Project Review Form – PROPOSED CONDITIONS

| |
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**Comments / Conditions:**

Signature: N Kelsay

Department: Engineering

Date Returned to CD: 9/11/23

Total # of hours for review _____

City of Forest Grove Engineering Conditions of Approval – Browns Farm MUPD

Applicant/representative shall sign below and return to City Engineering. Applicant/representative has read the conditional approval form and understands the conditions of approval outlined to this project. Not meeting these conditions may result in withdrawal of engineering approval to project.

GENERAL

1. All plans submitted to date are considered preliminary only. Upon completion of land use application approval, detailed construction plans and specifications must be submitted to engineering that demonstrate compliance with standards and regulations adopted by the City of Forest Grove and/or all other agencies that have jurisdiction including Clean Water Services, Washington County, Oregon Department of Transportation, and the conditions of approval as passed by the City Planning Commission for Land Use Approval. Contact engineering for questions on detail construction plan check process and the required number of construction plan sets/specification required for the detailed review.

2. All detailed construction plans submitted shall be stamped by an Oregon registered professional engineer.

3. All information related to vertical and horizontal location including in documents containing legal description, Draft Development Plan, Final Development Plan, Final Plat, Right-of-Way Deed, or Easement, and Record Drawings must be on the City of Forest Grove current City Datum. Narrative of City Datum including Bench Mark information is available through City Engineering Department.

4. Prior to issuance of Building Permit, Applicant will enter into an agreement with the City of Forest Grove for the construction of public facilities. City will prepare Agreement Allowing Developer to Construct Public facilities. The Agreement document shall be fully executed by City and Developer prior to start of construction.

5. Public improvements shall be in place and accepted by the City Engineer prior to issuance of building permits for new lots of record.

6. Final Development Plans and Specifications containing design for construction of public facilities shall receive approvals (as applicable) from City of Forest Grove, Clean Water Services, and other affected jurisdictional agencies. Developer is responsible for all submittals, approvals and permit acquisitions, unless advised otherwise by the City. Permits, if required, shall be secured by developer or authorized representative prior to start of construction (e.g. both on-site and off-site construction).

7. It is the responsibility of the Applicant to ensure that the project contractor is aware of, and abides by, all conditions of approval. Prior approval from engineering must be received before any changes are constituted in site design, grading, building design, building colors or materials, etc.

8. Applicant shall, at applicant's expense, and under City's direction, provide for traffic control,

during construction, so as to minimize the impact on residents surrounding or adjacent to the Project. Applicant agrees that, during any construction within or as a part of the overall Project, all existing roadways as of the date of approval of this project, at all times, remain passable to a minimum of two lanes of traffic, one in each direction, or an acceptable detour approved by City. Applicant further agrees that if, at any time, City shall determine that there are not sufficient acceptable traffic lanes or acceptable detours which are passable, that all construction by applicant shall immediately cease upon written demand therefore, by City.

9. Applicant shall replace, or have replaced, or repair or have repaired, as the case may be, all existing infrastructure which have been destroyed or damaged, and applicant shall replace or have replaced, repair, or have repaired, as the case may be, or pay to the owner, the entire cost of replacement by reason of any work done hereunder, whether such property be owned by the City or any agency thereof, by any private, or by any person whomsoever, or by any combination of such owners. Any such repair or replacement shall be to the satisfaction and subject to the approval of the City Engineer.

10. Applicant shall provide such monumentation as may be required by City Engineer, in accordance with accepted standards. The applicant shall post security guaranteeing the payment of the cost of setting the monuments. The cost of setting the monuments will be determined by the City Engineer upon approval of the improvement plans. The Applicant shall pay the engineer or surveyor for the cost of setting the monuments within three (3) months from date of notification by the engineer or surveyor that the monuments have been set. If the applicant does not pay the engineer or surveyor within the three (3) months from date of notification, the City shall pay the engineer or surveyor for the security and refund the difference, if any, to the Applicant.

11. Prior to commencement of project work the project Applicant shall provide proposed trucking routes for all equipment and material deliveries as may be required by the City Engineer. The City shall, at Applicant expense, video the routes to establish preconstruction conditions. Damage to any public improvements, on or off site caused by construction operations, during construction on the subject property shall be repaired to the satisfaction of the City Engineer at full expense to the Applicant. This shall include slurry seal, overlay, or street reconstruction if deemed warranted by the City Engineer.

12. Project Applicant shall obtain, at Project Applicants sole expense, any and all easements or real property which may be required for the development of the Project, and which may be necessary and required in order for Project Applicant to comply with these Conditions of Approval, and the applicable ordinances and resolutions of the City.

13. All engineering design, including, but not limited to, storm sewers and appurtenances, sanitary sewers and appurtenances, streets including, but not limited to, geometrics, sight distances, lighting and sound walls, water systems and appurtenances, signing and striping, landscaping and appurtenances, shall be supported by applicable engineering studies/calculations, as required by the City Engineer.

14. Project applicant shall design/install all improvements and perform all work required for this project in accordance with established City Standards or as approved by the City Engineer and

Public Works. Plans for all improvements, including, but not limited to, storm drainage, water and sewer main sizes, either on-site or off-site, shall be in accordance with City Specifications and shall be approved by the City Engineer.

15. The Project Applicant shall be responsible for all work performed by any and all contractors and subcontractors.

16. Detailed plans reflecting the design and construction of all public infrastructure improvements for street, sewer, water, fiber optics and storm drain, both on- and off-site, shall be as directed by the City Engineer. Developer shall have written approval from the City Engineer for any variations from the City's master plans or standards prior to any final approval.

17. The applicant, in order to reduce the tracking of mud throughout the City, shall design/install standard construction entrances, and shall be responsible for cleaning up (or any expenses incurred by the City for cleaning up) mud, debris, etc. from City streets that is attributed to his project during construction.

18. As-built work in the public right of way are to be submitted to the engineering department on CD ROM or DVD computer disk in a format approved by engineering. Digitized information shall be submitted before requesting a final inspection and should reflect as-built status and information as approved by engineering.

19. Public facilities serving the proposed development, including but not limited to, sanitary sewers, water, streets, storm sewers, electrical power facilities, parks, public safety and schools shall be adequate and meet current City standards; or it is guaranteed that inadequate or nonexistent public facilities will be upgraded or constructed by the applicant prior to occupancy of the project.

20. Except as provided otherwise, in the City's conditions of approval or special specifications for construction of public improvements, the Design and Construction Standards for Sanitary Sewer and Surface Water Management by Clean Water Services shall apply in all matters concerning sanitary sewers and the management of storm and surface water runoff.

21. The recommendations of the traffic study, geotechnical report, and drainage report shall be incorporated into the detailed construction plans and specification review.

22. Unless approved otherwise applicant shall extend utilities and roadways through the project to site boundaries for purposes of future development.

23. Identify in plans and profile, any potential vertical conflict points between utilities. Show provisions necessary to accommodate any such questionable or otherwise close conditions.

DEDICATIONS

24. The Applicant shall provide all necessary easements for streets, alleys, sewer, and water facilities, irrigation, fiber optics, district facilities, and other facilities as may be required by the

City. Utility easements shall be at a minimum a clear fifteen feet (16') for one utility and a clear twenty feet (20') for two or more utilities. Easements shall not be split between property lines or as otherwise determined by the City Engineer. The easement widths identified are minimums and in certain circumstances, additional easement widths may be required as determined by the City Engineer.

GRADING/DRAINAGE

25. It is the responsibility of the Applicant to meet all Clean Water Service Standard. City engineering will coordinate and submit a set of completed detailed construction plans (completed City engineering review process) for Clean Water Services review.

26. Regarding drainage, the applicant must identify if the project will impact existing surrounding uses including but not limited to agricultural uses. The applicant shall submit a drainage plan showing enough detail to address the mitigation of impacts on these existing surrounding uses or to conclusively show that there will be no impacts to the satisfaction of the City Engineer. The mitigation of these impacts is the financial responsibility of the Applicant until the City formally accepts the mitigation. Additionally, the Applicant shall bear the financial responsibility of, and shall dedicate to the City, runoff control easements, as needed.

27. The applicant must identify issues where the finished grade of the property is higher or lower than the abutting property or adjacent lots, and a suitable solution acceptable to City Engineering shall be required. Solutions including retaining walls shall be shown on grading plans. Retaining walls shall be structurally engineered if over four (4) feet in height, including surcharge, and will require a separate building permit. Applicant shall ensure proper setback requirement on these measures for mitigating grade differences, including building code requirement of two foot setback from toe of slopes.

28. A geotechnical report shall be prepared and submitted by a geotechnical engineer who will be retained by the Applicant to observe, test, and certify that all recommendations outlined in the Report are fulfilled during construction. The reports shall be less than one year old. The reports shall include information on the nature, distribution, physical, and engineering properties of the soils onsite and/or soils to be used as fill, and include recommendations on grading procedures.

29. Prepare and submit hydrology/hydraulic calculations for sizing of all proposed drainage devices. The analysis shall also determine if changes in the post-development versus pre-development conditions have occurred. The analysis shall be stamped and signed by an Oregon Civil Engineer and prepared per area standard, including Clean Water Services requirements. Local regulations requires certain new development and redevelopment projects/activities to incorporate post construction Best Management Practices (BMPs) into the grading/drainage plans to control pollutants. Please refer to the Clean Water Service guidelines for specific comments and requirements.

30. The applicant shall take every step necessary to contain all dirt, construction materials, and construction run-off on site. No grading or construction-related debris, either directly or indirectly carried by water, will be permitted to leave the construction site.

31. All grading projects require an Erosion Control Plan as part of the grading plans. Grading permits will not be issued until an Erosion Control Plan is approved. Please refer to Clean Water Services requirements.

32. The project shall incorporate site design measures for reducing water quality impacts of the project, in compliance with Clean Water Services requirements. Where feasible, parking lots and other impervious areas shall be designed to drain stormwater runoff to, private water quality facilities, vegetated drainage swales, filter strips, and/or other treatment devices that can be integrated into required landscaping areas and traffic islands prior to discharge into storm drain systems. The use of permeable paving for parking and driveway surfaces is encouraged, to reduce runoff from the site. Such paving should meet fire department requirements and be structurally appropriate for the location. Such water quality mitigations should plan to meet manufacture required maintenance provision.

33. All new private water quality facilities will be required to sign a Private Water Quality Facility Maintenance Agreement and provide information for City master storm water connection report prior to receiving building permit.

34. Project applicant shall, at Project Applicant expense, shall prepare and submit a Dust Emission Control Plan for Project Grading. The Plan shall require that contractor work specifications shall include provisions for adequate water to be applied during construction in order to control dust disturbance resulting from grading operations. The Plan and related contractor work specifications shall be reviewed and approved by the

35. Prior to City issuance of a grading permit, dust control measures shall be applied in accordance with all ordinances, rules and regulations of the City, including regarding use of water for compaction or dust control purposes.

36. The Applicant shall submit a grading plan to the City Engineer for approval which reflects the recommendations of a final Geologic and Geotechnical study, including construction procedures and/or design criteria. Construction plans submitted to the City Engineering shall conform to the City Engineering Design Standards and include specifications necessary to minimize potential impacts resulting from soil conditions on the project site. The City Engineer or his representative shall verify in the field that all conditions have been satisfied.

37. The project plans shall include erosion control measures to prevent soil, dirt and debris from entering the storm drain system, in accordance with Clean Water Service standards. Drainage from parking lots and private streets to the public right-of-way will be filtered through a City approved systems. The system shall be located on the development property and maintained by the property owner.

38. Pre-development flow from adjacent properties onto the project site shall be maintained or accounted for in the final design.

39. The on-site drainage system must be properly designed to maximize infiltration of roof and/or surface runoff into the underlying soil before discharging into public storm drain,

street or alley. Also, the storm drainage from project site can not become a nuisance to surrounding property.

40. Storm pipe video inspection shall be provided to the Engineering Division prior to final approval.

RIGHT OF WAY IMPROVEMENTS

41. Any existing damage or damage incurred during construction to the approaches, curb, gutter and/or sidewalk shall be repaired and/or replaced to the approval of the City Engineer.

42. A State Encroachment permit shall be secured prior to the construction of improvements on State or County Facilities.

43. All street improvements shall conform with the requirements of the Americans with Disabilities Act, including the placement of sidewalk at the rear of the driveway at all driveway locations and adjacent to the back of curb at all non-driveway locations.

44. All proposed streets shall be fully improved in conformance with the City standards to the width required by the City. The Project shall install normal and necessary public improvements along the property street frontages to the satisfaction of the City Engineer.

45. These improvements may include, but are not necessarily limited to, grading, curb and gutter, sidewalk, paving, make-up paving and American Disabilities Act (ADA) compliant curb ramps, along with construction of all standard utilities necessary including water facilities, sanitary sewer, and storm drainage systems, street lighting, underground utilities, traffic control devices, landscaping, and automatic irrigation systems. All approved driveway locations shall be constructed to City standards.

46. Public sidewalk location shall be shown on the approved plans. Sidewalks (parallel with public streets) shall be located near property/R.O.W. line unless approved otherwise by the City Engineer. Unless designated otherwise on the approved plans, sidewalks shall be installed concurrent with development of lot(s) of record.

TRAFFIC & LIGHTING

47. Arrange for relocation of all utilities, poles, signals, street lights, etc.

48. Developer shall provide and install the following : (1) all signing including, but not limited to, street names, speed, warning, no parking, vehicular and pedestrian traffic protection and direction, for public rights-of-way and easements; and (2) pavement striping, marking and reflective pavement markers. All such signing, striping and marking shall be shown on the approved plans.

49. All signing shall conform to the City Sign Ordinance in regards to size, design, and location. All signs shall be reviewed, approved, and a sign permit obtained prior to installation.

50. Prior to acceptance of improvements by the City, the developer shall perform roadway surface improvements, such as slurry seal or overlay as required by the City Engineer, and shall install any additional traffic signs, striping and pavement markings determined necessary by the City's Traffic Engineer, after inspection of the final physical improvement, to insure safe operation of all intersections and segments of streets before any building can be occupied.

51. Establishment of new pedestrian crossings at uncontrolled intersections or at mid-block locations on roadways under control of the City shall be based upon an engineering study by applicant, and reviewed and approved by the City Engineer according to evaluation process set by Washington County.

STORM AND SANITARY SEWER IMPROVEMENTS

52. Sewer pipe video inspection shall be provided to the Engineering Division prior to final approval.

53. Regarding septic systems, the applicant must identify if the project will impact existing surrounding systems. The applicant shall submit a plan showing enough detail to address the mitigation of impacts on these existing surrounding uses or to conclusively show that there will be no impacts to the satisfaction of the City Engineer. The mitigation of these impacts is the financial responsibility of the Applicant until the City formally accepts the mitigation. Additionally, the Applicant shall bear the financial responsibility of, and shall dedicate to the City, runoff control easements, as needed. County standards on setbacks to existing system shall be followed.

54. Public Storm Drain and Sewer pipe materials shall be in accordance with the latest Clean Water Services design and construction standards.

55. Location of sewer and storm mains shall follow City standards or approved otherwise by the City Engineer.

56. Submit Drainage Report. Include (therein) data relevant to treatment and detention of storm and surface water runoff.

EXCAVATION, PAVING, and GRADING

57. Paving shall be per City Standards.

58. Limits of Paving Restoration shall be determined by the City Engineer or Public Works Inspector.

59. All site grading and public improvement work shall conform with the City of Forest Grove Municipal Code, development Conditions of Approval, City of Forest Grove Standard Specifications, Uniform Building Code Appendix Chapter 33-Excavation and Grading, and, if applicable, the Agreement Allowing Developer to Construct Public Improvements.

WATER

60. Water facilities must comply with plumbing cross-connection control standards as required by City Ordinance and State law for the protection of water supplies. Information on acceptable back-flow assemblies is available from the City Water Division.

61. The size and location of all water meters shall be determined by the Engineer/Architect or authorized representative. All water meters will be furnished and installed by the Water Division at the expense of the Applicant.

62. All public water system components must be constructed within public right-of-way or public easements.

63. All water connections to the City Water Distribution system shall be shown on the construction plan submittal review. This includes irrigation water meters for general open areas in a development project. Water irrigation meters and related impact fees will be paid before the Civil/Grading plans are approved and will be based on the City current meter fee schedules.

64. Municipal Code requires that water systems shall be designed to flow a minimum 2000 gpm (medium density) with 20 psi residual pressure at all new fire hydrants. New public water mains shall be sized 8-inch minimum dia. and be D.I.P. unless approved otherwise by the City Engineer.

65. Standard location for public water mains is on the West and/or South side of the public street R.O.W. and additionally, West and/or South of public storm drains unless approved otherwise by the City Engineer.

66. Public Fire Hydrant spacing and location shall conform to City Code and as otherwise required by the City Fire Marshal.

67. All new Fire Hydrants shall conform to current City Standards. City Standards require that all hydrants be equipped with a 4-inch Storz fitting. Where possible, each hydrant location shall be identified with installation of blue reflective pavement marker, adjacent to hydrant, near centerline of street or as determined otherwise by the City Fire Marshal. Hydrants situated outside of public street R.O.W. shall be clearly marked and protected from damage as deemed necessary by the City Fire Marshall.

68. Size of the new water meter service shall be shown on the plans and shall be installed by the Applicant at his/her expense per City Standard Specifications.

69. Domestic and fire backflow-prevention devices, designed to protect the public water supply, shall be approved by the City Engineer in addition to the City Building & Plumbing Official.

70. Water used in conjunction with construction of the project shall be obtained only from pre-approved sources. A permit to take City water for this purpose shall be secured by applicant or representative prior to start of construction activity.

**SPECIAL CONDITIONS**

Provide a traffic analysis of the intersections of Bonnie Lane and Sunset Drive, and Sunset Drive and Hwy 47 Bypass. Look at current traffic movements and movements after build out for both intersections and proposed access points to determine future impact.

If you have any questions about any of the above items, please contact me at nkelsay@forestgrove-or.gov or (503) 992-3230.

**Project Engineer:**

Nick Kelsay

Applicant: Print Name: _____

Signature _____ Date _____

Clean Water Services
Our commitment is clear.

CWS File Number
**23-000887**

# Service Provider Letter

**This form and the attached conditions will serve as your Service Provider Letter in accordance with Clean Water Services Design and Construction Standards (R&O 19-5, as amended by R&O 19-22).**

| | | | |
|---|---|---|---|
| **Jurisdiction:** | Forest Grove | **Review Type:** | Allowed Use |
| **Site Address / Location:** | 3081 NW Sunset DR<br>Forest Grove, OR 97116 | **SPL Issue Date:**<br>**SPL Expiration Date:** | April 04, 2023<br>April 03, 2025 |

| **Applicant Information:** | | **Owner Information:** | |
|---|---|---|---|
| Name | JESSE NEMEC | Name | |
| Company | JT SMITH COMPANIES | Company | JT SMITH COMPANIES |
| Address | 5285 MEADOWS RD STE 171<br>LAKE OSWEGO OR 97035 | Address | 5285 MEADOWS RD STE 171<br>LAKE OSWEGO OR 97035 |
| Phone/Fax | (503) 730-8620 | Phone/Fax | (503) 730-8620 |
| E-mail: | jnemec@jtsmithco.com | E-mail: | jnemec@jtsmithco.com |

| **Tax lot ID** | **Development Activity** |
|---|---|
| 1N331A000100, 600 | Mixed Use Commercial & Residential |

| **Pre-Development Site Conditions:** | | **Post Development Site Conditions:** | |
|---|---|---|---|
| Sensitive Area Present: | [X] On-Site [X] Off-Site | Sensitive Area Present: | [X] On-Site [X] Off-Site |
| Vegetated Corridor Width: | 50 | Vegetated Corridor Width: | 50 |
| Vegetated Corridor Condition: | Degraded | | |

**Enhancement of Remaining Vegetated Corridor Required:** [X]

**Square Footage to be enhanced:** 74,891

**Encroachments into Pre-Development Vegetated Corridor:**

| Type and location of Encroachment: | Square Footage: |
|---|---|
| Stormwater Pipe (Temporary Encroachment; Restoration Planting In-place Required) | 1,465 |
| Stormwater Outfall (Permanent Encroachment; No Mitigation) | 96 |

**Mitigation Requirements:**

| Type/Location | Sq. Ft./Ratio/Cost |
|---|---|
| | |
| | |
| | |

[X] Conditions Attached [X] Development Figures Attached (4) [ ] Planting Plan Attached [ ] Geotech Report Required

**This Service Provider Letter does NOT eliminate the need to evaluate and protect water quality sensitive areas if they are subsequently discovered on your property.**

## In order to comply with Clean Water Services water quality protection requirements the project must comply with the following conditions:

1. No structures, development, construction activities, gardens, lawns, application of chemicals, uncontained areas of hazardous materials as defined by Oregon Department of Environmental Quality, pet wastes, dumping of materials of any kind, or other activities shall be permitted within the sensitive area or Vegetated Corridor which may negatively impact water quality, except those allowed in R&O 19-5, Chapter 3, as amended by R&O 19-22.
2. Prior to any site clearing, grading or construction the Vegetated Corridor and water quality sensitive areas shall be surveyed, staked, and temporarily fenced per approved plan. During construction the Vegetated Corridor shall remain fenced and undisturbed except as allowed by R&O 19-5, Section 3.06.1, as amended by R&O 19-22 and per approved plans.
3. **If there is any activity within the sensitive area, the applicant shall gain authorization for the project from the Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE). The applicant shall provide Clean Water Services or its designee (appropriate city) with copies of all DSL and USACE project authorization permits. No wetland impacts proposed for this project.**
4. An approved Oregon Department of Forestry Notification is required for one or more trees harvested for sale, trade, or barter, on any non-federal lands within the State of Oregon.
5. Prior to any ground disturbing activities, an erosion control permit is required. Appropriate Best Management Practices (BMP's) for Erosion Control, in accordance with Clean Water Services' Erosion Prevention and Sediment Control Planning and Design Manual, shall be used prior to, during, and following earth disturbing activities.
6. Prior to construction, a Stormwater Connection Permit from Clean Water Services or its designee is required pursuant to Ordinance 27, Section 4.B.
7. Activities located within the 100-year floodplain shall comply with R&O 19-5, Section 5.10, as amended by R&O 19-22.
8. Removal of native, woody vegetation shall be limited to the greatest extent practicable.
9. The water quality swale and detention pond shall be planted with Clean Water Services approved native species, and designed to blend into the natural surroundings.
10. **Should final development plans differ significantly from those submitted for review by Clean Water Services, the applicant shall provide updated drawings, and if necessary, obtain a revised Service Provider Letter.**
11. The Vegetated Corridor width for sensitive areas within the project site shall be a minimum of 50 feet wide, as measured horizontally from the delineated boundary of the sensitive area.
12. **For Vegetated Corridors up to 50 feet wide, the applicant shall enhance the entire Vegetated Corridor to meet or exceed good corridor condition as defined in R&O 19-5, Section 3.14.2, Table 3-3, as amended by R&O 19-22.**
13. Prior to any site clearing, grading or construction, the applicant shall provide Clean Water Services with a Vegetated Corridor enhancement/restoration plan. Enhancement/restoration of the Vegetated Corridor shall be provided in accordance with R&O 19-5, Appendix A, as amended by R&O 19-22, and shall include planting specifications for all Vegetated Corridor, including any cleared areas larger than 25 square feet in Vegetated Corridor rated ""good.""
14. Prior to installation of plant materials, all invasive vegetation within the Vegetated Corridor shall be removed per methods described in Clean Water Services' Integrated Pest Management Plan, 2019. During removal of invasive vegetation care shall be taken to minimize impacts to existing native tree and shrub species.
15. Clean Water Services and/or City shall be notified 72 hours prior to the start and completion of enhancement/restoration activities. Enhancement/restoration activities shall comply with the guidelines provided in Planting Requirements (R&0 19-5, Appendix A, as amended by R&O 19-22).

16. **Maintenance and monitoring requirements shall comply with R&O 19-5, Section 2.12.2, as amended by R&O 19-22. If at any time during the warranty period the landscaping falls below the 80% survival level, the owner shall reinstall all deficient planting at the next appropriate planting opportunity and the two year maintenance period shall begin again from the date of replanting.**
17. **Performance assurances for the Vegetated Corridor shall comply with R&O 19-5, Section 2.07.2, Table 2-1 and Section 2.11, Table 2-2, as amended by R&O 19-22.**
18. **Clean Water Services shall require an easement over the Sensitive Area and Vegetated Corridor conveying storm and surface water management to Clean Water Services or the City that would prevent the owner of the Vegetated Corridor from activities and uses inconsistent with the purpose of the corridor and any easements therein.**

**FINAL PLANS**

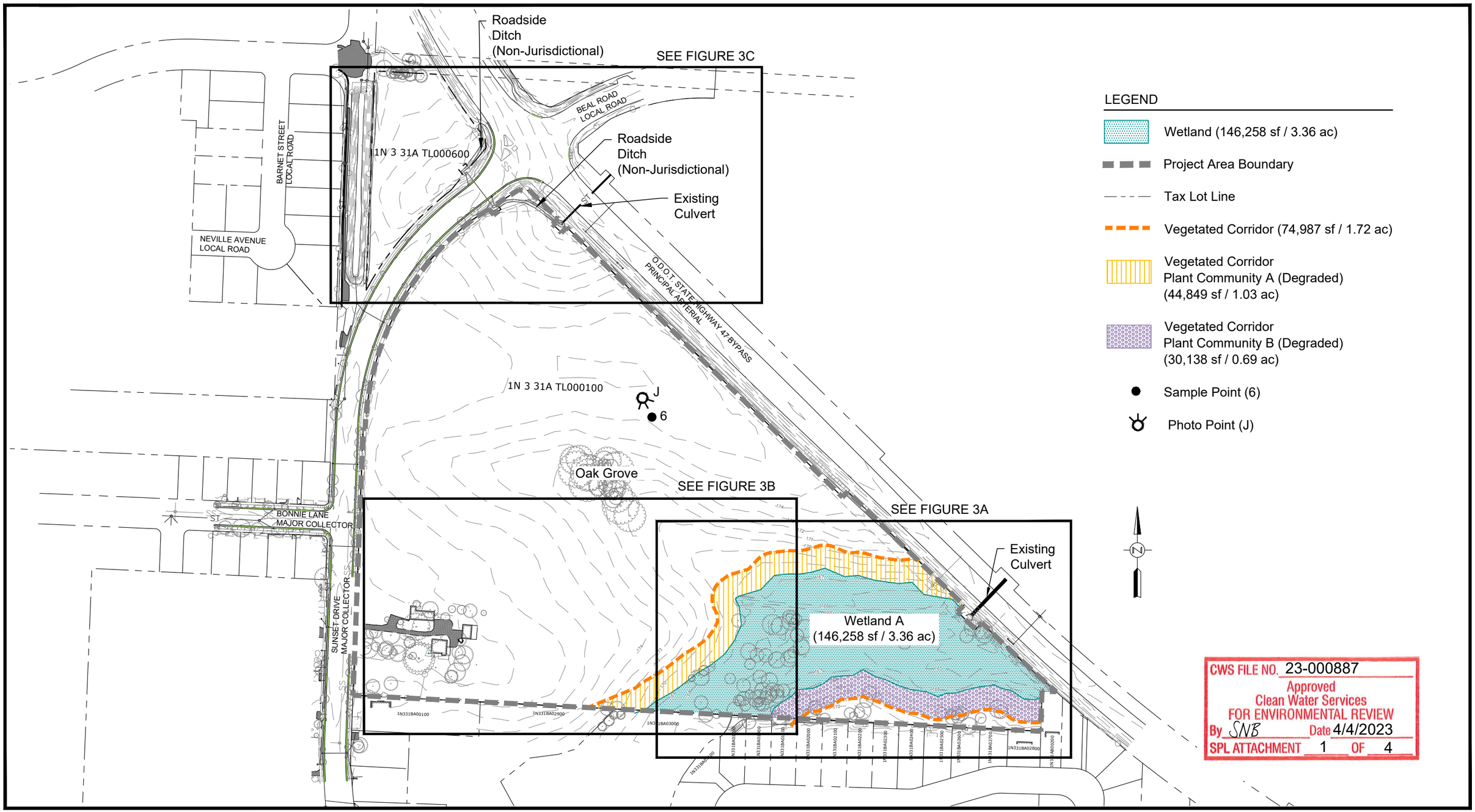
19. **Final construction plans shall include landscape plans.** In the details section of the plans, a description of the methods for removal and control of exotic species, location, distribution, condition and size of plantings, existing plants and trees to be preserved, and installation methods for plant materials is required. Plantings shall be tagged for dormant season identification and shall remain on plant material after planting for monitoring purposes.
20. **A Maintenance Plan shall be included on final plans** including methods, responsible party contact information, and dates (minimum two times per year, by June 1 and September 30).
21. **Final construction plans shall clearly depict the location and dimensions of the sensitive area and the Vegetated Corridor** (indicating good, marginal, or degraded condition). Sensitive area boundaries shall be marked in the field.
22. Protection of the Vegetated Corridors and associated sensitive areas shall be provided by the installation of permanent fencing and signage between the development and the outer limits of the Vegetated Corridors. **Fencing and signage details to be included on final construction plans.**

**This Service Provider Letter is not valid unless CWS-approved site plan is attached.**

Stacy Benjamin

**Stacy Benjamin**
**Environmental Plan Review**

**Attachments (4)**




LEGEND

- Wetland (146,258 sf / 3.36 ac)
- Project Area Boundary
- Tax Lot Line
- Vegetated Corridor (74,987 sf / 1.72 ac)
- Vegetated Corridor Plant Community A (Degraded) (44,849 sf / 1.03 ac)
- Vegetated Corridor Plant Community B (Degraded) (30,138 sf / 0.69 ac)
- Sample Point (6)
- Photo Point (J)

CWS FILE NO. 23-000887
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 4/4/2023
SPL ATTACHMENT 1 OF 4


Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855


Base Map Provided by 3J Consulting

Vegetated Corridor Plant Communities Overview and Sheet Index
Brown's Farm 3081 Sunset Drive - Forest Grove, Oregon

FIGURE 3

3-16-2023

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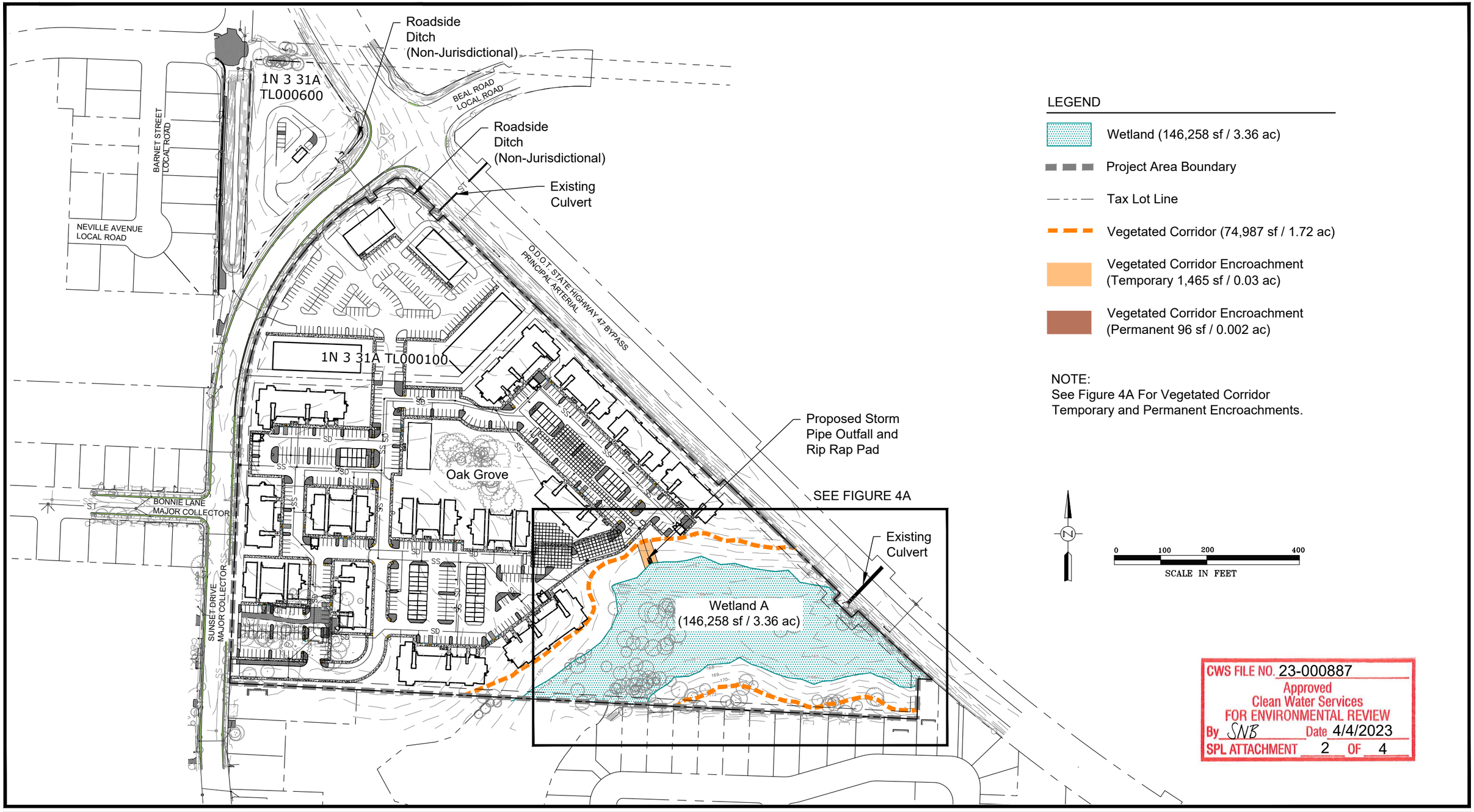


CWS FILE NO. 23-000887
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 4/4/2023
SPL ATTACHMENT 2 OF 4


Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855


Plan Provided by 3J Consulting

Proposed Site Development Plan Overview and Sheet Index
Brown's Farm 3081 Sunset Drive - Forest Grove, Oregon

FIGURE 4

3-16-2023

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CWS FILE NO. 23-000887
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 4/4/2023
SPL ATTACHMENT 3 OF 4

LEGEND

- Wetland (146,258 sf / 3.36 ac)
- Project Area Boundary
- Tax Lot Line
- Vegetated Corridor (74,987 sf / 1.72 ac)
- Vegetated Corridor Encroachment (Temporary 1,465 sf / 0.03 ac)
- Vegetated Corridor Encroachment (Permanent 96 sf / 0.002 ac)

Proposed Storm Pipe
(Temporary Vegetated
Corridor Encroachment)

Outfall Rip Rap Pad
(Vegetated Corridor
Permanent Encroachment)

Existing
Culvert

Wetland A
(146,258 sf / 3.36 ac)

1N 3 31A 00006100

1N331BA03000

1N331BA03100

1N331BA01700

1N331BA01900

1N331BA01900

1N331BA02000

1N331BA02100

1N331BA02200

1N331BA02300

1N331BA02400

1N331BA02500

1N331BA02600

1N331BA02700

1N331BA02800

1N331AB00200

0 30 60 120

SCALE IN FEET

Base Map Provided by 3J Consulting

Proposed Site Development Plan and Vegetated Corridor Encroachment
Brown's Farm 3081 Sunset Drive - Forest Grove, Oregon

FIGURE 4A

3-16-2023

Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

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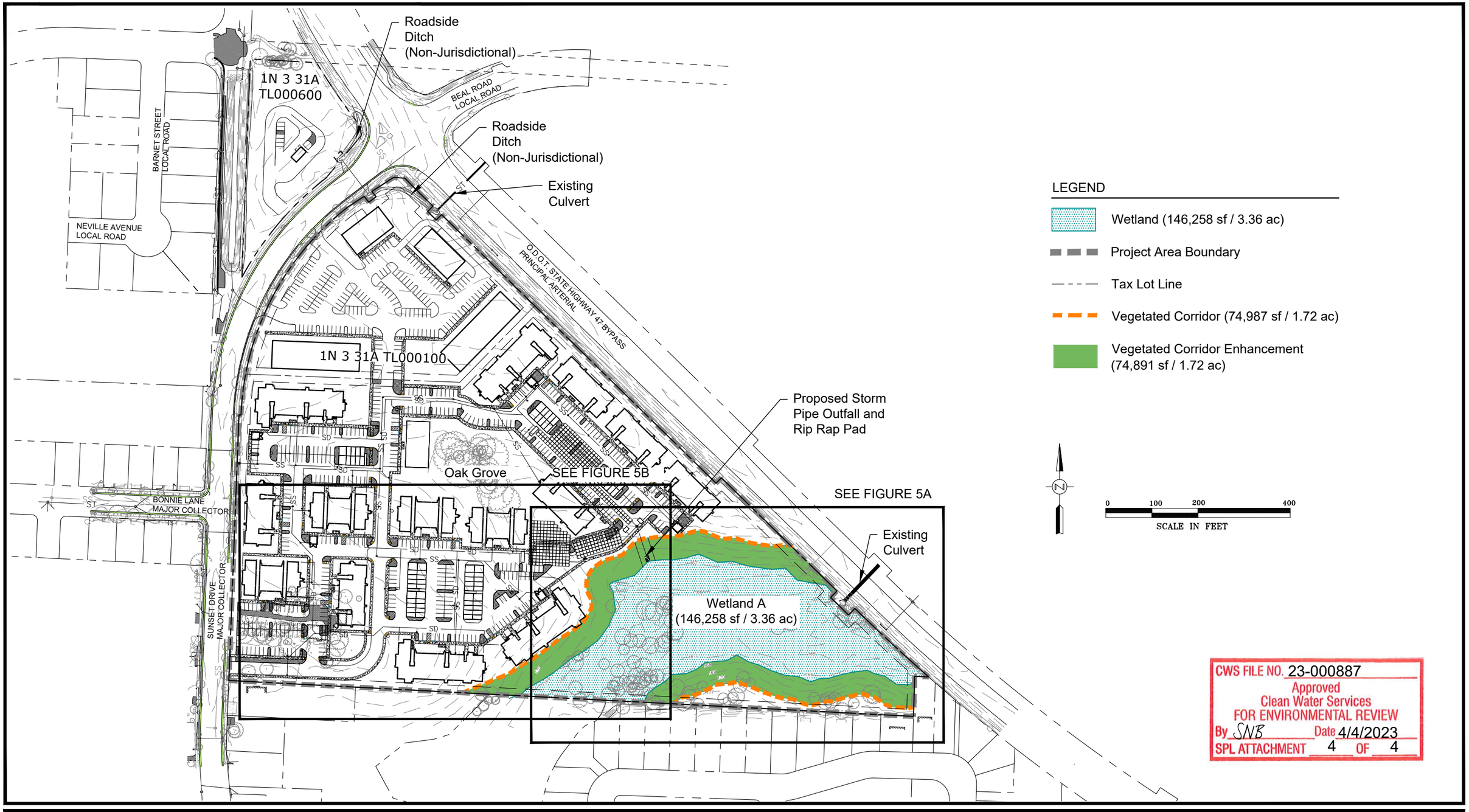


CWS FILE NO. 23-000887
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By SNB Date 4/4/2023
SPL ATTACHMENT 4 OF 4

PHS
Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Plan Provided by 3J Consulting

Vegetated Corridor Enhancement Plan Overview and Sheet Index
Brown's Farm 3081 Sunset Drive - Forest Grove, Oregon

FIGURE 5

3-16-2023

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## Kate McGuire

**From:** Gregory Robertson
**Sent:** Friday, November 17, 2023 10:14 AM
**To:** 'Aaron Murphy'
**Cc:** Kate McGuire; Bryan Pohl; Jesse Nemec; Mercedes Serra; Jim Schmitt; Matt Bell
**Subject:** RE: File No. 311-23-000022-PLNG Brown's Farm - Proposed Signalized Crosswalk Location at Sunset and Bonnie

Good morning Mr. Murphy:

In general, the location of the planned crosswalk is acceptable. We will want to see a complete design before giving final approval prior to implementing any improvements on Sunset Drive.

Regards,

Gregory H Robertson, P.E., AICP, PMP
Director of Public Works
City of Forest Grove, Oregon

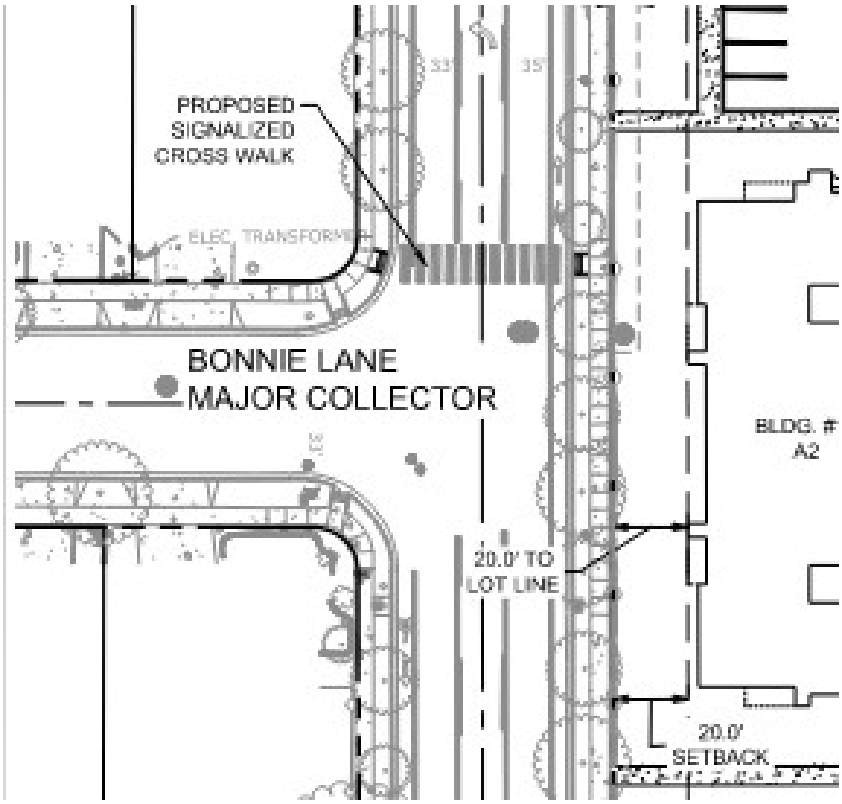
---

**From:** Aaron Murphy <aaron.murphy@3j-consulting.com>
**Sent:** Wednesday, November 15, 2023 10:24 AM
**To:** Gregory Robertson <grobertson@forestgrove-or.gov>
**Cc:** Kate McGuire <kmcguire@forestgrove-or.gov>; Bryan Pohl <BPohl@forestgrove-or.gov>; Jesse Nemec <jnemec@jtsmithco.com>; Mercedes Serra <mercedes.serra@3j-consulting.com>; Jim Schmitt <jim.schmitt@3j-consulting.com>; Matt Bell <mbell@kittelson.com>
**Subject:** File No. 311-23-000022-PLNG Brown's Farm - Proposed Signalized Crosswalk Location at Sunset and Bonnie

Good morning Greg,

We're reaching our on behalf of JT Smith Companies with a request to review the proposed signalized crosswalk location that we're planning to incorporate as part of the overall Brown's Farm Development. The project is currently in the land use phase and will hopefully receive preliminary approval towards the end of the year at which time, we'll be moving forward with processing permit applications and construction in summer 2024.

The signalized crosswalk is planned to be located on the north side of the Sunset Drive/Bonnie Lane intersection as depicted on attached Sheet C201 and below. Beacons will be added in accordance with the MUTCD and City of Forest Grove codes. The design will be stamped by a licensed professional civil engineer.




We look forward to any comments you may have and look forward to discussing this further with you as we move forward into the permitting process.

Best Regards,

**Aaron Murphy, PE** | Senior Project Manager | **3J Consulting**
he/him | O: 503.946.9365 x218 | C: 720.220.3915

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9600 SW Nimbus Ave, Suite 100 | Beaverton, OR 97008
Civil Engineering | Water Resources | Community Planning
Connect with us: Website | LinkedIn | Facebook | Instagram

## Kate McGuire

**From:** Jesse Nemec <jnemec@jtsmithco.com>
**Sent:** Wednesday, November 15, 2023 10:47 AM
**To:** Aaron Murphy
**Cc:** Gregory Robertson; Kate McGuire; Bryan Pohl; Mercedes Serra; Jim Schmitt; Matt Bell
**Subject:** Re: File No. 311-23-000022-PLNG Brown's Farm - Proposed Signalized Crosswalk Location at Sunset and Bonnie

Hi Greg,
I just wanted to elaborate a bit. My vision for this crosswalk would include on-demand, push-button LED flashing beacons, similar to the examples below. These are becoming quite common in other parts of the metro area.

**Jesse Nemec**
Sr Development Manager | J.T. Smith Companies
503.730.8620
5285 Meadows Rd. Ste 171, Lake Oswego, OR 97035

jtsmithco.com JTS Instagram JTS Linkedin

■ JTS OR #141930 ■ JTSC OR #200237 ■ JTSC WA #JTSCLL*870N9 ■

IMPORTANT: The contents of this email and any attachments are confidential. It is strictly forbidden to share any part of this message with any third party, without a written consent of the sender. If you received this message by mistake, please reply to this message and follow with its deletion, so that we can ensure such a mistake does not occur in the future.

On Wed, Nov 15, 2023 at 10:24 AM Aaron Murphy <aaron.murphy@3j-consulting.com> wrote:

> Good morning Greg,

Oregon
Tina Kotek, Governor

**Department of Transportation**
Transportation Region 1
123 NW Flanders St.
Portland, OR 97209-4012
(503) 731-8200
Fax: (503) 731-8259

9/19/23: ODOT #12692

# ODOT Response

| | |
|---|---|
| **Project Name:** Browns Farm | **Applicant:** JT Smith |
| **Jurisdiction:** City of Forest Grove | **Jurisdiction Case #:**311-23-000022-PLNG |
| **Site Address:** 3081 Sunset Drive | **State Highway: OR 47** |

The site of this proposed land use action is adjacent to OR 47 which is a high speed facility. ODOT has permitting authority for this facility and an interest in ensuring that this proposed land use is compatible with its safe and efficient operation. **Please direct the applicant to the District Contact indicated below to determine permit requirements and obtain application information.**

**PROJECT DESCRIPTION**

The applicant is proposing to partition of lot 100 to create 3 new parcels; a mixed use planned development containing commercial development and 360 residential apartment units at final build out (3 phases); a text amendment to allow higher density; and a variance to allow buildings up to 45' outside of the village center (for residential structures).

**COMMENTS/FINDINGS**

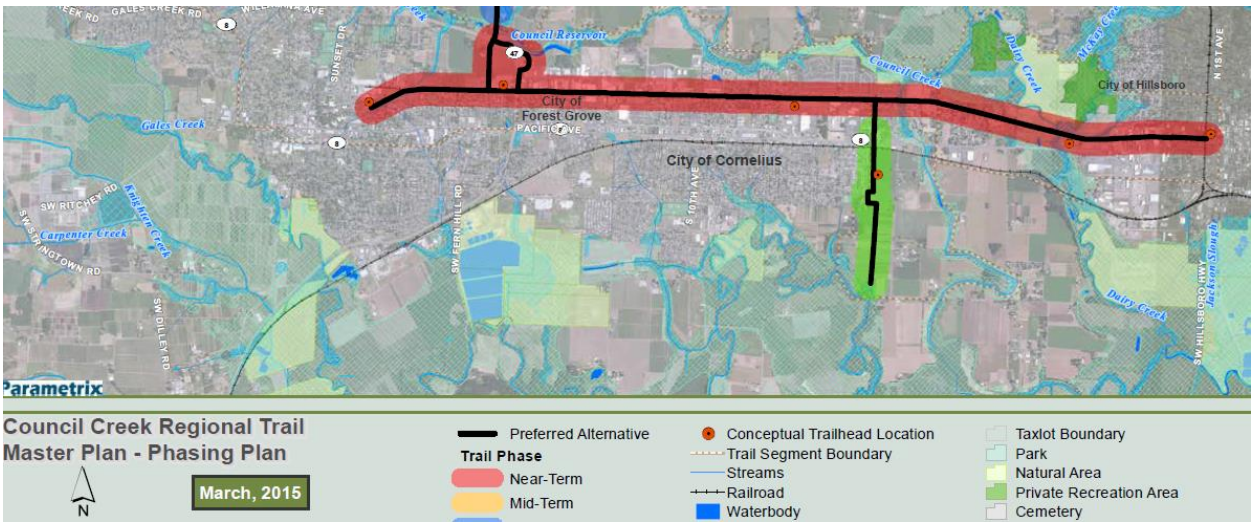
Traffic Study

Kittelson and Associates prepared a Technical Memorandum dated July 14, 2023 which analyzed the impacts of the proposed development on the surrounding transportation facilities including OR 47 intersections. The memo found that all highway intersections meet ODOT Oregon Highway Plan mobility standards. However, page 27 of the memo identifies that standing queues on Sunset Dr approaching the OR 47 intersection. "During these time periods, turning movements at the driveway may be effectively limited to right-in/right-out by standing queues."

Signal timing changes are typically not considered by ODOT as mitigation for development impacts. Therefore, Kittelson recommends the City of Forest Grove reach out to ODOT to explore this topic further. If the city is interested in discussing signal timing changes, please contact the Region 2 Traffic Unit.

Council Creek Regional Trail

The OR 47 frontage for the proposed development falls within the alignment of the Council Creek Regional Trail as identified below.




ODOT, Metro, THPRD, Forest Grove and other Washington County stakeholders have been working towards the common vision of a multi-use path providing critical transportation and recreational opportunities for people walking and bicycling along the trail corridor. This is an exciting opportunity to build a critical part of the trail.

Since we do not anticipate bicycle and pedestrian facilities on the opposite side of the highway due to the UGB, ODOT recommends that the city require the applicant to install a 10ft wide multi-use path with 2ft shoulders on either side as illustrated below.

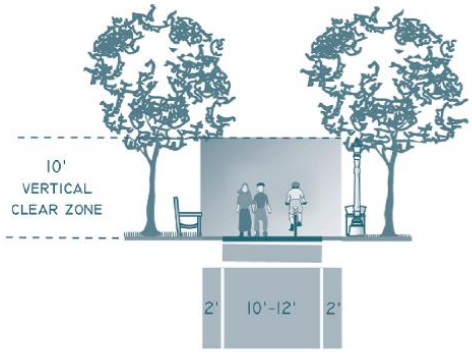



Figure 2. Regional Trail

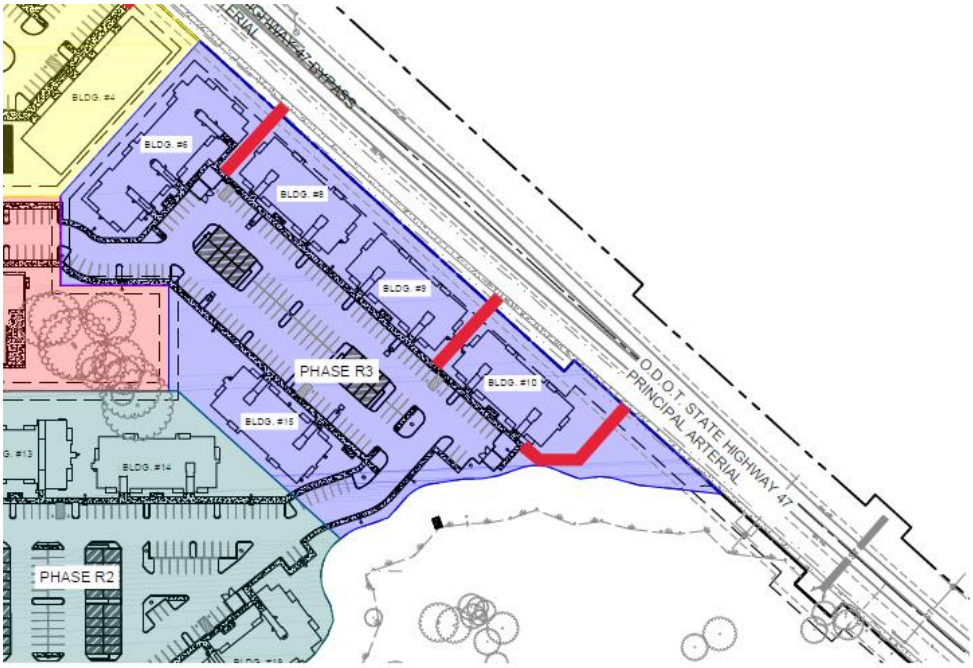
The existing highway drainage system should remain in place with the path placed behind it. If additional right of way is needed, we recommend the city require it to be donated to ODOT.

Highway Access

As requested, all access for vehicles to the State highway have been eliminated.

Due to the residential nature of this development and the surrounding neighborhood, it is important to provide pedestrian and bicycle connections to the Council Creek Regional Trail to be consistent with the Forest Grove Development Code 17.115 On-Site Pedestrian Walkways.

ODOT recommends the city require a pedestrian walkway at one or more of the locations identified in red below:




All alterations within the State highway right of way are subject to the ODOT Highway Design Manual (HDM) standards. Alterations along the State highway but outside of ODOT right-of-way may also be subject to ODOT review pending its potential impact to safe operation of the highway. If proposed alterations deviate from ODOT standards a Design Exception Request must be prepared by a licensed engineer for review by ODOT Technical Services. Preparation of a Design Exception request does not guarantee its ultimate approval. Until more detailed plans have been reviewed, ODOT cannot make a determination whether design elements will require a Design Exception.

Note: Design Exception Requests may take **4 months or longer** to process.

All ODOT permits and approvals must reach 100% plans before the District Contact will sign-off on a local jurisdiction building permit, or other necessary requirement prior to construction.

**ODOT RECOMMENDED LOCAL CONDITIONS OF APPROVAL**

Frontage Improvements and Right of Way

☒ The applicant shall install a 10ft wide multi-use path with 2ft shoulders on each side along the property's OR 47 frontage consistent with local, ODOT and ADA standards. The existing drainage system shall remain in place and the applicant shall donate right of way donated to ODOT as necessary to accommodate the path. The deed must be to the State of Oregon, Oregon Department of Transportation. The ODOT District contact will assist in coordinating the transfer. ODOT should provide verification to the local jurisdiction that this requirement has been fulfilled. The property owner must be the signatory for the deed and will be responsible for a certified environmental assessment of the site prior to transfer of property to the Department.

Note: It may take up to **6 months or longer** to transfer ownership of property to ODOT.

Permits and Agreements to Work in State Right of Way

☒ An ODOT Miscellaneous Permit must be obtained for all work in the highway right of way. When the total value of improvements within the ODOT right of way is estimated to be $100,000 or more, an agreement with ODOT is required to address the transfer of ownership of the improvement to ODOT. An Intergovernmental Agreement (IGA) is required for agreements involving local governments and a Cooperative Improvement Agreement (CIA) is required for private sector agreements. The agreement shall address the work standards that must be followed, maintenance responsibilities, and compliance with ORS 276.071, which includes State of Oregon prevailing wage requirements.

Note: If a CIA is required, it may take **6 months or longer** to process.

**Please send a copy of the Notice of Decision including conditions of approval to:**

ODOT Region 1 Planning
Development Review
123 NW Flanders St
Portland, OR 97209

ODOT_R1_DevRev@odot.oregon.gov

| | |
|---|---|
| Development Review Planner: Marah Danielson | 503.731.8258, marah.b.danielson@odot.oregon.gov |
| District 1 Contact: Virginia Williams | virginia.l.williams@odot.oregon.gov |

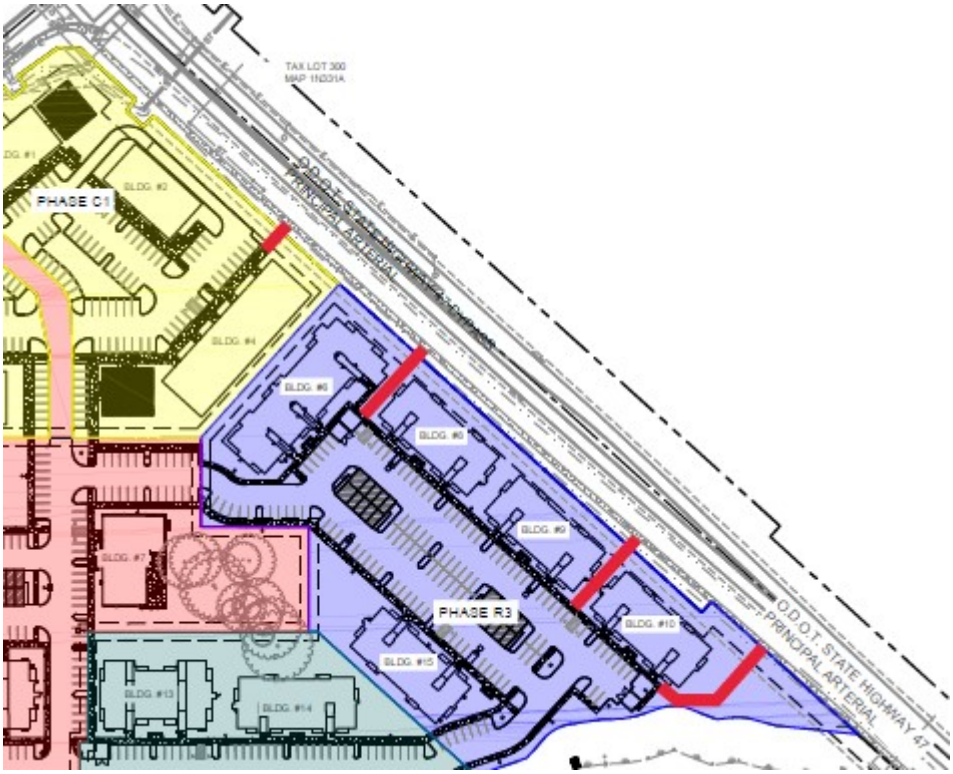
## Kate McGuire

**From:** RUSSELL John <John.RUSSELL@odot.oregon.gov>
**Sent:** Wednesday, September 20, 2023 9:38 AM
**To:** Kate McGuire
**Cc:** DANIELSON Marah B
**Subject:** RE: ODOT Comments: "Browns Farm - Partition and Mixed Use Planned Development
**Attachments:** FG 12692_230802_phasing_plan with paths.pdf

Kate,

As a minor correction, it appears that the map I drafted of potential pedestrian connections was truncated. Without being too prescriptive on the exact location, it is important to ensure that commercial buildings in Phase C1 also have a direct connection to the proposed trail.

If it is any help to you, I have attached the full PDF as well as a screenshot below:

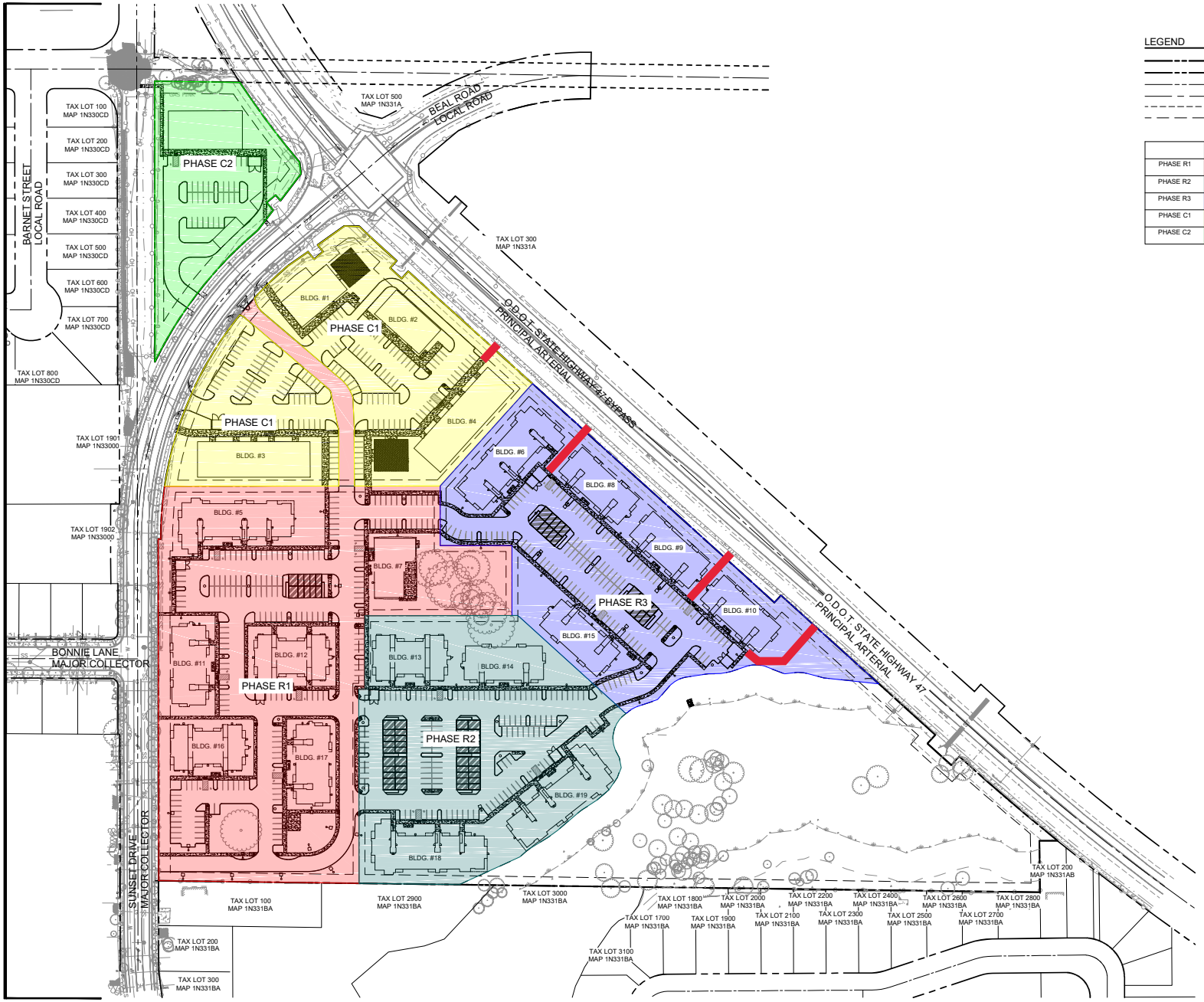



Thank you,

John Russell, PE [he/him]
Traffic Analysis Engineer
Oregon Dept of Transportation
John.Russell@odot.oregon.gov
503.731.8282

---

**From:** Kate McGuire <kmcguire@forestgrove-or.gov>
**Sent:** Tuesday, September 19, 2023 5:44 PM
**To:** DANIELSON Marah B <Marah.B.DANIELSON@odot.oregon.gov>




LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT OF WAY LINE
- EXISTING ADJACENT PROPERTY LINE
- EXISTING ROW CENTERLINE
- PROPOSED EASEMENT LINE
- PROPOSED SETBACK LINE

| | | TOTAL ACRES |
|---|---|---|
| PHASE R1 | | 6.45 |
| PHASE R2 | | 3.76 |
| PHASE R3 | | 3.96 |
| PHASE C1 | | 3.77 |
| PHASE C2 | | 1.54 |

N

W E

S

**NOTE: NORTH ARROW IS APPROX. 2° 15' 40.02" EAST OF TRUE NORTH

SCALE: 1" = 80'

0 80 160 FT

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 9, 2004
ELIZABETH D. JONES
EXPIRES: 12/31/24

PRELIMINARY

PUBLISH DATE
JULY 13, 2023

ISSUED FOR
LAND USE

REVISIONS

PHASING PLAN

BROWN'S FARM

JTSC, LLC
FOREST GROVE, OREGON

3J CONSULTING

CIVIL ENGINEERING
WATER RESOURCES
COMMUNITY PLANNING

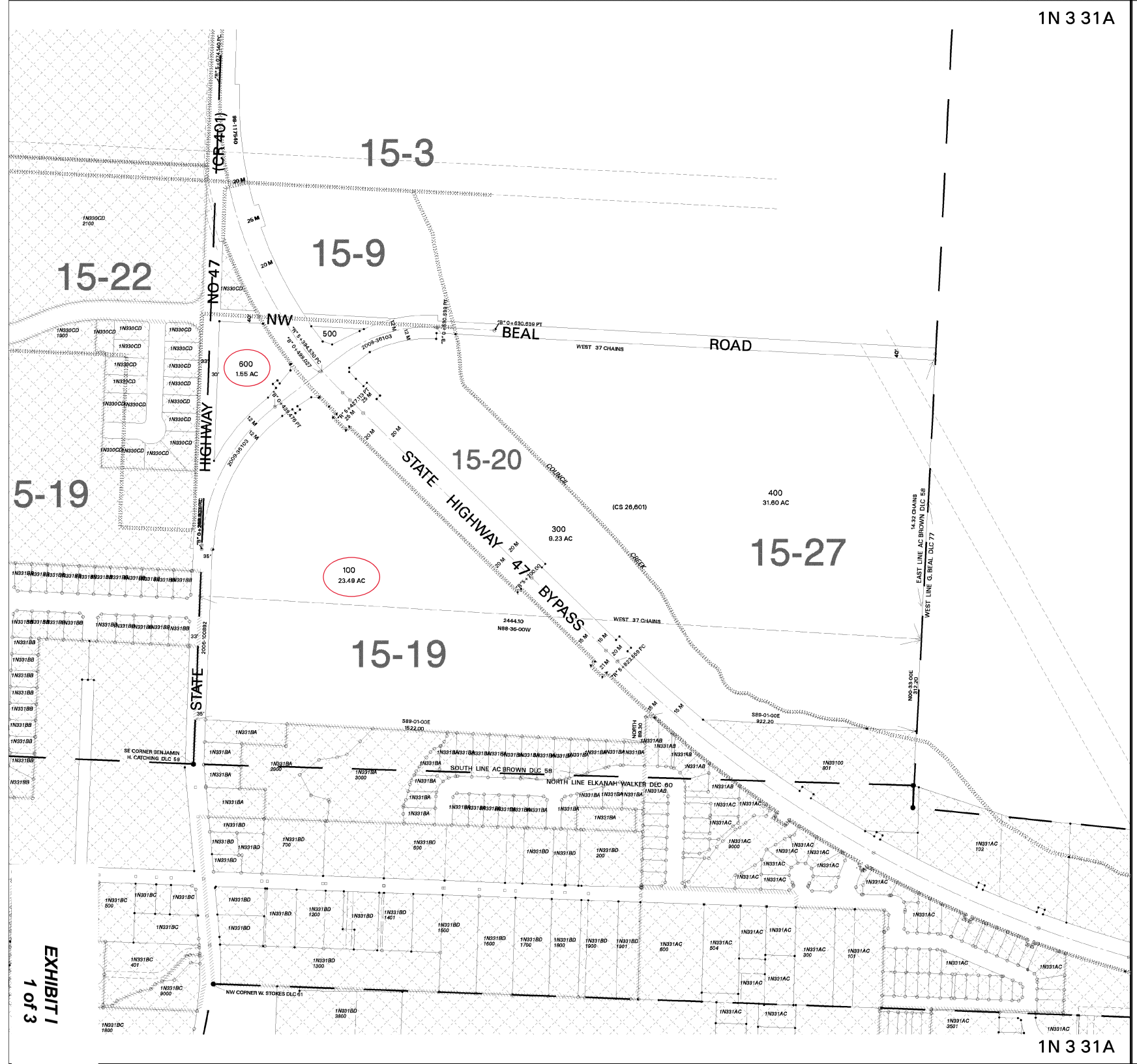
9600 SW NIMBUS AVE., SUITE 100; BEAVERTON, OR 97008

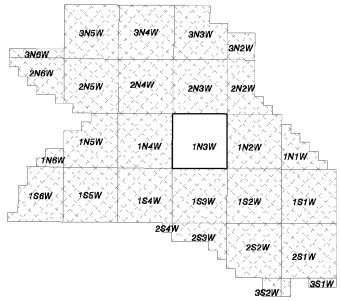
PROJECT INFORMATION

3J PROJECT # | 22807
TAX LOT(S) | 100, 600
LAND USE # | -
DESIGNED BY | LEO, KDO, SMT
CHECKED BY | AJM, JJS

SHEET NUMBER
C190

P:\22807-JTS\BROWN'S FARM\MIXED USE\CAD\SHEETS\PHASING PLAN-22807.DWG

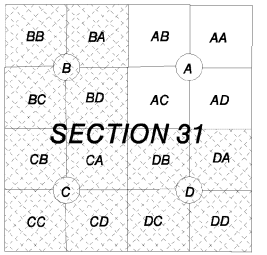



**WASHINGTON COUNTY OREGON**
**NE1/4 SECTION 31 T1N R3W W.M.**
**SCALE 1" = 200'**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 36 | 31 | 32 | 33 | 34 | 35 | 36 | 31 |
| 1 | 6 | 5 | 4 | 3 | 2 | 1 | 6 |
| 12 | 7 | 8 | 9 | 10 | 11 | 12 | 7 |
| 13 | 18 | 17 | 16 | 15 | 14 | 13 | 18 |
| 24 | 19 | 20 | 21 | 22 | 23 | 24 | 19 |
| 25 | 30 | 29 | 28 | 27 | 26 | 25 | 30 |
| 36 | 31 | 32 | 33 | 34 | 35 | 36 | 31 |
| 1 | 6 | 5 | 4 | 3 | 2 | 1 | 6 |

***FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.washington.or.us***




Cancelled Taxlots For: 1N331A
200,

SCALE 1" = 200'
0 100 200 400 600

WASHINGTON COUNTY OREGON 1843
Assessment
CARTOGRAPHY
Taxation

PLOT DATE: March 29, 2013

*FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE*

*Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.*

FOREST GROVE
1N 3 31A

***EXHIBIT I***
***1 of 3***

| Property | Owner | Property Address | 2023 Real Market Value |
|---|---|---|---|
| R741843 | DAVIDSON, ERNEST D FAM TR (STATE QTIP) | 3081 SUNSET DR, FOREST GROVE, OR 97116 | $8,833,380 |

## 2024 GENERAL INFORMATION

| | |
|---|---|
| Property Status | A Active |
| Property Type | Residential |
| Legal Description | ACRES 23.49, POTENTIAL ADD'L TAX LIABILITY |
| Alternate Account Number | - |
| Neighborhood | 4TL1 TRACTLAND-AREA 1 WESTERN WASHINGTON COUNTY |
| Map Number | 1N331A000100 |
| Property Use | 5411: SPECIALLY ASSESSED - UNZONED FARMLAND - IMPRVD - RESID |
| Levy Code Area | 015.19 |
| 2023 Certified Tax Rate | 18.7717 |

## RELATED PROPERTIES

| | |
|---|---|
| Linked Properties | - |
| Property Group ID | - |
| Grouped Properties | - |
| Split / Merge Date | - |
| Split / Merge Accounts | - |
| Split / Merge Message | - |

## 2024 OWNER INFORMATION

| | |
|---|---|
| Owner Name | DAVIDSON, ERNEST D FAM TR (STATE QTIP) |
| Mailing Address | 1000 SE SHADOWOOD DR BEND, OR 97702 |

## 2023 IMPROVEMENTS

Expand/Collapse All

| | | | | |
|---|---|---|---|---|
| ⊞ Improvement #1 - | Improvement Type Single-Family Residence | Beds / Baths 1 / 1 | Sketch |
| ⊞ Improvement #2 - | Improvement Type Single-Family Residence | Beds / Baths 2 / 2 | Sketch |
| ⊞ Improvement #3 - | Improvement Type Other Improvements | | Sketch |
| ⊞ Improvement #4 - | Improvement Type Other Improvements | | Sketch |
| ⊞ Improvement #5 - | Improvement Type Other Improvements | | Sketch |

EXHIBIT I
2 of 3

| Property | Owner | Property Address | 2023 Real Market Value |
|---|---|---|---|
| R2083935 | DAVIDSON, ERNEST D FAMILY TRUST & DAVIDSON, WYNONA D REV TRUST & T&T PROPERTIES | NS, FOREST GROVE, OR | $582,810 |

## 2024 GENERAL INFORMATION

| | |
|---|---|
| Property Status | A Active |
| Property Type | Residential |
| Legal Description | ACRES 1.55, POTENTIAL ADD'L TAX LIABILITY |
| Alternate Account Number | - |
| Neighborhood | 4TL1 TRACTLAND-AREA 1 WESTERN WASHINGTON COUNTY |
| Map Number | 1N331A000600 |
| Property Use | 5401: SPECIALLY ASSESSED - UNZONED FARMLAND - VACANT - RESID |
| Levy Code Area | 015.19 |
| 2023 Certified Tax Rate | 18.7717 |

## RELATED PROPERTIES

| | |
|---|---|
| Linked Properties | - |
| Property Group ID | - |
| Grouped Properties | - |
| Split / Merge Date | - |
| Split / Merge Accounts | - |
| Split / Merge Message | - |

## 2024 OWNER INFORMATION

| | |
|---|---|
| Owner Name | DAVIDSON, ERNEST D FAMILY TRUST & DAVIDSON, WYNONA D REV TRUST & T&T PROPERTIES |
| Mailing Address | 1000 SE SHADOWOOD DR BEND, OR 97702 |

EXHIBIT I
3 of 3

# Oregon Historic Site Record

## LOCATION AND PROPERTY NAME

| | | | |
|---|---|---|---|
| **address:** | 3081 NW Sunset Dr<br>Forest Grove, Washington County | **historic name:** | Brown, Alvin Clark, House |
| | | **current/other names:** | |
| **assoc addresses:** | | **block/lot/tax lot:** | |
| **location descr:** | | **twnshp/rng/sect/qtr sect:** | 1N 3W 31 |

## PROPERTY CHARACTERISTICS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **resource type:** | Building | **height (stories):** | 1.5 | **total elig resources:** | 1 | **total inelig resources:** | 1 |
| **elig evaluation:** | eligible/contributing | | | **NR Status:** | | | |
| **prim constr date:** | 1863 | **second date:** | | **date indiv listed:** | | | |

| | | | |
|---|---|---|---|
| **primary orig use:** | Single Dwelling | **orig use comments:** | |
| **second orig use:** | | | |
| **primary style:** | Vernacular | **prim style comments:** | |
| **secondary style:** | Classical Revival: other | **sec style comments:** | |
| **primary siding:** | Horizontal Board | **siding comments:** | |
| **secondary siding:** | Wood:Other/Undefined | | |
| **plan type:** | Side Passage/Entry | **architect:** | |
| | | **builder:** | |

**comments/notes:**

## GROUPINGS / ASSOCIATIONS

| Survey/Grouping Included In: | Type of Grouping | Date Listed | Date Compiled |
|---|---|---|---|
| Settlement-era Dwellings, Barns & Farm Groups the the Willamette Valley, Oregon | Survey & Inventory Project | | 2013 |

## SHPO INFORMATION FOR THIS PROPERTY

| | | | |
|---|---|---|---|
| **NR date listed:** | N/A | **106 Project(s):** | None |
| **ILS survey date:** | | **Special Assess Project(s):** | None |
| **RLS survey date:** | 01/03/2013 | **Federal Tax Project(s):** | None |

## ARCHITECTURAL / PROPERTY DESCRIPTION

*(Includes expanded description of the building/property, setting, significant landscape features, outbuildings and alterations)*

Refer to scanned documents links.

## HISTORY

*(Chronological, descriptive history of the property from its construction through at least the historic period - preferably to the present)*

Refer to scanned documents links.

## RESEARCH INFORMATION

| | | | |
|---|---|---|---|
| Title Records | Census Records | Property Tax Records | Local Histories |
| Sanborn Maps | Biographical Sources | SHPO Files | Interviews |
| Obituaries | Newspapers | State Archives | Historic Photographs |
| City Directories | Building Permits | State Library | |

| | | | |
|---|---|---|---|
| **Local Library:** | | **University Library:** | |
| **Historical Society:** | | **Other Respository:** | |

**Bibliography:**

CES|NW

EXHIBIT 'A'

3081 Sunset Drive
November 29, 2022

Tax Map 1N 3 31A
Tax Lot 100
Tax Lot 600

TWO TRACTS OF LAND SITUATED IN THE NORTHEAST ONE QUARTER OF SECTION 31, TOWNSHIP 1 NORTH, RANGE 3 WEST, WILLAMETTE MERIDIAN, CITY OF FOREST GROVE, WASHINGTON COUNTY, OREGON AND BEING A PORTION OF THE ALVIN BROWN D.L.C. NUMBER 58; BEING DESCRIBED AS FOLLOWS:

PARCEL-1

BEGINNING AT THE SOUTHEAST CORNER OF SAID FIRST TRACT OF LAND SAID POINT BEING AT THE NORTHERLY CORNER OF LOT 9, "COUNCIL MEADOWS", WASHINGTON COUNTY PLAT RECORDS SAID POINT ALSO BEING 49.21 FEET SOUTHWESTERLY OF THE CENTERLINE OF STATE HIGHWAY 47 BYPASS ON THE SOUTHWESTERLY RIGHT OF WAY LINE OF SAID STATE HIGHWAY BEING MARKED BY A 5/8" IRON ROD WITH YELLOW PLASTIC CAP STAMPED "AKS ENGR"; THENCE NORTHWESTERLY ALONG SAID SOUTHWESTERLY LINE 218.43 FEET ALONG THE ARC OF A 4068.24 FOOT RADIUS CURVE CONCAVE NORTHEASTERLY WITH A CENTRAL ANGLE OF 3°04'35" WHICH THE LONG CHORD BEARS NORTH 48°45'33" WEST 218.41 FEET; THENCE SOUTH 42°46'45" 19.69 FEET; THENCE NORTH 47°13'03" WEST 54.33 FEET; THENCE NORTH 42°46'47" EAST 19.69 FEET; THENCE NORTH 47°13'03" WEST 351.05 FEET; THENCE SOUTH 42°46'57" WEST 16.41 FEET; THENCE NORTH 47°13'03" 833.34 FEET; THENCE SOUTH 42°46'57" 16.40 FEET; THENCE NORTH 47°13'03" WEST 26.24 FEET; THENCE NORTH 42°46'57" EAST 16.40 FEET; THENCE NORTH 47°13'03" WEST 35.72 FEET; THENCE 50.16 FEET ALONG THE ARC OF A 1453.42 FOOT RADIUS CURVE CONCAVE NORTHEASTERLY WITH A CENTRAL ANGLE OF 1°58'39" WHICH THE LONG CHORD BEARS NORTH 46°13'53" WEST 50.16 FEET; THENCE NORTH 87°36'48" WEST 24.68 FEET TO A POINT ON THE SOUTHEASTERLY RIGHT OF WAY LINE OF SUNSET DRIVE SAID POINT BEING 49.17 FEET SOUTHERLY OF CENTERLINE AND BEING MARKED BY A 3/4" IRON PIPE WITH YELLOW PLASTIC CAP SCRIBED "COUNTY SURVEYOR"; THENCE SOUTH 55°29'38" WEST 55.99 FEET ALONG SAID SOUTHEASTERLY LINE; THENCE SOUTH 39°17'39" EAST 14.55 FEET; THENCE SOUTH 50°47'54" WEST 19.68 FEET; THENCE NORTH 39°17'39" WEST 16.20 FEET; THENCE SOUTH 55°30'33" WEST 41.26 FEET; THENCE 524.95 FEET ALONG THE ARC OF A 600.39 FOOT RADIUS CURVE CONCAVE SOUTHEASTERLY WITH A CENTRAL ANGLE OF 50°05'48" WHICH THE LONG CHORD BEARS SOUTH 25°39'28" WEST 508.39 FEET; THENCE NORTH 89°34'56" WEST 4.37 FEET TO THE EASTERLY RIGHT OF WAY LINE OF STATE HIGHWAY 47 (C.R. 401) SAID POINT BEING 35.00 FEET EASTERLY OF CENTERLINE AND BEING MARKED BY A 5 8" IRON ROD WITH ORANGE PLASTIC CAP INSCRIBED "CESNW INC."; THENCE SOUTH 00°35'33" WEST 576.65 FEET ALONG SAID EASTERLY LINE; THENCE LEAVING SAID EASTERLY LINE SOUTH 88°35'24" EAST 1487.76 FEET TO THE NORTHEAST CORNER OF LOT 24, "COOK VILLAGE", WASHINGTON COUNTY PLAT RECORDS; BEING ON THE WEST LINE OF SAID LOT 9 "COUNCIL MEADOWS" BEING MARKED BY A 5/8" IRON ROD WITH YELLOW PLASTIC CAP STAMPED "LAND TECH"; THENCE NORTH 00°02'03" WEST 87.00 FEET ALONG THE WEST LINE OF SAID LOT 9; THENCE SOUTH 89°15'39" EAST 30.51 FEET TO THE POINT OF BEGINNING.

CONTAINS 23.37 ACRES, MORE OR LESS.

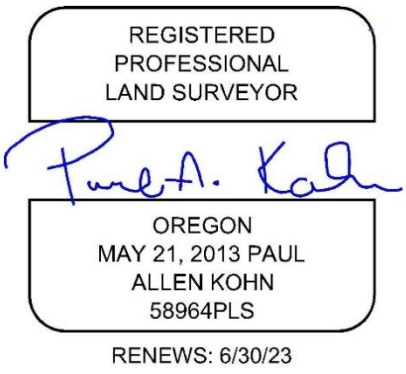
PARCEL-2

BEGINNING AT THE MOST SOUTHERLY CORNER OF THE SAID SECOND TRACT OF LAND SAID POINT BEING EASTERLY 30.00 FEET OF THE CENTERLINE OF STATE HIGHWAY 47 (C.R. 401) ON THE EASTERLY RIGHT OF WAY LINE OF SAID HIGHWAY SAID POINT ALSO BEING 39.37 FEET NORTHWESTERLY OF THE CENTERLINE OF SUNSET DRIVE SAID POINT BEING MARKED BY A 5/8" IRON ROD WITH ORANGE PLASTIC CAP ON THE NORTHWESTERLY RIGHT OF WAY LINE OF SAID SUNSET DRIVE; THENCE ALONG SAID NORTHWESTERLY LINE 284.39 FEET ALONG THE ARC OF A 679.13 FOOT RADIUS CURVE CONCAVE SOUTHEASTERLY WITH A CENTRAL ANGLE OF 23°59'34" WHICH THE LONG CHORD BEARS NORTH 38°42'41" EAST 282.31 FEET; THENCE NORTH 37°59'46" EAST 42.13 FEET; THENCE NORTH 39°17'39" WEST 16.98 FEET; THENCE NORTH 50°42'21" EAST 19.68 FEET; THENCE SOUTH 39°17'39" EAST 12.56 FEET; THENCE NORTH 37°59'19" EAST 57.19 FEET; THENCE NORTH 06°23'02" WEST 19.54 FEET TO THE SOUTHWESTERLY RIGHT OF WAY LINE OF HIGHWAY 47 BYPASS SAID POINT BEING 65.62 FEET SOUTHWESTERLY OF CENTERLINE SAID POINT BEING MARKED BY A 3/4" IRON PIPE WITH YELLOW PLASTIC CAP SCRIBED "COUNTY SURVEYOR"; THENCE 168.44 FEET ALONG THE ARC OF A 1453.42 FOOT RADIUS CURVE CONCAVE NORTHEASTERLY WITH A CENTRAL ANGLE OF 6°38'25" WHICH THE LONG CHORD BEARS NORTH 36°05'30" WEST 168.35 FEET TO THE SOUTHERLY RIGHT OF WAY LINE OF NW BEAL ROAD SAID POINT BEING MARKED BY A 5/8" IRON ROD WITH ORANGE PLASTIC CAP INSCRIBED "CESNW INC." BEING 20.00 FEET SOUTHERLY OF CENTERLINE; THENCE NORTH 88°30'15" WEST 143.94 ALONG SAID SOUTHERLY LINE TO THE EASTERLY RIGHT OF WAY LINE OF SAID HIGHWAY 47 (C.R. 401) SAID POINT BEING 30.00 FEET EASTERLY OF CENTERLINE AND BEING MARKED BY A 5/8" IRON ROD WITH ORANGE PLASTIC CAP INSCRIBED "CESNW INC."; THENCE SOUTH 00° 35'33" WEST 473.69 FEET TO THE POINT OF BEGINNING.

CONTAINS 1.54 ACRES, MORE OR LESS.

THE BASIS OF BEARINGS IS THE OREGON COORDINATE REFERENCE SYSTEM PORTLAND ZONE A BEARING OF NORTH 00°35'33" EAST WAS HELD ALONG THE CENTERLINE OF STATE HIGHWAY 47 (C.R. 401).

Prepared by CESNW.



Meeting Date: November 20th

Current Development Plan

Time: 7:00 pm

| Name | List of concerns/thoughts regarding development |
|---|---|
| Laura Lewis<br>3254 Barnet | ● Traffic on both sunset/47 intersection and Bonnie/Sunset<br>○ OF NOTE: These studies were conducted during “peak hours”, (7:15-8:15 am and 4:15-5:15 pm)) which do NOT match the FGHS bell schedule and bussing concerns. (3:15-4pm) Therefore, the study completely misses the 3 block back-up of school/bus traffic that occurs directly at the intersections of Main & Bonnie and Bonnie & Sunset.<br>● Duplexes on adjacent acreage & adequate parking (I do NOT want them parking in our dead-end/cul de sac)<br>● Construction noise & debris/dust, etc. What measures will be taken to ensure livability for current homeowners?<br>● How are they changing the “walkability” requirement as listed in the original zoning code to match that of the proposed duplex area?<br>● Why houses and not businesses there?<br>● What would it take to get a park put there instead of duplexes? |
| Shesna Calkins<br>3261 Barnet | ● Duplexes on adjacent acreage: overflow parking will certainly spill out onto the cul de sac. Also, an added multiuser trash/recycling space will have to go somewhere in that area.<br>● Will the added duplexes be part of the larger development? Shared common areas? Again, walkability concerns.<br>● Traffic concerns |
| Jimi Smith<br>3260 Barnet | ● Please note the units going in behind us are four-plexes, equaling 24 housing units and accompanying parking and traffic congestion issues. With 1.4 parking spaces per unit, Beal and Barnet will become overflow parking lots. How will this concern be addressed?<br>● As Laura mentioned, the traffic study doesn’t address the FGHS dismissal congestion. I also don’t believe it adequately addresses the impact of all those 380 residences dumping traffic onto Sunset so close to the Sunset/47 intersection.<br>● Are additional pedestrian safety features being implemented for the foot traffic crossing from the four-plexes/townhomes to the retail area on the east side of Sunset? Additional crosswalk recommendation from official traffic report.<br>● Will there be a concrete median on the north end of Sunset to enforce the “right in/right out” only from the larger development?<br>● The introduction of the traffic study indicates that the “Construction of the proposed townhomes is expected to be complete in 2024 while construction of the proposed apartments and retail center is expected to be complete in 2026.”<br>● Traffic study also includes a recommendation that JT Smith and the City collaborate to design and construct a marked crossing at Sunset & Bonnie. How likely is this to happen? |

| | |
|---|---|
| Linda Hedlund<br>3255 Barnet | ● Traffic concerns:<br>● 360 units @ 1.4 cars equal 504 vehicles per traffic study<br>● 24 unit @ 1.4 cars equal 34 vehicles per traffic study<br>● Realistic vehicles per unit (minimum)<br>● 360 unites @ 2 cars equal 1008 vehicles<br>● 24 units @ 2 cars equal 68 vehicles<br>● This will have a minimum of 1,076 vehicles entering and exiting Sunset Drive<br>● during peak travel times (7:00 am-9:00 am and 4:00 pm - 6:00 pm)<br>● Pedestrian traffic (high schoolers) will be at risk, they would be within the<br>● district's no busing furnished and will be crossing and walking down Sunset Drive<br>● to Bonnie Lane or cutting through fourplex area onto Beal Road.<br>● What is flexible commercial space (going into apartment complex)? What type of<br>● commercial business will be going in?<br>● Will the commercial space be the type that surrounding residences will be going<br>● to use? This will also add additional traffic and pedestrian concerns?<br>● Concern that the Alvin Clark Brown house would be demolished.<br>● Park/playground, indoor basketball court, and common areas are all in apartment<br>● complex, no safe access for residents in fourplexes.<br>● From what I can determine on the fourplex plan there is no adequate parking for<br>● residents or visitors. We are concerned that overflow/additional parking will be<br>● on Beal Road and Barnet Street.<br>●<br>● Plan states 4 units in each bldg, but where are the parking areas for those units? Hard to tell on the new plan.<br>● New plan doesn't show a walkway onto old Sunset Drive and Beal Road, has it been removed?<br>● Will there be fencing behind the fourplex units? |
| Meghan Wiggette and Ben | ● Traffic Concerns: Increase in cars<br>● Pedestrian Traffic: Increased foot traffic through Beal St. More kids walking to FGHS.<br>● Overflow Parking Concerns: Safety of the current neighborhood, increase noise, increase foot traffic/traffic at all hours. No overflow parking for the current neighborhood.<br>● Safety of Current Neighborhood: Increase traffic=decrease safety. Car accidents, robbery/theft/graffiti.<br>● Construction Nuisance: Noise, Debris, Traffic/Accessibility<br>● Environmental Concerns: Duck Pond, Preservation of birds, Wildlife/Litter |
| Heidi Campbell<br>2110 Neville | ● -Traffic increase- particularly back up from Sunset and Bonnie<br>● - Increased traffic and overflow parking<br>● from units near duck pond<br>● -impact on wildlife<br>● -impact of retail space on noise and traffic in the overall neighborhood<br>● -impact of retail space on existing small, locally owned businesses that make up our downtown. |

| | |
|---|---|
| | • -privacy issues from 4 plexes-Are they going to have a bird's eye view of back yards? |
| Jenice Pittman<br>3243 Barnet | We are residents that live on Barnet Street in Forest Grove, OR. We are concerned about the construction that is being proposed behind our homes which borders Sunset Dr. This is a small strip of property that already has a small swill, walking path and the Welcome to Forest Grove sign and surrounding landscape. The proposal is requesting six four plexes and parking. Sunset Drive is already a busy road that connects to hwy 47 the main thoroughfare to Banks. There is also proposed construction across Sunset Dr for mixed residential and commercial use. There is another large Construction project underway in our area. David Hill, that is going to have a huge impact on our area when completed. This will add further stress to our area streets that we fear will seriously impact our homes and our property values. In conclusion we understand Urban growth but it is really important to keep the charm of our communities and the green spaces that are so important to our communities. We enjoy the duck ponds, walking paths and green spaces that add to the livability to our community. |

| | |
|---|---|
| Chaffy Clemens<br>2106 Beal Rd | • What will the street traffic be between that marsh area and the fence line of Barnet street houses (like Jill, Shesna, Linda, etc) will they be opening that area up for access to those apts or business to have more entry points.<br>• Will they be extending Beal for any reason to make it a thru street not a dead end. If not that will make for another point of traffic concerns having people use Main & Beal as a place to enter/exit during peak times and avoid build ups at other intersections.<br>• Who will maintain the wetland area and the added trash, problems and safety concerns that will come with more people in this area.<br>• What will the area around the flag pole/Welcome to Forest Grove going to become? Will that all be part of that new development. Or will it still be more of a “neighborhood” feel for us still with the limited access people have currently.<br>• With no other locations to enter those new developments other than those 3 “drive ways” that is going to cause lots of back ups when cars need to wait for a break in traffic to enter or exit on Sunset, causing back up potentially onto Highway 47 especially with stop light timing.<br>• Can entry points be located some where else such as the “south end of property line and just creating a new road that would come out on Sunset between Bonnie and Williamina.<br>• What type of boundaries will these new complexes have large brick walls, fences and trees that will limit visibility (like on David Hill where all the trees are growing and its hard to see oncoming traffic)<br>• Run off water: where is all the water going to go our street already floods without all that land to soak it up its going to cause more flooding into the pond<br>• Why did the plan change from business to complexes? With a business that closes we could have less overnight issues instead of houses |

| | |
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| Joanna Ortiz<br>3237 Barnet | ● Traffic on sunset<br>● We will have more foot traffic.<br>● We will have more people trying to park on Beal st for the duplex.<br>● There is no way there's enough parking per unit in the apartment complex.<br>● More people will be using our walking path and can be a target for Tagging our fence.<br>● Will the swale be the same size or will I be bigger?<br>● How many feet from the swale will the duplex be built?<br>● Will they all be double story duplex? |

PEDESTRIAN CONCERNS:

- How are they changing the "walkability" requirement as listed in the original zoning code to match that of the proposed duplex area?
- Will the added duplexes be part of the larger development? Shared common areas? Again, walkability concerns.
- Park/playground, indoor basketball court, and common areas are all in apartment complex, no safe access for residents in fourplexes.
- Are additional pedestrian safety features being implemented for the foot traffic crossing from the four-plexes/townhomes to the retail area on the east side of Sunset? Additional crosswalk recommendation from official traffic report.
- Pedestrian traffic (high schoolers) will be at risk, they would be within the district's no busing furnished and will be crossing and walking down Sunset Drive to Bonnie Lane or cutting through fourplex area onto Beal Road.
- We will have more foot traffic.
- Pedestrian Traffic: Increased foot traffic through Beal St. More kids walking to FGHS.

*The proposed Mixed Use Planned Development incorporates both tax lots; 100 and 600, and connectivity of the smaller parcel located west of Sunset is a consideration. As addressed elsewhere in the staff report where the pedestrian connectivity requirements of the MUPD (§17.4.300) were addressed, staff has expressed concerns regarding the safety and deficiency of existing connectivity across Sunset, between the two sites involved in the development, that were not addressed in the original proposal or the revised submittal.*

***The concerns identified above must be addressed by the Applicant or the Applicant's Traffic Engineer.*

- New plan doesn't show a walkway onto old Sunset Drive and Beal Road, has it been removed?

*The existing walkway on the abandoned portion of old Sunset drive that connects to Beal is not on the subject property.*

- More people will be using our walking path and can be a target for Tagging our fence.

*It is unclear to staff if the walking path in question is the same located west of the proposed development that exists along the abandoned portion of old Sunset, when viewing aerial imagery, staff does not see any other potential paths or walkways in proximity to the proposal.*

*If it is the same path, although it abuts fencing on private property, the path itself exists within a public right of way and there is no way to control who utilizes it, regardless of any adjacent proposed development.*

TRAFFIC CONCERNS:

- Traffic on both sunset/47 intersection and Bonnie/Sunset

- OF NOTE: These studies were conducted during “peak hours”, (7:15-8:15 am and 4:15-5:15 pm)) which do NOT match the FGHS bell schedule and bussing concerns. (3:15-4pm) Therefore, the study completely misses the 3 block back-up of school/bus traffic that occurs directly at the intersections of Main & Bonnie and Bonnie & Sunset.

- Traffic concerns:
  360 units @ 1.4 cars equal 504 vehicles per traffic study
  24 unit @ 1.4 cars equal 34 vehicles per traffic study
  Realistic vehicles per unit (minimum)
  360 unites @ 2 cars equal 1008 vehicles
  24 units @ 2 cars equal 68 vehicles
  This will have a minimum of 1,076 vehicles entering and exiting Sunset Drive
  during peak travel times (7:00 am-9:00 am and 4:00 pm - 6:00 pm)
- the traffic study doesn’t address the FGHS dismissal congestion. I also don’t believe it adequately addresses the impact of all those 380 residences dumping traffic onto Sunset so close to the Sunset/47 intersection.
- With no other locations to enter those new developments other than those 3 “drive ways” that is going to cause lots of back ups when cars need to wait for a break in traffic to enter or exit on Sunset, causing back up potentially onto Highway 47 especially with stop light timing.
- Traffic on sunset
- Traffic Concerns: Increase in cars
- Traffic increase- particularly back up from Sunset and Bonnie
- impact of retail space on noise and traffic in the overall neighborhood

  ***All questions/concerns regarding potential traffic increases or flow thereof, and explanations of traffic analysis findings and report must be addressed by the Applicant or the Applicant’s Traffic Engineer.*

- Can entry points be located some where else such as the “south end of property line and just creating a new road that would come out on Sunset between Bonnie and Williamina.

  *A two-way accessway for ingress and egress to the apartment complex is already proposed along the southern property boundary, between Bonnie and Willamina (represented on both the initial and revised site plans). No new “road” is proposed or necessary.*

- Will they be extending Beal for any reason to make it a thru street not a dead end. If not that will make for another point of traffic concerns having people use Main & Beal as a place to enter/exit during peak times and avoid build ups at other intersections.

  *The segment of Beal Street located to the north of tax lot 600 is not improved and therefore, not currently used by any vehicular traffic. This segment of Beal is not proposed for use for the current development proposal and does not provide any connection to the quadplexes proposed on tax lot 600, it simply exists abutting the property. Access to and from the quadplexes will be taken directly from Sunset Drive (see site plan demonstrating access only to Sunset Drive.*

- What will the street traffic be between that marsh area and the fence line of Barnet street

houses (like Jill, Shesna, Linda, etc) will they be opening that area up for access to those apts or business to have more entry points.

*There will be no vehicular traffic on the abandoned portion of Sunset Drive. It will continue to serve as a maintenance road/path but will not be reopened as an accessible vehicular right of way as a result of the current proposal. The water quality facility will not be affected by the current proposal on the subject property.*

- The introduction of the traffic study indicates that the "Construction of the proposed townhomes is expected to be complete in 2024 while construction of the proposed apartments and retail center is expected to be complete in 2026."

  *It is unclear to Staff what this statement of concern may be.*

- Traffic study also includes a recommendation that JT Smith and the City collaborate to design and construct a marked crossing at Sunset & Bonnie. How likely is this to happen?

  *Dependent on conditions of approval.*

- Will there be a concrete median on the north end of Sunset to enforce the "right in/right out" only from the larger development?

  ?

PARKING CONCERNS:

- There is no way there's enough parking per unit in the apartment complex.
- Plan states 4 units in each bldg, but where are the parking areas for those units? Hard to tell on the new plan.
- From what I can determine on the fourplex plan there is no adequate parking for residents or visitors. We are concerned that overflow/additional parking will be on Beal Road and Barnet Street.
- Overflow Parking Concerns: Safety of the current neighborhood, increase noise, increase foot traffic/traffic at all hours. No overflow parking for the current neighborhood.
- Increased traffic and overflow parking from units near duck pond
- Please note the units going in behind us are four-plexes, equaling 24 housing units and accompanying parking and traffic congestion issues. With 1.4 parking spaces per unit, Beal and Barnet will become overflow parking lots. How will this concern be addressed?
- Duplexes on adjacent acreage & adequate parking (I do NOT want them parking in our dead-end/cul de sac)
- Duplexes on adjacent acreage: overflow parking will certainly spill out onto the cul de sac.
- We will have more people trying to park on Beal st for the duplex.

  *There is no connectivity or pathway proposed within the written findings or demonstrated on the submitted site plan, between the quadplex development and Beal Street and none is required by the code. The only pathway identified, connects to the sidewalk located on the southwestern right of way of Hwy 47. If tenants of the quadplexes or visitors of those tenants wish to park on adjacent public rights of way, they will be subject to the parking*

*enforcement requirements of Municipal Code Title VII, Chapter 73 – PARKING REGULATIONS, which any vehicle parked on a public street in any neighborhood in the city are subject to.*

*The Climate-Friendly and Equitable Communities ("CFEC") program administered by the State of Oregon Department of Land Conservation and Development ("DLCD") was adopted on July 21, 2022. As a result, Oregon Administrative Rule ("OAR") 660-012-0430(2) "Reduction of Parking Mandates for Development Types" became effective August 17, 2022. The rule identifies; cities within a metropolitan area that have not adopted land use regulations without parking mandates as provided in OAR 660-12-0405 through 660-012-0415, are subject to the following provision:*
*"Cities and counties may not require more than one parking space per unit in residential developments with more than one dwelling unit on a single legally-established property."*

*The Applicant's proposal provides more parking spaces than are required by state law.*

***While the local Development Code cannot require additional parking beyond what is required by state law, the Applicant may wish to provide additional commentary to address neighborhood concerns.*

GENERAL QUESTIONS / CONCERNS:

- What is flexible commercial space (going into apartment complex)? What type of commercial business will be going in?

  *The property is in the Neighborhood Mixed Use zone district. Development Code §17.3.310 (C) Neighborhood Mixed Use (NMU) provides:*
  *"The Neighborhood Mixed Use zone is established to support the development of pedestrian-friendly mixed-use neighborhoods with a diversity in the mix of housing types and neighborhood-scale retail sales and service, office, civic or recreational uses. Most non-residential uses must be located within a "Village Center." The Village Center is intended to serve as the center of the neighborhood, providing convenient access to goods and services as well as "third places" where residents can gather. The NMU Zone implements the Comprehensive Plan's Mixed-Use designation."*

  *Development Code Table 3-8 identifies the types of commercial uses authorized in the NMU zone district, and the application procedures to obtain planning authorization to operate those businesses. A condition of any approval will require that proposed commercial operations comply with Table 3-8.*

- Will the commercial space be the type that surrounding residences will be going to use? This will also add additional traffic and pedestrian concerns?

  *Development Code Table 3-8 identifies the types of commercial uses authorized in the NMU zone district, and the application procedures to obtain planning authorization to operate those businesses. A condition of any approval will require that proposed commercial operations comply with Table 3-8.*

- Why houses and not businesses there?
- Why did the plan change from business to complexes? With a business that closes we

could have less overnight issues instead of houses

*Development Code §17.4.315 – MUPD STANDARDS, subsection (F) specifically identifies the maximum area the Village Center (commercial area) can encompass: "50% of the buildable land within the MUPD or three acres, whichever is greater." There is no minimum commercial area required by the Development Code, within the MUPD. Only one Village Center is allowed within a MUPD.*

*The Applicant revised their proposal to contain the Village Center to one location and to incorporate a diversity in the mix of housing types, as required by the MUPD process. The revised proposal had the effect of bringing the proposed development into alignment with the purpose and intent of the MUPD code.*

- Will they all be double story duplex?

  *Yes, please see attached floor plans (Plans Sheet A201) and building elevation profiles (Plans Sheet A501).*

- Also, an added multiuser trash/recycling space will have to go somewhere in that area

  *The Applicant has addressed §17.7.205 SOLID WASTE AND RECYCLING – SIZE, LOCATION, DESIGN AND ACCESS STANDARDS FOR STORAGE AREAS within their written findings (page 70) and an enclosure is represented on the northeastern portion of the quadplex development. Enclosures serving the apartment units and commercial areas are represented throughout that portion of the development as well. A condition of any approval will require compliance with the requirements of this section of the development code.*

- Will there be fencing behind the fourplex units?

  *No fencing is required. The revised landscape plan identifies that a "Type C" buffer area will be installed along the western property boundary of tax lot 600 which includes installation of a 4' hedge.*

- What type of boundaries will these new complexes have large brick walls, fences and trees that will limit visibility (like on David Hill where all the trees are growing and its hard to see oncoming traffic).

  *Pursuant to Development Code §17.8.425 – BUFFERING AND SCREENING STANDARDS, as proposed, the development does not require any brick walls, fences or trees that will limit visibility. There are existing street trees on Sunset that will be retained as required by Development Code §17.5.120.*

- Safety of Current Neighborhood: Increase traffic=decrease safety. Car accidents, robbery/theft/graffiti.

  *Public safety concerns, although understandable, are not specific to the current development proposal and are generally a concern wherever there is population growth*

*and the subsequent necessary development to accommodate it. The current proposal attempts to provide housing inventory to meet Metro requirements the City is required to meet as specifically addressed separately herein, where the text amendment for density increase is addressed.*

*Public safety concerns in any area of the city whether development has previously existed or where new development is proposed, are regulated by the City Municipal Code, particularly; Chapters 130 – Orderly Conduct & 132 – Graffiti (§132.99 – Penalty).*

- Construction Nuisance: Noise, Debris, Traffic/Accessibility
- Construction noise & debris/dust, etc. What measures will be taken to ensure livability for current homeowners?

  *All contractors provided a "Best Management Practices" handout by the building division (attached) which include requirements for solid waste containment, worksite perimeter protection and street cleaning, etc. The City of Forest Grove municipal code contains noise regulations at §91.030 and §91.035 provides the days of the week and timeframe allowed for construction activities.*

| *Construction activities* | | |
|---|---|---|
| Sound created by construction activities, provided equipment is maintained in good repair and equipped with sound dissipating devices in good working order. | Monday - Friday<br>7:00 a.m. to 10:00 p.m. | Saturday<br>8:00 a.m. to 7:00 p.m. |

- Will the swale be the same size or will I be bigger?

  *The proposed development will have no effect on the size of the existing swale.*

- How many feet from the swale will the duplex be built?

  *Measurement taken from City mapping data with underlain aerial imagery, indicates that the swale is located approximately 10 -15 feet at any given point where it abuts the western boundary of the subject property. The Applicant has proposed a 10 foot structural setback from the property boundary. Therefore, the duplexes will be located approximately 20 - 25 feet from the swale.*

- Who will maintain the wetland area and the added trash, problems and safety concerns that will come with more people in this area.

  *The owner/operator of the apartment complex will maintain the wetland area in compliance with the requirements of Clean Water Services ("CWS"). Safety concerns will be handled by the police.*

- impact on wildlife
- Environmental Concerns: Duck Pond, Preservation of birds, Wildlife/Litter
- Run off water: where is all the water going to go our street already floods without all that land to soak it up its going to cause more flooding into the pond.

*The proposed development is not associated with the property the duck pond is located on. That property (tax lot 1N330CD02100) is owned and maintained by the City of Forest Grove. The Applicant has provided a Preliminary Stormwater Report that provides analysis and proposed mitigation. Staff will defer to the Applicant to provide detail to address this concern.*

- Concern that the Alvin Clark Brown house would be demolished.

  *The Applicant identifies that they are working with Friends of Historic Forest Grove to re-locate the dwelling. Staff would defer to the Applicant to address the progress of that cooperative effort.*

- impact of retail space on existing small, locally owned businesses that make up our downtown.

  *The development code does not participate in creating monopolies for existing commercial enterprises, it simply regulates what kinds of commercial uses are authorized in various zoning districts and the application process to gain approval to conduct business. The commercial development required as part of the NMU zone and MUPD plan is intended to serve the residents of the MUPD and neighboring areas. Commercial uses are limited to those authorized by Table 3-8 of the development code and may or may not compete with existing business in town.*

- What will the area around the flag pole/Welcome to Forest Grove going to become? Will that all be part of that new development. Or will it still be more of a "neighborhood" feel for us still with the limited access people have currently.

  *The flag pole and Welcome to Forest Grove sign are not located on the subject property and will not be affected by the proposed development. They are located on property located to the north of tax lot 600 (tax lot 1N330CD02201) which is owned by Washington County Facilities Management.*

- What would it take to get a park put there instead of duplexes?

- We are residents that live on Barnet Street in Forest Grove, OR. We are concerned about the construction that is being proposed behind our homes which borders Sunset Dr. This is a small strip of property that already has a small swill, walking path and the Welcome to Forest Grove sign and surrounding landscape. The proposal is requesting six four plexes and parking. Sunset Drive is already a busy road that connects to hwy 47 the main thoroughfare to Banks. There is also proposed construction across Sunset Dr for mixed residential and commercial use. There is another large Construction project underway in our area. David Hill, that is going to have a huge impact on our area when completed. This will add further stress to our area streets that we fear will seriously impact our homes and our property values. In conclusion we understand Urban growth but it is really important to keep the charm of our communities and the green spaces that are so important to our communities. We enjoy the duck ponds, walking paths and green spaces that add to the livability to our community.

## § 91.035 EXEMPTIONS.

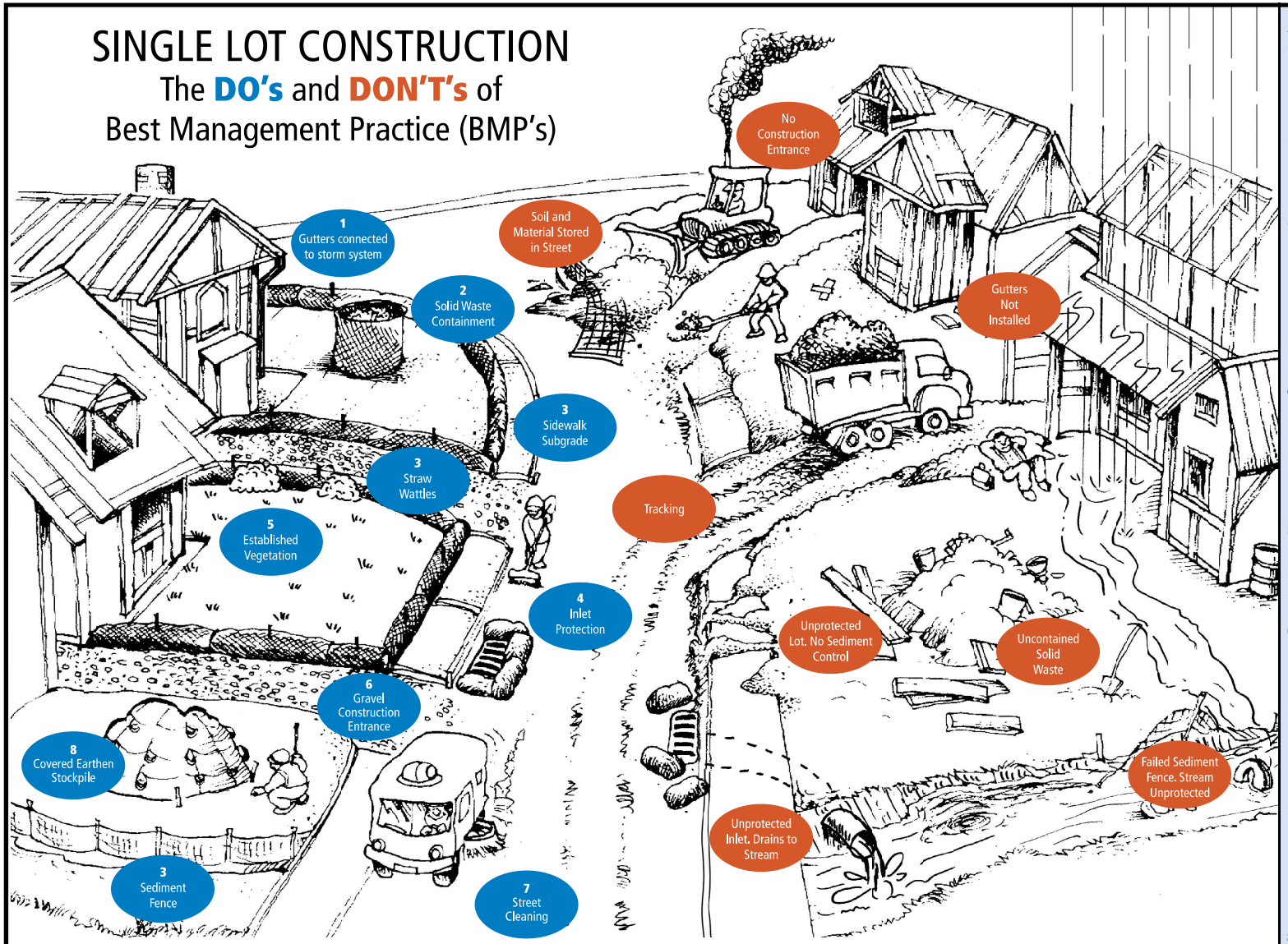
The following sounds are exempted from provisions of this subchapter.

| | | |
|---|---|---|
| *Construction activities* | | |
| Sound created by construction activities, provided equipment is maintained in good repair and equipped with sound dissipating devices in good working order. | Monday - Friday 7:00 a.m. to 10:00 p.m. | Saturday 8:00 a.m. to 7:00 p.m. |
| *Domestic power tools and chainsaws* | | |
| Sounds created by domestic power tools, provided sound dissipation devices on tools are maintained in good repair. Sounds caused by chainsaws, when used for pruning, trimming, cutting of live trees. | Monday - Friday 7:00 a.m. to 10:00 p.m. | Saturday - Sunday 8:00 a.m. to 7:00 p.m. |
| *Explosives* | | |
| The discharge of legal explosive devices or legal fireworks on the third of July, Fourth of July, and the Friday and Saturday during the weekend closest to the Fourth of July of each year. | Monday - Friday 7:00 a.m. to 11:00 p.m. | |
| The discharge of legal explosive devices or legal fireworks on January 1 of each year. | Monday - Friday 11:00 p.m. to 12:30 a.m. | |
| *Refuse pickup* | | |
| Sounds created by refuse pickup operations in a noise sensitive area. | Monday - Friday 5:00 a.m. to 7:00 p.m. | |
| *Amplifiers and loudspeakers*. Sounds produced by amplifying equipment and loudspeakers at organized athletic or city-permitted activities or events. | | |
| *Emergency work or equipment*. Sounds caused by the performance of emergency work, vehicles, and/or equipment. | | |
| *Events*. Non-amplified sounds produced by organized athletic or city-permitted activities or events at places such as stadiums, parks, public plazas, schools, athletic fields, and other public areas. | | |
| *Warning devices*. Sounds made by warning devices operating continuously for three minutes or less. | | |

(Prior Code, § 5.255) (Ord. 2010-08, passed 2-28-2011)

# SINGLE LOT CONSTRUCTION

## The **DO's** and **DON'T's** of Best Management Practice (BMP's)




**Erosion prevention information available on the internet:**

- For the region's most commonly used erosion control manual, go to: **http://cleanwaterservices.org/media/1464/erosion-prevention-and-sediment-control-manual.pdf**
- For more information about erosion prevention measures, go to the International Erosion Control Association at **http://www.ieca.org/**

### ADDITIONAL INFORMATION

**1.** Rain Drains. Roof runoff can create construction site erosion problems.
- Protect eavesdrop areas with straw, compost, gravel or plywood.
- Connect rain drains to the stormdrain system as soon as gutters are installed.

**2.** Solid Waste Containment. Keep trash and building wastes out of streets and storm drain systems.
- Separate and cover construction wastes, or remove them from the site.

**3.** Work Site Perimeter Protection. Choose the proper method for conditions.
- Install straw wattles or mulch berms where sediment fencing is not practical.
- Utilize sidewalk sub-grade area to trap sediments in runoff where possible.
- Mark construction limits with sediment or construction fencing.
- Make sure that all workers are aware of the limits to construction activities.

**4.** Inlet Protection. Choose the proper protection for inlet type, location and conditions.
- Use catch basin inserts in high traffic areas. Use bio bags to protect irregular-shaped inlets.
- Check daily, as traffic can knock barriers out of place, and accumulated sediments will need to be removed. Maintain after every major storm.

**5.** Ground cover and Vegetation. Apply approved groundcover when seeking final between September 1 and May 31.
- Stabalize soils as soon as grading is complete.
- Coordinate the application of approved groundcovers (straw, compost, mulch, woodchips) with landscaping.

**6.** Gravel Construction Entrance. Install an entrance adequate to last through the job. A well-stabilized entrance usually will not need to be replaced during the project.
- Use clean crushed rock (placed over geotextile fabric if necessary).
- Consider rocking other areas necessary for sub-contractor parking.
- Educate equipment operators about the cost of entrance replacement.

**7.** Street Cleaning. Deal with dirty streets before they get out of hand.
- Don't clean up mud on sidewalks or streets by hosing it down. This merely washes sediments into the storm drain system.
- Mechanically remove sediments from streets and sidewalks by scraping with a flat blade shovel or sweeping. Remove the sediments to a stable site.
- Call a vacuum sweeper if necessary, before tracking results in a project shutdown.

**8.** Covered Earth Stockpile. Cover stockpiles during the wet weather season (Oct. 1 thru May 31).
- Use weighted plastic or a 3-inch layer of mulch, straw or wood chips.
- Make sure that concentrated flows from plastic-covered stockpiles do not generate erosion.
- Seed stockpiles for long-term protection.